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A STUDY TO ASSESS THE IMPACT OF ALASKAN PETROLEUM DEVELOPMENT O--ETC(U)

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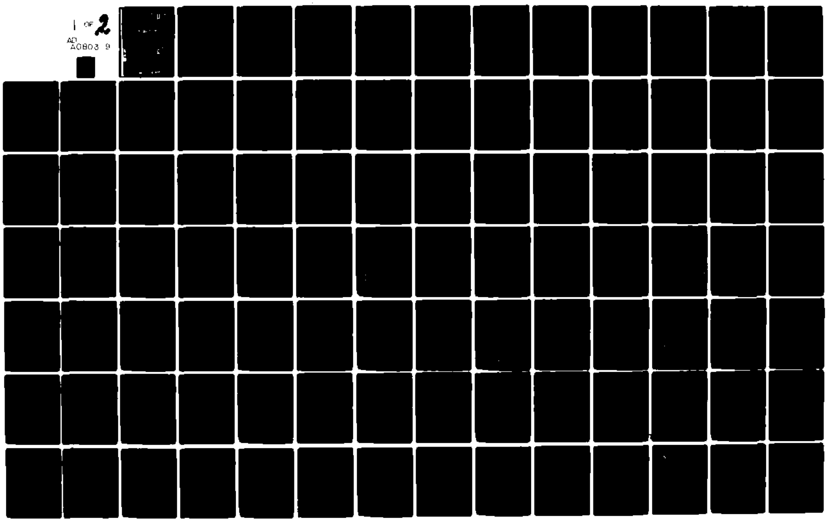

A Study To Assess The Impact Of Alaskan Petroleum Development On The Coast Guard Through The Year 2000.

EXECUTIVE SUMMARY

This study was undertaken to address the problem of a regional expansion in marine industry activities beyond historical levels and existing Coast Guard resource capabilities. Forecasts project that Alaska and its Outer Continental Shelf will become the primary area for petroleum exploratory activity for the remainder of the century. As a quantum increase in marine activities in Alaska would tax Coast Guard capabilities in the area, it was necessary to project the extent of this activity and its impact on the Coast Guard. This information would allow program managers and the Seventeenth Coast Guard District to plan for additional resources and to make the necessary decisions regarding their distribution for optimum response to workload increases resulting from increased industry activity. Analyses of the problem proceeded as follows:

A forecast of petroleum development activities in Alaska to the year 2000 was made and scenarios presented which allow for the various possibilities under high, medium, and low discoveries of recoverable resources. Each scenario provides resource estimates for all offshore petroleum provinces and the timing of their development. The number of exploratory and production rigs and support vessel requirements are provided for each case.

A marine forecast was then developed utilizing petroleum activity as the pacing parameter. This was done for the total range of marine activity in Alaska to the year 2000 and includes a tanker forecast, a non-crude cargo commercial shipping forecast and a fishing industry forecast. The petroleum development scenarios and marine forecast were then used in an analysis of Coast Guard workload requirements in Alaska. This analysis was made on a program by program basis. Manpower and resource requirements are provided for ice operations, marine safety activities, search and rescue, and to a lesser extent, other program areas as well.

The conclusions drawn by the study are that the Coast Guard will have sufficient lead time to plan and budget for those resources required to address workload increases resulting for petroleum development activity in Alaska. This is true under all scenarios, including the most rapid development scenario which is postulated. The results of this study have already been provided to cognizant program managers and Commander, Seventeenth Coast Guard District for inclusion in their program plans.

Introduction

This report summarizes the results of the work performed under Contract No. DOT-CG-73602-A, "A Study To Assess The Impact Of Alaskan Petroleum Development On The Coast Guard Through The Year 2000." The purpose of this study was to obtain information required for planning purposes so that Coast Guard program managers and district commanders would be able to make the policy/resource decisions necessary to respond to expected workload demands and possible new initiatives resulting from petroleum industry developments in Alaska. The objective of this report is to present a summary of the analysis, conclusions, and recommendations provided by the contractors, Energy Resources Company, Inc. (ERCO) and E. G. Frankel, Inc. (EGF). For a detailed presentation of the specific subtasks of this study, including references for the data which are presented, the individual task reports should be consulted as follows: Task 1, Petroleum Development Scenarios; Task 2, Marine Vessel Activity; Task 3, Icebreaking; Task 4, Port Safety and Security; Task 5, Marine Environmental Protection; Task 6, Commercial Vessel Safety; Task 7, Other Program Areas; Task 8, Program Support; and Task 9, Other Coast Guard Districts. The discussion in this report proceeds as follows: First the petroleum development scenarios for Alaska through the year 2000 are developed and presented; second a marine forecast flowing from the scenarios is given; finally, the impact on the Coast Guard of petroleum development in Alaska with its associated marine activity is presented on a program by program basis.

1-1 Estimate of Alaskan Petroleum Resources

The magnitude of Alaskan petroleum resources is the subject of much research and debate and there is considerable variance in the published estimates of the undiscovered recoverable oil and gas resources of Alaska and its outer continental shelf. (Undiscovered recoverable resources are defined as those economic resources, yet undiscovered, which are estimated to exist in favorable geologic settings. "Economic" in this context refers to the feasibility of recovery within a given set of price-cost and technological conditions.)

Most experts agree that the Alaskan petroleum provinces are the nation's most promising exploration and development areas. They do not agree, however, on the extent of these resources or on a development timetable. Accordingly, the study team was tasked to bring a myriad of estimates together and, using their informed judgement, to present a rational picture of petroleum development that would form the framework for future Coast Guard planning within the geographical area. This has been accomplished by utilization of a scenario approach which provides a petroleum development "envelope" for the evaluation of the various possibilities. The study encompasses the 14 major onshore petroleum provinces in Alaska (Figure 1-1) and the 13 sedimentary provinces of the Alaskan Continental Shelf (Figure 1-2) but scenarios are developed for the latter only.

The conclusions drawn by the study team are that during the period 1978-2000 onshore petroleum development in excess of current operations will be feasible only in the Arctic Coastal Plain, Northern and Southern Foothills, and Cook Inlet provinces. Before 1990, only production increases in the Arctic Coastal Plain and Cook Inlet areas are likely. No significant impacts on Coast Guard activities will result from these

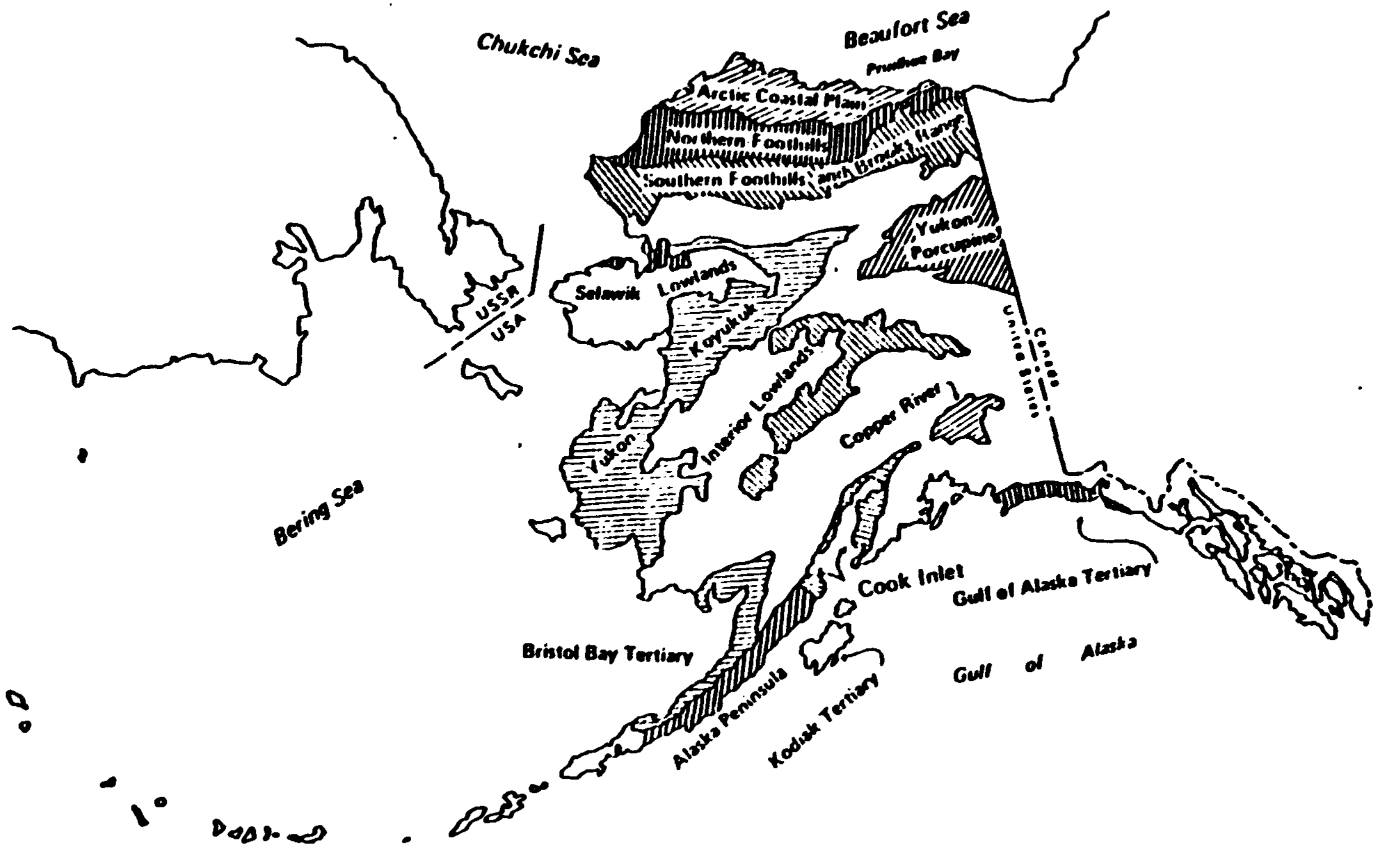

Figure 1-1 Onshore oil and gas provinces.

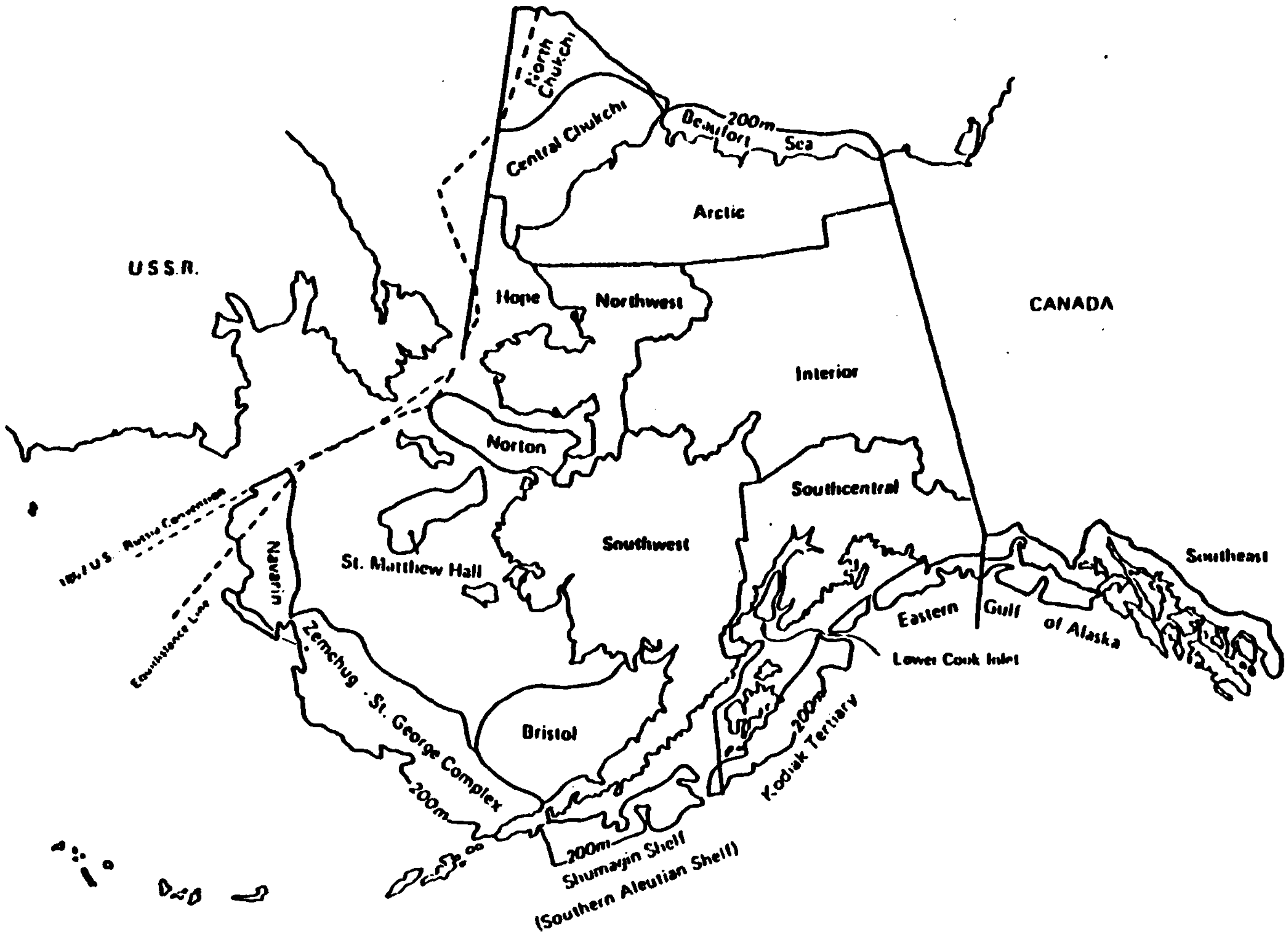

Figure 1–2 Offshore oil and gas provinces.

developments as they will serve principally to offset the production declines that will occur in the Prudhoe Bay and Cook Inlet areas at that time. Production of the National Petroleum Reserve of Alaska (NPRA) will have no significant implications for the Coast Guard as it will occur at a very slow pace, using the existing transportation infrastructure. Therefore, the petroleum development areas with significant implications for the Coast Guard are only those that will occur offshore. These are reviewed in detail.

1-2 Alaskan OCS Areas

Given the vast potential for the Alaskan OCS, there remains considerable uncertainty regarding the extent of offshore resources and the timing for development. The technology required for exploration and development in all but the far offshore Beaufort and Chukchi Sea regions has already been demonstrated, and so oil and gas appear to be recoverable from most Alaskan OCS areas if discovered in sufficient quantity. Due to the high costs of recovery in many offshore locations, discovery itself is not sufficient to guarantee development. It is important, therefore, to appreciate the operating conditions faced by industry in each OCS area which will impact on the cost of recovery to understand the Scenarios which are developed.

1-2.1 Gulf of Alaska

The operating environment of the Gulf of Alaska is very similar to that of the northern portions of the North Sea. The area is explorable year-round using the largest semi-submersible drilling platforms and development activities are feasible in the area, using present technology, to 600 foot water depths. In most of the "high potential" tracts, water depths are in the 400 to 600 foot range, resulting in slow and costly exploration and development operations. All of the Gulf of Alaska is free of ice and the leased areas are an average of about 22 miles from shore. Many onshore sites are available for locating support and supply bases, tanker terminals, and onshore production-treatment facilities.

If and when a discovery is made in the Gulf of Alaska, development will be relatively expensive and slow due to water depths, severe storm conditions, and earthquake activity. A 100-year storm in the Northern Gulf of Alaska would involve winds in excess of 110 knots and waves over 100 feet high. With respect to seismic conditions, the area is subject to frequent moderate seismic activity and to occasional severe seismic activity. Although not without considerable added cost in time and dollars, present technology enables oil production platforms and other facilities to be designed to withstand both the extreme wave and earthquake conditions of the Gulf of Alaska. Initial production will probably occur 4 to 8 years after discovery, with peak production achieved in 7 to 12 years.

1-2.2 Lower Cook Inlet

The Lower Cook Inlet can be fully explored with existing technology. Drillships, semi-submersibles, or large jack-up rigs can be used depending on location. From a production standpoint, the Lower Cook Inlet is the most preferable OCS area of Alaska in which to operate; operations there will be an extension of past and present production activities in Upper Cook Inlet. Although water depths in Lower Cook Inlet are deeper on the average than in Upper Cook Inlet (200 feet versus 80 feet), tidal currents are more moderate and ice conditions much less troublesome.

Pan ice from Upper Cook Inlet extends only infrequently into the northern areas of Lower Cook Inlet. Oil operations supply facilities are already established at nearby Kenai and so logistics are favorable. The timing of oilfield development in Lower Cook Inlet will probably be controlled by the construction of pipelines (onshore and offshore) and an onshore marine terminal. From the time a discovery of sufficient size is made in Lower Cook Inlet, initial production in 2 to 5 years and peak production in 4 to 8 years can be expected.

1-2.3 Kodiak Basin

Exploration in the ice-free Western Gulf of Alaska can occur year-round and the area's operational requirements are very similar to those of the ongoing Northern Gulf of Alaska exploration program. The largest size of semi-submersible drilling rig and supply boat would be used during exploration in Kodiak. Development activities in the Kodiak region will encounter the same wind, wave, and earthquake design conditions as in the rest of the Gulf, but water depths will be 250 to 350 feet versus 400 to 600 feet. Also, the Kodiak Basin areas of interest are somewhat less remote from established population centers than are other Gulf of Alaska lease sale areas. Following a discovery in the Kodiak region, production platform construction and establishment of onshore terminals and facilities will control the development time to initial (4 to 7 years) and peak (7 to 11 years) production.

1-2.4 Southern Aleutian Shelf

Currently, the Southern Aleutian Shelf is not on the Federal OCS lease sale schedule and is not an oil industry preferred area. It is possible that exploration and development activities in the Kodiak Basin will determine the future of the Aleutian Shelf. The operational characteristics of the Aleutian Shelf are virtually the same as the Kodiak Basin, although the Aleutian province presents more difficult logistics problems and is susceptible to periods of dense fog. The water depths are a manageable 250 to 300 feet. The time frame from discovery to initial production would be 4 to 7 years, with peak production occurring in 6 to 10 years. As in the Kodiak province, offshore platform and onshore facilities construction provide the development time controls.

1-2.5 Bristol Bay

In the event that Bristol Bay is made available for oil and gas exploration activities, progress toward peak production can be expected to be slow. Initial production would probably not occur for 6 to 8 years, while more than 10 years would pass before peak production is reached. The Bristol Bay region is subject to an annual ice cover of 1 to 3 feet for 7 to 8 months. Water depths in Bristol Bay are in the 200 to 300 foot range. Storm conditions in Bristol Bay are only slightly less severe than in the Gulf of Alaska. The 100-year storm would consist of 100 knot winds and 80 foot waves. Earthquake conditions in Bristol Bay are essentially the same as in the Gulf of Alaska.

Exploration of the Bristol Bay region during the summer drilling season would be conducted using the largest class of semi-submersible drilling rig. Development operations in Bristol Bay will be more challenging than in the Gulf of Alaska due to a combination of unfavorable ice, earthquake, oceanographic, climatic, and logistic factors. While each factor is singularly similar to or less severe than in other

Alaskan OCS areas, their combined impact in Bristol Bay makes the region a most difficult operating area. Thus, the timing of oilfield development will be controlled to a great extent by the timeframe of platform construction and installation in a harsh and remote environment. Siting and construction of an onshore marine terminal and production-treatment facility will also constrain the development schedule. Support and supply operations during exploration and development will be hampered by high winds, rough seas, sea ice, superstructure icing, and frequent dense fog. Although distances to shore from prospective areas in Bristol Bay are relatively short, there is no extant oil-related infrastructure, the area is remote, and good logistics base locations are few.

1-2.6 Norton Basin

Exploration in the Norton Sound area will most likely be conducted with jack-up rigs, or perhaps a bottom-founded semi-submersible rig. This will be possible because water depths in the areas of interest are typically 50 to 100 feet and earthquake conditions are moderate. During an average winter in the Norton Sound, sea ice will be about 3 feet thick and will last for 6 to 7 months. Severe winters will produce ice thicknesses of 4 to 6 feet that may endure for 7 to 8 months.

Development operations in the Norton Sound area of the Bering Sea will be aided by the shallow water feature and by the absence of severe earthquake activity. Conversely, development will be hindered by sea ice conditions, severe weather, and the area's remoteness. Since the Norton Sound area does not provide access to a year-round ice-free port, a pipeline will have to be built from the area, perhaps to a more southerly port. Alternatively, icebreaking tankers could be used to move production during the winter months. This aspect of Norton Basin oilfield development will most likely provide the time control from initial discovery to initial production.

From a logistics point of view, the Norton Sound region presents a difficult situation. Platform support and supply operations will face rough seas, sea ice, and superstructure icing. The most likely logistical base is the city of Nome, which lacks rail and road connections to other coastal or interior areas. Due to the shallow nearshore waters at Nome, supply operations by barge convoy would be required in the summer. In the winter, air transport of supplies would be needed.

1-2.7 St. George Basin

Exploration activities will require the largest class of semi-submersible drill rig and work boat. Water depths in the St. George Basin are in the 200 to 300 foot range, and wind and wave storm conditions approximate those of the Gulf of Alaska. Earthquake characteristics in areas close to the Aleutian Islands are similar to those in the Gulf of Alaska, but become less severe with distance from the Aleutians.

Generally, development operations in St. George Basin will be slightly less difficult than in the nearby Bristol Bay region. The primary difference between these two regions, in terms of operational ease, is that ice conditions in the St. George Basin are less severe and less extensive. The most likely logistics bases for the St. George Basin operations are Cold Bay and Dutch Harbor. The considerable remoteness factor for this region is exacerbated as development activities move further away from the Aleutian Islands. The time required to achieve initial and peak production after discovery in the St. George Basin will be more or less the same as in Bristol Bay (4 to 7 years initial, 7 to 12 years peak). Offshore plant construction will be less difficult than in Bristol Bay, but siting and construction of the needed storage, processing, and transport system, including marine terminals and pipelines will be more difficult.

1-2.8 Navarin Basin

From a technical standpoint, this area could be explored and developed although at great cost due to the distances involved and water depth considerations. Exploration in the Navarin province would be accomplished with the largest class of semi-submersible drilling rig. Most of the Basin is beyond the western edge of the Bering Sea sheet ice for all but the most severe winters. Thus, exploration drilling on a year-round basis would be feasible in most of the region. Support and supply operations for Navarin exploration (and production) would be very costly. The closest U.S. landfall is the St. Matthew-Hall Islands located 150 miles away.

Development operations in the Navarin Basin will probably be more difficult than in other Bering Sea Shelf provinces. Wind, wave, and ice conditions are expected to be quite similar to the St. George Basin, and earthquake conditions are mild throughout Navarin. However, water depths in the Navarin province range from 300 to 500 feet, as opposed to the 200 to 300 foot depths in the St. George area, and the Navarin Basin is extremely remote (the Basin is nearer to the Asian land mass than to the North American land mass). The Alaskan coastal communities of Bethel, Nome, and Dutch Harbor are more than 500 miles from the Navarin region. The remoteness of the region is reflected in estimates of time required to proceed from discovery to initial and peak production (5 to 10 year initial, 10 to 20 years peak). The establishment of oil and gas transportation systems would appear to be the controlling factor.

1-2.9 Beaufort Sea

The Beaufort Sea is an area of both immense petroleum potential and formidable technological challenge. With the exception of eastern nearshore regions having water depths of less than 30 feet, the oil and gas resources of the Beaufort Sea are inaccessible with existing exploration and production technology. Current oil industry estimates are that at least 10 years of technology development are needed on methods of working in Beaufort Sea water depths of more than 30 feet.

Apart from the technology/water depth constraints on Beaufort Sea development, harsh weather conditions, a short construction season, limited labor and materials, and remoteness pose further difficulties. To progress from discovery to initial production will require from 3 to 10 years, and peak production will not be achieved until 7 to 12 years following discovery.

1-2.10 Chukchi Sea and Hope Basin

Many of the technological difficulties associated with offshore Beaufort Sea development are applicable to the Chukchi Sea. Far offshore Chukchi Sea exploration and production will await development of technology to handle moving ice packs and massive vertical ice formations.

Technological constraints on petroleum development in the Chukchi Sea are not applicable to the Hope Basin province in Kotzebue Sound.

This area is accessible using current technology; water depths are generally 60 feet or less. Ice from 4 to 6 feet thick covers Kotzebue Sound for up to 6 months out of the year, however. Other development constraints will include the Arctic weather, remote location, labor and materials shortages, limited water transportation availability, and siting and construction of onshore production-related facilities. Oil transportation problems would necessitate construction of about 150 miles of pipeline from the south side of Kotzebue Sound across the Seward Peninsula lowlands to the Nome area. There, terminals and storage facilities could be built to serve oil tankers, which would require ice-breaker assistance 3 to 4 months out of the year. Initial production from the Chukchi Sea region will occur 3 to 10 years after discovery, while peak production will not be reached for 7 to 12 years after discovery.

1-3 ERCO/EGF Scenarios of Alaskan Petroleum Development 1978-2000

To provide a basis for assessing the changes in Coast Guard program responsibilities due to future Alaskan oil and gas development, predictions of that development are needed. In this section a series of scenarios of Alaskan petroleum development through the year 2000 are presented. A broad range of possible development patterns is represented in the scenarios which portray pessimistic, optimistic, and highly optimistic cases. The scenarios were formulated on the basis of (1) low, medium, and high estimates of recoverable resources in each petroleum province, and (2) estimates of the leasing and development timetables likely to be associated with each province. For natural gas, the scenarios present estimates of gas production in the Cook Inlet region for out-of-state shipment as liquified natural gas.

It should be kept in mind that scenarios of oil and gas development are highly speculative and involve many explicit and implicit assumptions relating to technology, market conditions, leasing schedules, exploration success, resource discoveries, development costs, industry decision-making, etc.. As with all such attempts at predicting petroleum development, the validity of the ERCO/EGF scenarios will be tested as events occur in the future. They were formulated to provide a broad baseline against which to compare future energy events in terms of their implications for the Coast Guard in Alaska. The assumptions and rationale behind the ERCO/EGF scenarios and the methodologies of their development are contained in Task 1 of this study.

The three scenarios representing pessimistic, optimistic, and highly optimistic cases, were designed to provide a petroleum development "envelope" for evaluation of Coast Guard programs over a wide range of development possibilities. The oil production associated with the ERCO/EGF scenarios is indicated in Figure 1-3 and the gas production in the Cook Inlet region (for out-of-state shipment as LNG) for the three scenarios is indicated in Figure 1-4. Each scenario is briefly discussed below.

1-3.1 Pessimistic Case. The ERCO/EGF pessimistic development scenario is summarized in Table 1-1 and the corresponding levels of oil production from each producing area during the 1978-2000 period are given in Table 1-2. Detailed exploration, development, and production schedules for each active area for the pessimistic case are provided in Task 1 Appendix

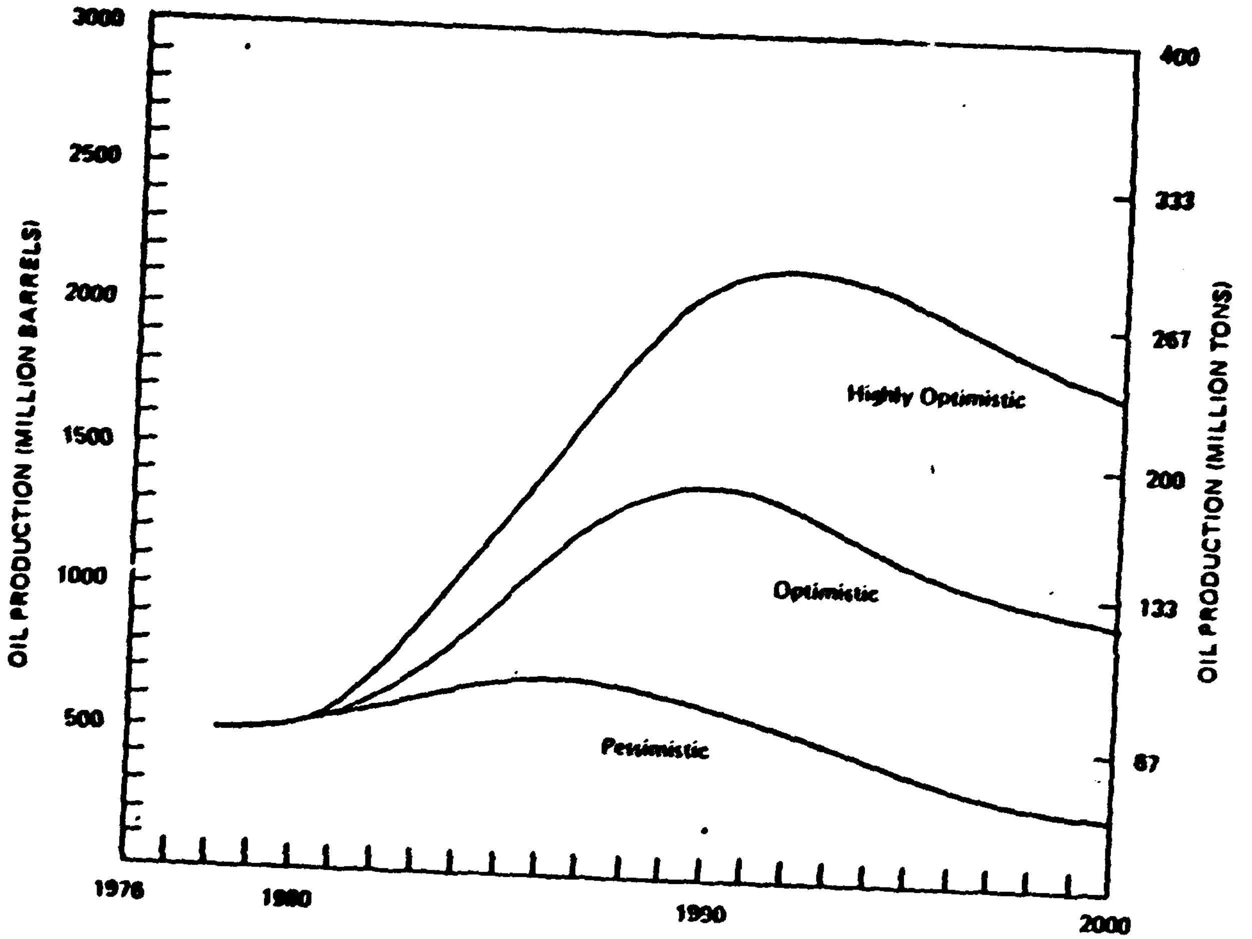

Figure 1-3 ERCO/EGF Alaskan oil production scenarios.

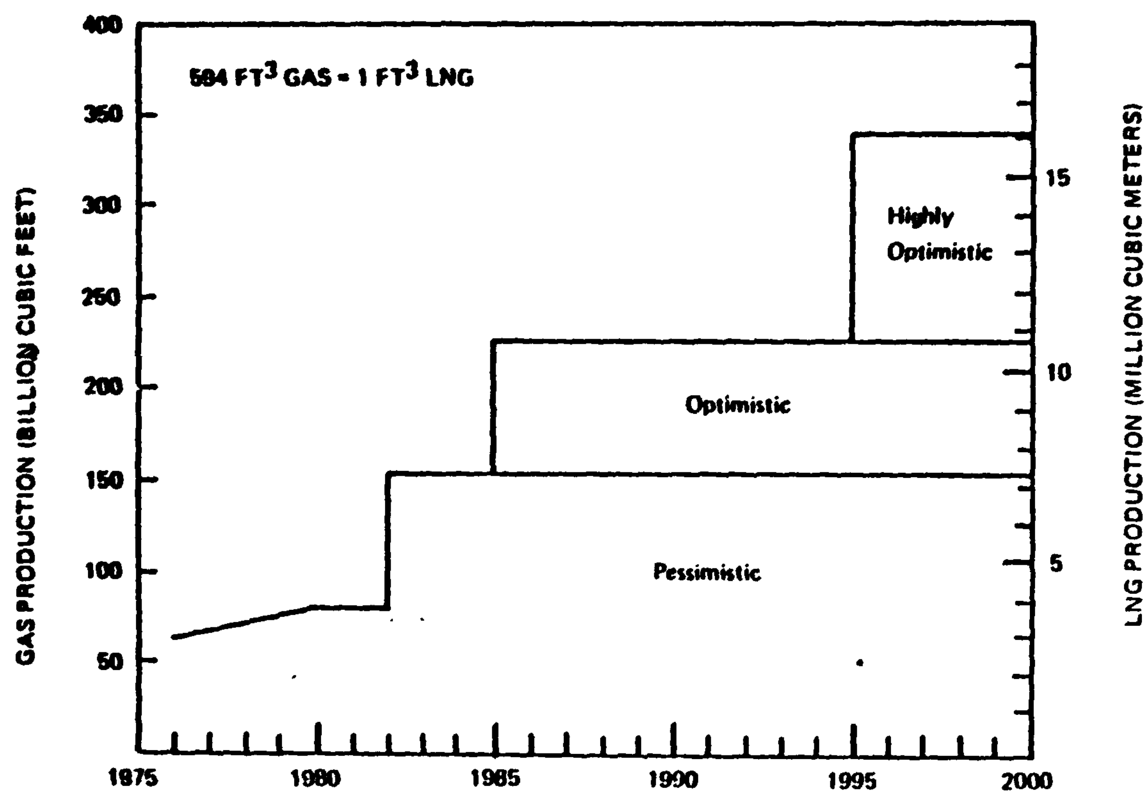

Figure 1-4 ERCO / EGF Alaskan gas production scenarios. All gas is produced in Cook Inlet region for shipment as LNG.

TABLE 1-1

PESSIMISTIC ERCO/EGP PETROLEUM DEVELOPMENT SCENARIO
(LOW RESOURCE ESTIMATES)

ALASKAN OCS AREA	ERCO/EGP RESOURCE ESTIMATES		DATE OF LEASE SALE	EXPLORATION PERIOD	INITIAL DISCOVERY	INITIAL PRODUCTION	PEAK PRODUCTION
	OIL[a]	GAS[b]					
Northern Gulf of Alaska (39)[c]	0.2	3.3	APR 1976	1976-1979	No find	-	-
Lower Cook Inlet (CI)	0.3	0.3	OCT 1977	1978-1983	1980	1983	1988
Federal-State Beaufort Sea	1.5	3.5	DEC 1979	1981-1987	1982	1986	1991
Northeast Gulf of Alaska (55)	0.3	3.3	JUN 1980	1981-1987	1984	1989	1993
Kodiak (46)	0.25	0.7	OCT 1980	1982-1984	No find	-	-
Lower Cook Inlet (60)	0.3	0.3	MAR 1981	1981-1986	1983	1985	1989
Bering Sea-Norton (57)	0.5	1.0	DEC 1981	1984-1989	1987	1995	2000+
S. Aleutian Shelf	0.1	0.1	No sale	-	-	-	-
Bering Sea-St. George	0.5	3.3	No sale	-	-	-	-
Beaufort Sea	2.5	8.0	DEC 1986	1991-1997	1993	1998	2000+
Hope Basin	0.2	0.9	DEC 1986	1988-1990	No find	-	-
Bristol Bay	0.5	1.6	No sale	-	-	-	-
Central Chukchi Sea	2.0	5.5	No sale	-	-	-	-
North Chukchi Sea	1.0	3.0	No sale	-	-	-	-
Bering Sea-Navarin	0.3	1.0	No sale	-	-	-	-

[a]Billion bbl.

[b]Trillion ft^3.

[c]U.S. Department of the Interior OCS lease sale area designations.

TABLE 1-2

ALASKAN OIL PRODUCTION 1978-2000
PESSIMISTIC ERCO/EGP PETROLEUM DEVELOPMENT SCENARIO

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Prudhoe Bay	(100)	440	440	440	440	584	584	584	584	584	511	474
Upper Cook Inlet	(68)	63	59	54	50	44	39	33	28	22	17	14
Northern Gulf (39)	No find	-	-	-	-	-	-	-	-	-	-	-
Lower Cook (CI)	*	-	-	-	-	-	11	20	24	26	28	30
Fed-State Beaufort			*	-	-	-	-	-	-	30	60	110
Northeast Gulf (55)				*	-	-	-	-	-	-	-	-
Kodiak (46)				*	No find	-	-	-	-	-	-	-
Lower Cook (60)					*	-	-	-	11	22	26	28
Bering-Norton (57)					*	-	-	-	-	-	-	-
S. Aleutian Shelf	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-St. George	No sale	-	-	-	-	-	-	-	-	-	-	-
Beaufort Sea										*	-	-
Hope Basin										*	No find	-
Bristol Bay	No sale	-	-	-	-	-	-	-	-	-	-	-
Central Chukchi	No sale	-	-	-	-	-	-	-	-	-	-	-
North Chukchi	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-Navarin	No sale	-	-	-	-	-	-	-	-	-	-	-
TOTALS[a]												
Million barrels	(168)	500	500	490	490	520	640	630	650	680	650	650
Million tons	(23)	68	68	66	66	70	86	85	88	92	88	88

* = Lease sale year.

[a]Totals have been rounded off.

TABLE 1-2 (CONT.)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Prudhoe Bay	440	401	376	340	303	266	237	200	168	146	128	110
Upper Cook Inlet	12	10	9	8	-	-	-	-	-	-	-	-
Northern Gulf (39)	No find	-	-	-	-	-	-	-	-	-	-	-
Lower Cook (CI)	26	20	18	16	14	13	11	10	8	6	5	5
Fed-State Beaufort	120	140	150	120	95	90	85	80	70	65	60	50
Northeast Gulf (55)	14	18	20	24	28	24	22	20	18	16	16	14
Kodiak (46)	No find	-	-	-	-	-	-	-	-	-	-	-
Lower Cook (60)	30	26	22	20	18	16	14	13	11	10	8	6
Bering-Norton (57)							12	20	30	36	44	50
S. Aleutian Shelf	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-St. George	No sale	-	-	-	-	-	-	-	-	-	-	-
Beaufort Sea	-	-	-	-	-	-	-	-	-	10	20	30
Hope Basin	No find	-	-	-	-	-	-	-	-	-	-	-
Bristol Bay	No sale	-	-	-	-	-	-	-	-	-	-	-
Central Chukchi	No sale	-	-	-	-	-	-	-	-	-	-	-
North Chukchi	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-Navarin	No sale	-	-	-	-	-	-	-	-	-	-	-
TOTALS[a]												
Million barrels	640	620	600	530	460	410	380	340	310	290	280	270
Million tons	86	84	81	72	62	55	51	46	42	39	38	36

* = Lease sale year.
[a]Totals have been rounded off.

1B. Inactive areas, or areas for which no lease sale is held, in the pessimistic case are the S. Aleutian Shelf, Bering Sea - St. George, Bristol Bay, Central and North Chukchi Seas, and Bering Sea - Navarin. Three other areas are assumed in this case to be explored unsuccessfully (i.e., no commercial oil is discovered)--Northern Gulf of Alaska, Kodiak, and Hope Basin. Summary features of the pessimistic scenario are:

* Peak oil production: 680 million barrels in 1986 (92 million tons)
* Exploration wells drilled: 230 total
* Discovery wells drilled: 12
* Production platforms installed on OCS: 24
* Production wells drilled: 530

Of the 680 million barrel pessimistic peak, 584 million barrels are from the Prudhoe Bay field, for which it is assumed that maximum TAPS capacity is 584 million barrels per year (1.6 million barrels per day). The remaining peak year production in this case is from the Cook Inlet region and the nearshore Beaufort Sea region. The pessimistic case envisions the first and only western offshore production coming from the Bering Sea - Norton Sound in 1995 and assumes offshore Beaufort Sea oil will begin flowing in 1998. The pessimistic scenario for Cook Inlet region gas production for shipment as LNG is given in Table 1-3.

TABLE 1-3

COOK INLET REGION GAS PRODUCTION FOR LNG SHIPMENT
PESSIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO
(BILLION CUBIC FEET)

YEAR	GAS SHIPPED AS LNG: PHILLIPS-MARATHTON	PACIFIC ALASKA	TOTAL
1980	80	-	80
1985	80	73	153
1990	80	73	153
1995	80	73	153
2000	80	73	153

1-3.2 Optimistic Case. The ERCO/EGF optimistic development scenario is summarized in Table 1-4, with associated levels of oil production from each producing area during the 1978-2000 period given in Table 1-5. Detailed exploration, development, and production schedules for each active area for the optimistic case are provided in Task 1 Appendix 1C. The optimistic scenario includes only three "no sale" areas-- S. Aleutian Shelf, Bristol Bay, and Bering Sea - Navarin-- and all exploration efforts are assumed to result in discovery of developable quantities of crude oil. For the Central and North Chukchi Seas, no crude output is forecast before the year 2000. Summary features of the optimistic scenario are:

* Peak oil production: 1,400 million barrels in 1990 (189 million tons)
* Exploration wells drilled: 358 total
* Discovery wells drilled: 42
* Production platforms installed on OCS: 83

* Production wells drilled: 2,256

In the optimistic scenario, Prudhoe Bay production peaks at 730 million barrels in 1990, accounting for about 52 percent of the optimistic peak of 1,400 million barrels. The nearshore Beaufort Sea region contributes 10 percent of the optimistic peak, while the remaining 38 percent is produced in the Cook Inlet - Gulf of Alaska - Kodiak region. The optimistic scenario has western offshore production starting in 1991 in the Bering Sea - Norton Sound area, followed by Bering Sea - St. George in 1996 and Hope Basin in 1997. Offshore Beaufort Sea oil again is assumed to start flowing in 1998.

TABLE 1-4

OPTIMISTIC ERCO/EGP PETROLEUM DEVELOPMENT SCENARIO
(MEDIUM RESOURCE ESTIMATES)

ALASKAN OCS AREA	ERCO/EGP RESOURCE ESTIMATES		DATE OF LEASE SALE	EXPLORATION PERIOD	INITIAL DISCOVERY	INITIAL PRODUCTION	PEAK PRODUCTION
	OIL[a]	GAS[b]					
Northern Gulf of Alaska (39)[c]	1.8	6.0	APR 1976	1976-1982	1978	1982	1987
Lower Cook Inlet (CI)	1.1	2.5	OCT 1977	1978-1982	1979	1982	1986
Federal-State Beaufort Sea	3.0	7.0	DEC 1979	1981-1987	1982	1986	1991
Northeast Gulf of Alaska (55)	2.2	7.0	JUN 1980	1981-1986	1982	1987	1993
Kodiak (46)	1.25	3.5	OCT 1980	1981-1986	1983	1989	1993
Lower Cook Inlet (60)	1.2	2.5	MAR 1981	1981-1986	1983	1986	1990
Bering Sea-Norton (57)	2.2	3.0	DEC 1981	1984-1988	1984	1991	1997
S. Aleutian Shelf	0.25	0.5	No sale	-	-	-	-
Bering Sea-St. George	5.0	13.0	DEC 1984	1987-1994	1989	1996	2000+
Beaufort Sea	5.0	16.0	DEC 1986	1991-1996	1992	1998	2000+
Hope Basin	1.1	3.3	DEC 1986	1989-1993	1990	1997	2000+
Bristol Bay	2.5	5.0	No sale	-	-	-	-
Central Chukchi Sea	6.0	30.0	DEC 1988	1992-1997	1994	2000+	2000+
North Chukchi Sea	4.0	19.5	DEC 1989	1993-1998	1995	2000+	2000+
Bering Sea-Navarin	2.0	5.4	No sale	-	-	-	-

[a]Billion bbl.

[b]Trillion ft^3.

[c]U.S. Department of the Interior OCS lease sale area designations.

TABLE 1-5

ALASKAN OIL PRODUCTION 1978-2000
OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Prudhoe Bay	(100)	440	440	440	440	584	584	584	584	584	730	730
Upper Cook Inlet	(60)	63	59	54	50	44	39	33	28	22	17	14
Northern Gulf (39)	-	-	-	-	-	11	44	66	132	160	180	176
Lower Cook (CI)	*	-	-	-	-	15	45	80	115	120	110	95
Fed-State Beaufort			*	-	-	-	-	-	-	30	60	110
Northeast Gulf (55)				*	-	-	-	-	-	-	40	80
Kodiak (46)				*	-	-	-	-	-	-	-	-
Lower Cook (60)					*	-	-	-		30	60	90
Bering-Norton (57)					*	-	-	-	-	-	-	-
S. Aleutian Shelf	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-St. George								*	-	-	-	-
Beaufort Sea										*	-	-
Hope Basin										*	-	-
Bristol Bay	No sale	-	-	-	-	-	-	-	-	-	-	-
Central Chukchi												*
North Chukchi												
Bering-Navarin	No Sale	-	-	-	-	-	-	-	-	-	-	-
TOTALS[a]												
Million barrels	(160)	500	500	490	490	650	710	760	860	940	1,200	1,290
Million tons	(23)	68	68	66	66	88	96	103	116	127	162	174

* = Lease sale year.
[a]Totals have been rounded off.

Table 1-5 (CONT.)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Prudhoe Bay	730	730	584	584	584	511	474	440	401	376	340	303
Upper Cook Inlet	12	10	9	8	-	-	-	-	-	-	-	-
Northern Gulf (39)	150	130	105	90	80	70	65	60	50	45	40	36
Lower Cook (CI)	85	80	70	60	50	40	35	25	25	20	15	15
Fed-State Beaufort	120	140	150 *	120	95	90	85	80	70	65	60	50
Northeast Gulf (55)	120	160	180	210	220	170	150	125	100	90	80	70
Kodiak (46)	15	30	55	100	125	105	95	85	80	70	65	60
Lower Cook (60)	105	120	100	90	80	75	70	65	60	50	45	40
Bering-Norton (57)	-	-	40	80	120	160	180	200	220	180	150	125
S. Aleutian Shelf	No sale	-	-	-	-	-	-	-	-	-	-	-
Bering-St. George	-	-	-	-	-	-	-	12	46	80	112	132
Beaufort Sea	-	-	-	-	-	-	-	-	-	10	25	45
Hope Basin	-	-	-	-	-	-	-	-	15	45	80	105
Bristol Bay	No sale	-	-	-	-	-	-	-	-	-	-	-
Central Chukchi	No output before 2000			-	-	-	-	-	-	-	-	-
North Chukchi	*	No output before 2000			-	-	-	-	-	-	-	-
Bering-Navarin	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS[a]												
Million barrels	1,340	1,400	1,290	1,340	1,350	1,220	1,150	1,090	1,070	1,040	1,010	980
Million tons	181	189	174	181	182	165	155	147	145	141	136	132

* = Lease sale year.
[a]Totals have been rounded off.

TABLE 1-6

COOK INLET REGION GAS PRODUCTION FOR LNG SHIPMENT
OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO
(BILLION CUBIC FEET)

	GAS SHIPPED AS LNG		
YEAR	PHILLIPS-MARATHTON	PACIFIC ALASKA	TOTAL
1980	80	-	80
1985	80	146	226
1990	80	146	226
1995	80	146	226
2000	80	146	226

1-3.3 Highly Optimistic Case. The ERCO/EGF highly optimistic development scenario is summarized in Table 1-7 and the corresponding levels of crude output for the 1978-2000 period are given in Table 1-8. Appendix 1D of Task 1 contains the detailed exploration, development, and production schedules for each area. In the highly optimistic scenario it is assumed that lease sales are held for all Alaskan OCS areas and that commercially developable quantities of crude oil are found in all areas except one--the Southern Aleutian Shelf. The summary features of the highly optimistic scenario are:

* Peak oil production: 2,140 million barrels in 1990 (289 million tons)
* Exploration wells drilled: 471
* Discovery wells drilled: 66
* Production platforms installed on OCS: 158
* Production wells drilled: 4,780

In the highly optimistic scenario, Prudhoe Bay production peaks at 730 million barrels in 1990, accounting for about 34 percent of the highly optimistic peak of 2,140 million barrels. A full 60 percent (1,270 million barrels) of this peak is contributed by the Cook Inlet - Gulf of Alaska - Kodiak region in southern Alaska. As for western OCS areas, this highly optimistic scenario envisions Bering Sea - Norton sound production starting in 1991, followed by Bering Sea - St. George and Bristol Bay in 1996, and Hope Basin in 1997. As in the previous two scenarios, it is expected that offshore Beaufort Sea oil will begin flowing in the TAPS line in 1998. Finally, for three remote OCS areas it is expected that initial production will not take place until after 2000—Central and North Chukchi Seas and Bering Sea - Navarin Basin.

The highly optimistic scenario for LNG production in the Cook Inlet region is summarized in Table 1-9.

TABLE 1-7

HIGHLY OPTIMISTIC ERCO/EGP PETROLEUM DEVELOPMENT SCENARIO (HIGH RESOURCE ESTIMATES)

ALASKAN OCS AREA	ERCO/EGP RESOURCE ESTIMATES OIL[a]	GAS[b]	DATE OF LEASE SALE	EXPLO-RATION PERIOD	INITIAL DIS-COVERY	INITIAL PRODUC-TION	PEAK PRODUC-TION
Northern Gulf of Alaska (39)[c]	3.6	12.0	APR 1976	1976-1982	1978	1982	1988
Lower Cook Inlet (CI)	2.2	5.0	OCT 1977	1978-1982	1978	1981	1985
Federal-State Beaufort Sea	6.0	14.0	DEC 1979	1981-1988	1981	1986	1994
Northeast Gulf of Alaska (55)	4.4	14.0	JUN 1980	1981-1986	1981	1987	1993
Kodiak (46)	2.5	7.0	OCT 1980	1981-1985	1982	1987	1991
Lower Cook Inlet (60)	2.4	5.0	MAR 1981	1981-1985	1982	1985	1990
Bering Sea-Norton (57)	4.4	6.0	DEC 1981	1984-1988	1984	1991	1996
S. Aleutian Shelf	0.5	1.0	DEC 1982	1983-1984	No find	-	-
Bering Sea-St. George	9.5	26.0	DEC 1984	1987-1992	1989	1996	2000+
Beaufort Sea	10.0	30.0	DEC 1986	1991-1997	1992	1998	2000+
Hope Basin	2.2	6.6	DEC 1986	1988-1992	1989	1997	2000+
Bristol Bay	5.0	10.0	DEC 1987	1990-1996	1991	1996	2000+
Central Chukchi Sea	12.0	60.0	DEC 1988	1992-1997	1994	2000+	2000+
North Chukchi Sea	8.0	39.0	DEC 1989	1993-1998	1995	2000+	2000+
Bering Sea-Navarin	4.0	10.8	DEC 1990	1992-1997	1994	2000+	2000+

[a]Billion bbl.

[b]Trillion ft^3.

[c]U.S. Department of the Interior OCS lease sale area designations.

TABLE 1-8

ALASKAN OIL PRODUCTION 1978-2000
HIGHLY OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Prudhoe Bay	(100)	440	440	440	440	584	584	584	584	584	730	730
Upper Cook Inlet	(68)	63	59	54	50	44	39	33	28	22	17	14
Northern Gulf (39)	-	-	-	-	-	30	90	160	240	300	330	360
Lower Cook (CI)	*	-	-	-	44	80	170	210	220	180	160	150
Fed-State Beaufort			*	-	-	-	-	-	-	30	60	100
Northeast Gulf (55)				*	-	-	-	-	-	-	40	90
Kodiak (46)				*	-	-	-	-	-	-	40	90
Lower Cook (60)					*	-	-	-	48	92	184	220
Bering-Norton (57)					*	-	-	-	-	-	-	-
S. Aleutian Shelf						*	No find	-	-	-	-	-
Bering-St. George								*	-	-	-	-
Beaufort Sea										*	-	-
Hope Basin										*	-	-
Bristol Bay											*	-
Central Chukchi												*
North Chukchi												
Bering-Navarin												
TOTALS[a]												
Million barrels	(160)	500	500	490	530	740	880	980	1,120	1,210	1,560	1,750
Million tons	(23)	68	68	66	72	100	119	132	151	164	211	236

* = Lease sale year.
[a]Totals have been rounded off.

TABLE 1-8 (CONT.)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Prudhoe Bay	730	730	584	584	584	511	474	440	401	376	340	303
Upper Cook Inlet	12	10	9	8	-	-	-	-	-	-	-	-
Northern Gulf (39)	300	270	240	200	180	150	125	100	90	80	75	70
Lower Cook (CI)	140	130	120	110	95	80	70	65	55	40	30	20
Fed-State Beaufort	120	140	160	200	230	260	240	220	200	180	160	140
Northeast Gulf (55)	180	380	400	420	440	420	400	380	340	300	260	240
Kodiak (46)	180	240	250	220	200	180	150	120	110	100	90	80
Lower Cook (60)	230	240	210	190	160	140	120	110	100	90	80	65
Bering-Norton (57)	-	-	40	90	180	380	400	440	390	350	300	260
S. Aleutian Shelf	No find	-	-	-	-	-	-	-	-	-	-	-
Bering-St. George	-	-	-	-	-	-	-	40	80	160	180	200
Beaufort Sea	-	-	-	-	-	-	-	-	-	10	30	60
Hope Basin	-	-	-	-	-	-	-	-	45	90	170	210
Bristol Bay	-	-	-	-	-	-	-	10	30	50	100	130
Central Chukchi	No output before 2000			-	-	-	-	-	-	-	-	-
North Chukchi	*	No output before 2000			-	-	-	-	-	-	-	-
Bering-Navarin		*	No output before 2000			-	-	-	-	-	-	-
TOTALS[a]												
Million barrels	1,890	2,140	2,010	2,020	2,070	2,120	1,980	1,930	1,840	1,830	1,820	1,780
Million tons	255	289	272	273	280	286	268	261	249	247	246	241

* = Lease sale year.

[a]Totals have been rounded off.

TABLE 1-9

COOK INLET REGION GAS PRODUCTION FOR LNG SHIPMENT
HIGHLY OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO
(BILLION CUBIC FEET)

	GAS SHIPPED AS LNG		
YEAR	PHILLIPS-MARATHTON	PACIFIC ALASKA	TOTAL
1980	80	-	80
1985	80	146	226
1990	80	146	226
1995	120	219	339
2000	120	219	339

2 Marine Vessel Activity. The complexity of the activity of marine traffic in Alaska is surprising considering the state population of less than 1/2 million. The various contributing sectors of marine traffic are tankers, fishing vessels, general and noncrude cargo vessels, and offshore oil related support activities. Each of these is analyzed to determine their impact on Coast Guard activities. For the general cargo analysis, the Data Resources, Inc. (DRI) model of the Alaskan economy was used as a predictor of tonnage throughput.

2-1 Syntheses of OCS Activity.

2-1.1 Exploration Phase

As specified in Task 1, only offshore petroleum development activities will have significant implications for the Coast Guard. Once the Bureau of Land Management (BLM) has approved the purchase of a lease area, exploration will usually start within a year. The purpose of this phase is both to discover oil and determine its economic feasibility for development. Mobile Offshore Drilling Units are used for this purpose and the results of drilling are analyzed to determine the size of the field once discovery is made. During this phase a determination will be made as to the number of platforms required to support production. Because of the great expense of platform construction as many wells as possible will be used from each platform with forty wells per platform as average. Offshore operations will require both vessel and aircraft traffic from their service base, with probably one helicopter flight per day and one supply boat round trip every two to three days. Pipe casings, well heads, cement, mud and materials will be delivered by commercial vessel from the lower forty-eight states to the supply bases every two to three weeks. The Exploration phase will generally occupy the first four years following the lease sale.

2-1.2 Installation and Development Phase

Several events must occur before production platforms can be installed. These include approval by the U.S. Geological Survey of the operating company's OCS Field Development Plan and then the order, design, and construction of the platforms required to implement this plan. The platforms, due to lack of an infrastructure and materials as well as the high cost of labor in Alaska, will probably be constructed in the lower 48 states and towed on location. Actual installation of the platform is dependent on mild weather and two summer seasons will usually be required. It is expected that this construction and installation period will occur in the 4th to 8th years following the lease sale.

Once the size of the field and economic feasibility of production has been determined from the exploratory phase, crucial decisions concerning the location, design, and construction of onshore facilities are made. Because pipelines, treatment facilities, tank farms, and oil terminals must be operational when oil and gas start flowing, construction of these facilities is carefully sequenced with platform installation and development drilling. This phase will be the time of greatest onshore activity and impact. It will also be the time of greatest vessel and aircraft activity between the platforms and their onshore bases. This onshore development activity will also occur in the 4th through 8th years following the lease sale.

2-1.3 Production Phase

The production phase will be characterized by almost total automation at both the platform and onshore facilities. Oil will be piped from the platform to shore, treated, and stored for shipment. Tanker traffic will become a daily occurrence and will transport the oil to the lower forty-eight states. Some refineries will be constructed in Alaska. The production phase should last for twenty-five to thirty years and will commence in the ninth year after the lease sale.

2-2 Offshore Oil Marine Forecast

In this section the number of rigs and supply vessels are forecast. Since some of the technology is still being improved and/or developed, (for example, drilling in ice areas and the building of exposed location single point moorings) precise forecasting, particularly with regard to time, is difficult. Nevertheless, OCS related data was analyzed by the Study Team according to scenario and Tables 2-1 through 2-3 present the predicted numbers and locations for oil exploration and production rigs by scenario. The production platforms are assumed to remain in place once installed, while exploration rigs are assumed to be mobile. Thus, the total number of rigs and platforms to be inspected in any one year is the sum of the installed production platforms plus the exploration rigs present in that year.

From this projection of offshore rigs it is possible to derive supply boat needs. They were calculated using a ratio of one boat per exploring rig, 2 1/2 boats for installation of a production rig, and three boats per four existing production platforms. In developing supply boat requirements assumptions were also required as to the

TABLE 2-1

OCS EXPLORATION RIG AND PRODUCTION PLATFORM FORECAST
PESSIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO[a]

	SOUTHERN ALASKA			WESTERN ALASKA			NORTHERN ALASKA		
YEAR	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]
1978	3		3						
1979	3		3						
1980	3		3						
1981	6		6				3		3
1982	8		8				4		4
1983	8	1	9				5		5
1984	6	1	8	1		1	3		3
1985	4	2	8	2		2	2		2
1986	2	1	7	2		2	1	2	3
1987	1	1	7	2		2	1	4	7
1988			7	3		3		2	8
1989		1	7	3		3		1	9
1990		1	8	1		1			9
1991		1	9				1		10
1992			9				2		11
1993			9				2		11
1994			9				2		11
1995			9		1	1	2		11
1996			8		1	2	1		10
1997			8		1	3	1		10
1998			7			3		1	10
1999			7			3		2	12
2000			6			3			12

[a]The number of exploration rigs shown is the actual number of rigs operating in a given year. The number of production platforms is the number of platforms installed in a given year. The production platforms are assumed to stay in-place once installed.

[b]Total for a given year includes all production platforms installed to date plus all exploration rigs operating in that year.

TABLE 2-2

OCS EXPLORATION RIG AND PRODUCTION PLATFORM FORECAST
OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO[a]

	SOUTHERN ALASKA			WESTERN ALASKA			NORTHERN ALASKA		
YEAR	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]
1978	4		4						
1979	6		6						
1980	5		5						
1981	8		8				3		3
1982	10	2	12				4		4
1983	8	4	14				5		5
1984	8	5	19	2		2	3		3
1985	6	2	19	3		3	2		2
1986	3	4	20	3		3	1	2	3
1987		5	22	4		4	1	4	7
1988		6	28	4		4		2	8
1989		6	34	3		3		1	9
1990		4	38	5		5			9
1991		5	43	5	2	7	1		10
1992		3	46	6	3	11	2		11
1993			46	6	3	14	2		11
1994			46	3	2	13	2		11
1995			45	3	2	15	1		10
1996			44	4	1	17	1		10
1997			43	3	3	19			9
1998			42	1	4	21			9
1999			41		3	23		2	11
2000			40		1	24			11

[a]The number of exploration rigs shown is the actual number of rigs operating in a given year. The number of production platforms is the number of platforms installed in a given year. The production platforms are assumed to stay in-place once installed.

[b]Total for a given year includes all production platforms installed to date plus all exploration rigs operating in that year.

TABLE 2-3

OCS EXPLORATION RIG AND PRODUCTION PLATFFORM FORECAST
HIGHLY OPTIMISTIC ERCO/EGF PETROLEUM DEVELOPMENT SCENARIO[a]

	SOUTHERN ALASKA			WESTERN ALASKA			NORTHERN ALASKA		
YEAR	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]	EXPL	PROD	TOT[b]
1978	3		3						
1979	5		5						
1980	6		6						
1981	9	3	12				3		3
1982	12	5	20				4		4
1983	12	9	29				5		5
1984	10	3	30	2		2	5		5
1985	8	6	34	4		4	4	2	6
1986	2	9	37	4		4	3	2	7
1987		15	50	5		5	2	4	10
1988		13	63	6		6	1	4	13
1989		6	69	5		5		2	14
1990		6	75	7		7			14
1991		3	78	7	3	10	1		15
1992			78	8	6	17	2		16
1993			77	5	6	20	2		16
1994			76	6	6	27	2		16
1995			75	7	3	31	1		15
1996			74	7	4	35	1		15
1997			73	4	8	40			14
1998			72	1	11	48		1	15
1999			71		7	54		2	17
2000			70			50		2	19

[a]The number of exploration rigs shown is the actual number of rigs operating in a given year. The number of production platforms is the number of platforms installed in a given year. The production platforms are assumed to stay in-place once installed.

[b]Total for a given year includes all production platforms installed to date plus all exploration rigs operating in that year.

identity of those ports to be used as supply bases for each area. Although plans for bases have not been formalized, a consideration of preliminary data combined with a knowledge of harbor characteristics allowed the Study Team to identify potential supply bases. This is presented in Table 2-4. With the identification of supply bases, distances were calculable to the general areas of OCS activity. An exact knowledge of future rig locations was not required as only in the case of the St. George basin does the trip length materially affect the calculations. Using this information, the above ratios and the synthesis of details of Alaskan OCS activity contained in the preceding chapter, the supply boat projections contained in Figure 2-1 were developed.

In addition to the drill rigs and production platforms, a number of single point mooring (SPM) systems for tanker loading are expected to be installed on the Alaskan OCS. Specifically, SPM terminals are forecast as shown in Table 2-5, which also indicates the tanker loading frequencies predicted for each SPM. Onshore tanks for storage are assumed in all cases, although floating or submerged storage tanks are possible, particularly in the Bering-St. George OCS area. The tankers used in Western Alaska will all need to be of the icebreaking variety to enable year-round production of crude oil.

TABLE 2-4

FORECAST OF OIL FIELD SUPPLY BASE PORTS

No.	Designated Oil Field	Supply Base Port	Alternate Supply Base Port	Comments
	North Slope			
1.	Prudhoe Bay	Prudhoe Bay	-	Established supply port existing
2.	Beaufort Sea (BS,PS)	Prudhoe Bay	A secondary supply base could develop depending upon area of major oil finds	Should a second port develop Prudhoe Bay would probably serve as helo base
	Gulf of Alaska			
3.	Gulf of Alaska (55,59)	Yakatat Seward	Cordova, Valdez or Whittier	Established supply port existing
4.	Kodiak (46)	Kodiak	Other ports Kodiak Island	
	Cook Inlet			
5.	Cook Inlet (South) (57,61)	Nikiski and Homer	-	Established supply port existing Nikiski will be used to extent possible with Helo operations from Homer - later all operations may be based at Homer
	Western Alaska			
6.	Norton Sound (57)	Pastol Bay	Nome	Nome could be the base for Helo operations
7.	St. George (56)	Dutch Harbor	Port Moller or Pribiloff Islands	There is an existing supply base - not Dutch Harbor.
8.	Bristol Bay (BB)	Port Moller	Naknek, Dutch Harbor.	This will be easiest supply base to use in W. Alaska.
9.	Hope Basin (HB)	Kotzebue	Pt. Hope	Heavy ice will mean short boat season-air or surface will be alternatives.

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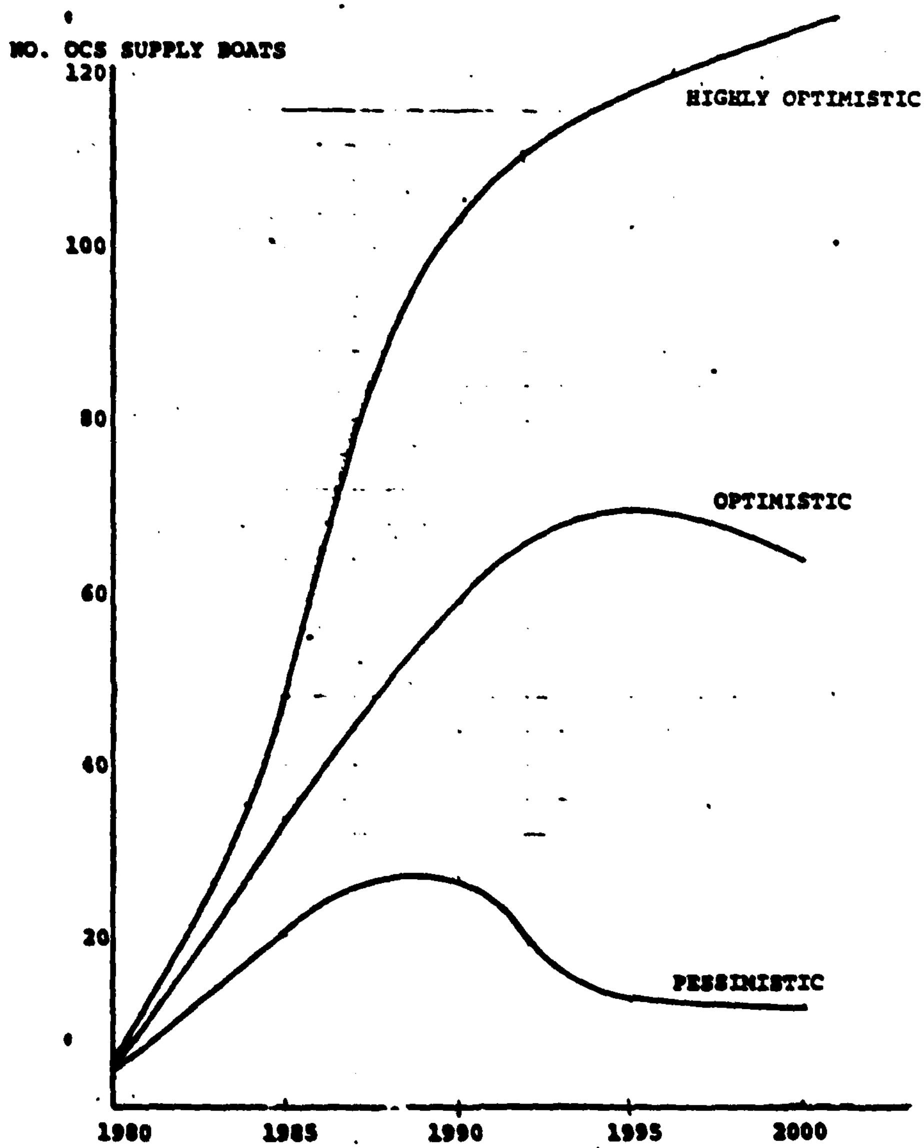
JOB ____
SHEET NO ____ OF ____
CALCULATED BY ____ DATE ____
CHECKED BY ____ DATE ____
SCALE ____



NUMBER OF SUPPLY BOATS REQUIRED VS TIME

FIGURE 2-1

TABLE 2-5

ERCO/EGF FORECASTS OF SPM OIL TERMINAL INSTALLATIONS a

ALASKAN OCS AREA	NUMBER OF SPMs	YEAR FIRST ACTIVE	TANKER LOADING FREQUENCY b	
			1995	2000
Pessimistic Scenario				
Bering Sea-Norton	1	1995	1/mo	1/wk
Optimistic Scenario				
Bering Sea-Norton	1	1991	3/wk	2/wk
Bering Sea-St. George	1	1996	-	2/wk
Hope Basin	1	1997	-	2/wk
Highly Optimistic Scenario				
Bering Sea-Norton	1	1991	1/day	4/wk
Bering Sea-St. George	1	1996	-	3/wk
Hope Basin	1	1997	-	3/wk
Bristol Bay	1	1996	-	2/wk

a All SPMs are located in Western Alaska.
b Average tanker size of 150,000 deadweight tons is assumed.

2-3 Alaskan Tanker Activity

The Alaskan tanker traffic is presented in terms of the number and size of tankers which will provide transportation for the Alaskan Petroleum trade. It is dependent upon the oil production rate of the petroleum development scenarios, the available tanker fleet, the consuming markets and cost of shipments to various ports, and various legal and physical constraints on the destinations of the oil and size and numbers of tankers.

The production of oil has already been discussed in the section on petroleum development scenarios. The next factor which must be considered in order to predict the necessary tanker fleet and traffic patterns is the destination of the crude. Four problems are associated with this, which make the forecast of shipping patterns a complicated and subjective task: these are a lack of demand for sour crude on the U.S. West Coast; high prices for foreign crude; environmental opposition; and limitations to international cooperation.

The first problem results from refineries' lack of plants adapted for Alaskan high sulphur crude. This shortage is forecast to exist until at least 1985. The second problem is that the artificially high prices for OPEC oil have reduced the rate of growth of demand throughout the U.S. and limited the capital that refiners are willing to make available to build or modify refineries. In addition, reduced world demand has created a surplus fleet of foreign tankers capable of delivering crude oil at low transport cost from foreign sources to the U.S. East Coast as contrasted to the very expensive transportation cost of Alaskan crude to the East Coast in "Jones Act" vessels. At the same time, environmentalist pressure has delayed plans to use pipelines to bring oil to energy short regions of the country. Finally, legal problems concerning cooperation with Canada and the sale of TAPS oil to Japan add even more confusion to this issue. Taking these factors into cons ieration, Table 2-6 presents a summary of the projected distribution Forecast. Details are contained in Task II.

2-4 U.S. - Alaska Tanker Fleet Forecast

The impact of Alaskan crude traffic was calculated using the assumed

TABLE 2-6

ALASKA CRUDE SHIPMENT
TOTAL OF NEEDED TANKER TONNAGE (Long Kilotons)
(in transit)

PESSIMISTIC	Rt. Dist.	1981	1985	1990	1995	2000
Seattle	2856	342	771	996	642	428
San Francisco	3400	229	319	446	267	191
Long Beach	4248	1115	987	557	159	80
Japan*	5392	0	0	0	0	0
Total		1686	2077	1999	1068	699
OPTIMISTIC						
Seattle	2856	342	1231	2034	1713	1339
San Francisco	3400	229	510	701	700	637
Long Beach	4248	1115	1465	1831	955	444
Japan*	5392	0	0	0	647	808
Total		1686	3206	4566	4015	3228
HIGHLY OPTIMISTIC						
Seattle	2856	342	1606	2624	2270	2088
San Francisco	3400	229	573	740	663	612
Long Beach	4248	1115	1831	2887	2309	1593
Japan*	5392	0	0	1718	1820	1920
Total		1686	4010	7969	7062	6213

*Since distance from West Alaska to Japan is roughly the same as to U.S. West Coast, this will not influence the tonnage needs. No allowance made for foreign ships.

Note: Assumed Speed, 360 nautical miles/day
7740 bbls = 1 kiloton

$$\text{Kilo Tonnage} = \frac{\text{RT Distance x BBL/Day}}{\text{7400 x 360}}$$

traffic patterns and production rates, assumed tanker speed of 360 nautical miles per day and known round trip distances. The necessary tonnage requirements for the different scenarios is given in Table 2-6 and totals are graphed in Figure 2-2.

The size and characteristics of the present fleet of tankers are known for vessels built with and without Construction Differential Subsidies (CDS). A subjective estimate of trends in the world and U.S. tanker fleet was then made by the Study Team. Neglecting the possibility of a major depression, likely under the pessimistic scenario, and assuming that Alaska will be the only major trade route necessitating a large number of U.S. flag crude tankers, they forecast that the likely effect on the U.S. tanker fleet resulting from Alaska trade will be as indicated by Table 2-7. This table gives fleet size and growth over the first decade of this study. It is important to note that this table indicates that regardless of scenario, the Alaska crude trade will not rescue the depressed U.S. shipbuilding industry. This analysis thus indicates that the impact of Alaskan oil on U.S. shipyards and hence on USCG MIO's and MSO's new construction workload will be minimal, if not negligible. By necessity, regardless of scenario, there will be no shipbuilding over the second decade of the study except to replace scrapped tankers or to build or modify tankers for the ice capability needed in Western Alaska. Towards the end of the study, it is possible that oil will be shipped from heavy ice areas in Hope Basin and the Chukchi Sea. Norton Sound, St. George, and Bristol Bay also have seasonal icing and will require tankers with ice capability.

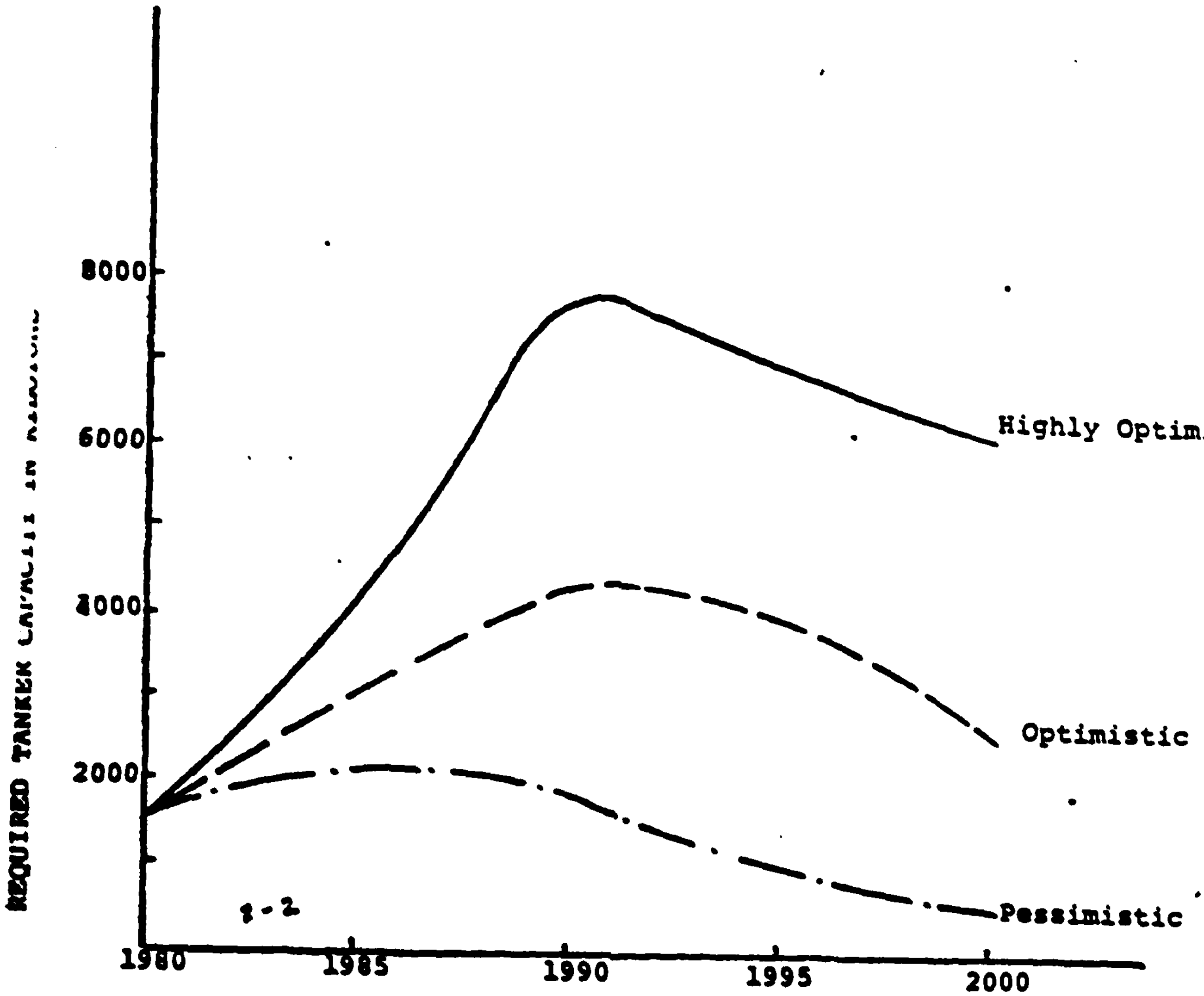


FIGURE 2-2 TANKERS IN TRANSIT CARRYING ALASKA CRUDE VOLUME IN KILOTONS

TABLE 2-7

U.S. TANKER FLEET, 1980 to 1990

TOTAL TONNAGES BY DWT CLASS (LONG KILOTONS)

	DWT CLASS					
	<81	81-100	100-130	130-2000	200>	Ave. DWT
1980 Fleet						
Non-CDS	1112 (20)	360 (4)	1080 (10)	1340 (8)	0	95
CDS	935 (14)	0	0	0	2225 (11)	126
Total 1978	2047	360	1080	1340	2225	
1990 Fleet						
High	2000+ (25)	500 (6)	2000 (18)	3500 (21)	5000 (22)	135
Medium	2000+ (25)	500 (6)	1700 (15)	2700 (16)	3000 (13)	127
Low	2000+ (25)	400 (5)	1500 (13)	2000 (12)	2500 (11)	121
New Building 1978-1988						
High	150 (2)	180 (2)	1000 (8)	2200 (13)	2700 (11)	175
Medium	75 (1)	180 (2)	700 (5)	1400 (8)	800 (2)	170
Low	0 (0)	40 (1)	500 (3)	700 (4)	200 (1)	160

Note: Discrepancies result from net increase due to scrap and replacement with a larger ship in same tonnage class.

2-4.1 Summary of Traffic Forecasts - Western Alaska

Beaufort Sea Traffic

Relative to the movement of Beaufort Sea/North Slope oil by sea, the study team has assumed that all of the gas and oil produced in the Beaufort Sea and the North Slope will be moved to market or to year round navigable waters (Valdez or equivalent) by the TAPS, a parallel gas TAPS and such additional TransAlaska and/or TransCanada pipelines as may become necessary and economical. It is the opinion of the ERCO/EGF study team that Beaufort Sea and North Slope oil and gas will not be transported by sea around Point Barrow in the winter season during the period of this study or prior to the year 2000.

2-4.2 Northwest Alaska Traffic

The oil production for Northwest Alaska consists of the forecast for Hope Basin, Norton Sound, the Saint George Basin, and Bristol Bay. All of the oil production in Northwestern Alaska in the pessimistic scenario will be in Norton Sound and all of the oil production for the optimistic and highly optimistic scenarios through the year 1995 will be in Norton Sound.

Oil production at Hope Basin, Saint George Basin and/or Bristol Bay is not forecast to commence until 1995-1996 at the earliest. However, under the optimistic and highly optimistic scenarios oil production in Norton Sound reaches its maximum at about 1995 and then gradually recedes to about 50% of maximum output by the year 2000 while the production at Hope Basin at year 2000, under the same scenario, reaches about 50% of the maximum at Norton Sound. In other words, storage facilities for Norton Sound oil could in later years be used for Hope Basin oil if they were located in the Nome to Galovin Bay area of Norton Sound and further provided that a pipeline is constructed across Seward Peninsula.

Since year round tanker service to Norton Sound will eventually be implemented, and further, since winter tanker service to Hope Basin will be more difficult, it is expected that a pipeline across Seward Peninsula will be constructed to bring Hope Basin oil to market.

2-5 Alaskan Fishing Forecast

Alaskan fishing is a very important part of this study for several reasons. The large commercial value of the catch is significant and the great distances and dangerous weather involved in Alaskan fisheries have a potentially high SAR demand. Furthermore, there appears to be a potential for conflict between offshore oil/gas development and fishing interest both with regard to exploration and production areas as well as traffic lanes.

To summarize likely development in the Alaskan fishing industry, there are four areas of future growth forecast. These include the Gulf of Alaska and Bering Sea bottom fishing industry, offshore salmon, tanner crabbing in the Aleutian and Bering Sea areas, and a new clamming industry. Large growth areas exist which should double in the next 10 years and could double in the next 5 years if the economics are right. However, limited entry, available dockage, and the economics of scale indicate that fleet growth will be slower than catch growth, with perhaps 50 new boats built per year for Alaska and some older and less efficient boats being scrapped.

2-6 Non Crude Cargo Activity

The remaining subtask for a total forecast of marine activity, based on the three ERCO/EGF scenarios, was to forecast the trends in carriage of commodities other than crude oil for the various ports and regions (defined as Central, Southeast and Western). The Data Resources, Inc. (DRI) model of the Alaskan economy was used by the ERCO/EGF study team for this purpose. Certain aspects of the model were particularly valuable to the study. These were the growth rate and scenario sensitivity of the DRI output. The sensitivity was shown to be quite small as indicated in Table 2-8. The DRI output was also used to calculate a 20 year growth rate which was modified by the ERCO/EGF study team and is presented in Table 2-9. The complete DRI forecast is contained in Task II.

2-6.1 Commercial Shipping in Alaska

Because of the nature of econometric modelling and its limitations, the DRI model was not completely adequate for the forecast required by this task and an additional analysis was undertaken by the ERCO/EGF study team. This included interviewing all of the major shipping interests in Alaska as well as regressing the cargo throughput for Alaska, as reported by the Waterborne Commerce of the U.S., into different aspects of the Alaskan economy used in the DRI model.

Four major companies comprise the bulk of Alaskan scheduled line and specialty barge service. The companies are Sealand, Tote, Foss Alaska Line, and Crowley Barge and Towing Company. Sealand is most active in Central Alaska and the Aleutians where they operate four C4-X container ships from Seattle to Kodiak and Anchorage twice a week in the winter and three times a week April through October. Sealand also operates a feeder service from Adak to Cordova. In two years they plan

TABLE 2-8

PERCENT DIFFERENCES
NON-CRUDE CARGO AS A FUNCTION
OF DIFFERENT ERCO/EGF OIL PRODUCTION SCENARIOS

PORT	YEAR	PERCENT DIFFERENCE OPTIMISTIC TO PESSIMISTIC	PERCENT DIFFERENCE OPTIMISTIC TO HIGHLY OPTIMISTIC
Anchorage	1985	-2	2
	1990	-7	5
	1995	-8	6
	2000	-9	6
Kodiak	1985	-1	2
	1990	-5	4
	1995	-6	5
	2000	-6	4
Skagway	1985	-2	2
	1990	-7	6
	1995	-8	6
	2000	-9	6
Valdez	1985	-2	2
	1990	-8	6
	1995	-9	7
	2000	-9	6
Juneau	1985	0	0
	1990	0	0
	1995	0	0
	2000	0	0

TABLE 2-9

DRI FORECAST - 20 YEAR GROWTH RATE

	Optimistic Scenario	EGF Adjustment
Dillingham	4.6	5
Bethel	-1	5
Naknek	2.5	5
Iliuliuk (Dutch Harbor)	6.4	7
S. Alaska Peninsula	Disregarded	
Kodiak	5.9	6
Anchorage	5.4	5
Seldovia	3.0	5
Homer	3.8	5
Whittier	5.4	6
Seward	6.4	7
Valdez	6.6	7
Cordova	3.9	5
Skagway	5.3	2 (ore)
Juneau	1.2	1
Sitka	8.4	3 (timber)
Petersburg	10.0	3 (industry)
Wrangell	12.1	3 (is likely)
Ketchikan	10.6	3 (to grow)
Metlakatla	7.2	3 (very little)
Pelican	2.0	1
Craig	5.4	3 (30 years)

to double the size of thei[illegible] er service and in four years to replace their C4-X ships with the larger and faster C4-J ships. This will more than double each ship's capacity. Sealand is confident that these changes will provide sufficient capacity for Alaska for the next 20 years.

Tote operates two modern RO-RO ships from Tacoma to Anchorage. These vessels are utilized 10.5 months per year with each ship being overhauled during half of the three month period when only one ship operates. Tote is presently operating at about 85% of capacity and carrying 40% of the total volume of general cargo to the Alaskan Gulf (approximately the same as Sealand.)

Foss Alaska Lines operates a common carrier intermodel barge and truck containerized service with weekly sailings from Seattle to Southeast Alaska and the Aleutians. They are presently operating at 75% of capacity and estimate a 5% growth per year.

The barge service to Northern Alaska is handled primarily by Crowley Barge who is the major contractor to supply Prudhoe Bay. Prudhoe Bay is generally open only 6 to 8 weeks each year after August 1st when Crowley resupplies the base using two 9000 HP pusher tugs behind icebreaking barges. The Prudhoe Bay service peaked in 1974 and has been decreasing ever since.

There are many other services both north of the Aleutians and throughout Alaska but they do not approach the major four in cargo carried. Table 2-10 contains a listing of these other services.

Table 2-10

Alaskan Shipping Services

Alaska Hydrotrain	- Weekly car float service Seattle to Whittier
Alaska Marine Highway System	- Seattle to Southeast Alaska, Kodiak, and Prince William Sound
Lyndon Transport Inc.	- Prince Ruppert to Southeast Alaska
Pacific Western Line	- Scheduled barge service Seattle to Anchorage
Western Pioneer	- Monthly sailings to Yakutat, Kodiak, and Aleutians
Aleut Corporation	- Seattle to Aleutians
Northland Services Inc.	- Barge service to Southeast Alaska and Yakutat
Cooper Tug and Barge Co.	- Contract carrier in Alaska
Arctic Lighterage	- Tug and barge operations out of Kotzebue
Alaska Barge and Salmon Railway	- Barge operation out of Seward connecting Alaskan railroad
Puget Sound Tug and Barge	- Subsidiary of Crowley operating out of Tacoma
Yatana Barge Lines	- Barge service out of Mennana
Elder Line	- Tug and Barge service out of Seward
Crystal Corporation	- Operates out of Stevenson Island
Pacific Alaska Lines	- Barge service from Portland to Seward

2-6.2 Modified Forecast for Non-Crude Cargo

Using the above information and a study of the aggregate recent history of total throughput and total port calls for Alaska for the past six years, the ERCO/EGF Study Team performed a multivariat analysis (details of which are contained in Task II) and derived a modified forecast. For traffic, a prediction was far more difficult because of the slack capacity and use of relatively small ships on many runs. Standard marine transportation practice is to increase ship size (over the long term) rather than ship traffic, because of the economics of scale. The forecast cargo volume was projected to the year 2000 and compared to expected U.S. fleet trends in ship size and speed for the same years. The ratio of ship loading to cargo volume was projected for the next 20 years and the average traffic increase was seen to be about 1%. The extreme imprecision of this growth rate reflects the fact that ship size substitution will happen in steps, and the knowledge that commercial ship tonnage and speed can vary greatly, with economy of large ships offset by their lack of flexibility. Generally, the study team forecast that ships available for Alaskan service will be those released from service elsewhere. Since the stock of ships (including tugs), barges, and product carriers, is quite large, it is possible to change the average ship capacity in Alaska with little difficulty. They drew the following conclusions about fleet growth rate:

> Certain routes will grow in accordance with port throughput at their terminals while others will depend on scenario. A 5% annual growth in tonnage and a 1% annual growth in trips means that average cargo per delivery will double, while a 7% tonnage growth rate

and a 1% trip growth rate would mean a tripling in tonnage per delivery over the next 20 years. This is consistent with general marine transportation projections for dry and tanker average capacities for routes of this sort. The scenario dependent routes, are largely liquid, crude, or refined products from Nikiski, while the rest are dry cargo flows needed to support oil activity. A tabulation of this route traffic forecast is found in Table 2-11.

TABLE 2-11

GULF OF ALASKA: ORIGIN AND DESTINATION PORT PAIRS

Study to Assess the Impact of Alaskan Petroleum Development on the Coast Guard Through the Year 2000

ENERGY RESOURCES COMPANY INC.
185 ALEWIFE BROOK PARKWAY
CAMBRIDGE, MA 02138

TASK 2

MARINE VESSEL ACTIVITY

E.G. FRANKEL, INC.
52 BAY STATE ROAD
BOSTON, MA 02215

Gulf of Alaska: Origin and Destination Port Pairs (in order of decreasing tonnage)

Route Number	Port 1 Origin	Port 2 Destination	Annual Tonnage (kilotons)	Annual Arrivals	Formal Route[a]	Dry or Liquid Cargo	Estimated Annual Growth Rates (%) Tonnage	Trips
1	Valdez	U.S.	60,000	600	Yes	L	See note b	
2	Drift River	U.S.	6,000	180	Yes	L	See note b	
3	Nikiski	U.S.	2,000	50	Yes	L	See note b	
4	Nikiski	Japan	1,000	30	Yes	L	See note b	
5	U.S.	Anchorage	1,000	225	No	D	5	0
6	Drift River	Nikiski	800	35	No	L	See note b	
7	Skagway	Japan	900	90	No	D	2	0
8	U.S.	Anchorage	800	60	Yes	L	5	1
9	Nikiski	Anchorage	800	110	No	L	5	1
10	Valdez	Nikiski	500	100	Yes	L	See note b	
11	SE Alaska	Japan	500	50	Yes	D	0	0
12	U.S., Canada	Whittier	350	300	Yes	D	6	0
13	Kodiak	U.S.	200	80	No	D	6	0
14	Nikiski	Valdez	200	50	Yes	L	7	1
15	U.S.	Valdez	200	25	Yes	L	7	1
16	Nikiski	Dutch Harbor	160	25	Yes	L	7[c]	1[c]
17	Nikiski	Whittier	150	45	No	L	6	1
18	Jakolof Bay	Japan	100	10	Yes	D	0[c]	0[c]
19	Icy Bay	Jakolof Bay	80	30	Yes	D	0	0
20	Japan	Seward	80	8	No	D	See note b	
21	U.S.	Seward	80	12	No	D	See note d	
22	Nikiski	Kodiak	75	15	No	L	7	1
23	Seattle	Kodiak	75	15	No	L	7	1
24	Kodiak	Valdez	20	25	Yes	D	7	0
25	U.S.	Nikiski	30	15	Yes	D	See note b	
26	Cordova	Kodiak	25	20	Yes	D	7	0
27	Nikiski	Homer	25	15	Yes	L	5	0
28	Nikiski	Cordova	25	15	Yes	L	5	0
29	Nikiski	Seward	15	8	No	L	5	0
30	U.S.	Yakutat	15	40	No	D	5	0

NOTES: [a]Formal routes involve use of either Valdez VTS or Homer VVTL for pilot pickup. Some formal traffic in Cook Inlet will have licensed pilot on board and will use liner route 5 rather than VVTL. Informal routes are generally courses from Coast Pilot.

[b]Growth rates are dependent upon ERCO/EGF petroleum development scenarios described in Task 1 and Task 2 reports.

[c]Actual growth rates may be higher due to private oil-related cargo carried by Crowley Barge. This traffic would not use VVTL to Homer.

[d]U.S. to Seward tonnage could triple and service double if cargo now going to Anchorage is diverted to Seward, if a large oil find is made in Gulf of Alaska, and gas pipeline is constructed. Higher throughput would strain available facilities and backup land.

SOURCES: U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*; U.S. Department of Commerce, Maritime Administration, *Domestic Waterborne Trade in U.S. 1966-1975*; U.S. Coast Pilot No. 9; U.S. Coast Guard MSO, Anchorage; ERCO/EGF Task 1 petroleum development scenarios.

FIELD CONTACTS: Crowley Barge/APUTCO; South Central Timber; Alaska Railroad; Sea Land; Tote; U.S. Coast Guard MSO Kodiak, MSO Valdez, and MSO Juneau.

3 Icebreaking Requirements

Task III was developed to determine Alaskan Icebreaking Requirements bearing in mind the development of marine commerce in Arctic West and Sub-Arctic Alaskan waters, particularly that commerce resulting from the development of petroleum resources in the area. These requirements were derived from the Petroleum Development Scenario of Task I and the Marine Activity forecast of Task II. They were further analyzed with respect to locations of activity, types of vessels involved, seasonality of operations, years of startup, and level of icebreaker assistance required.

3-1 Analysis of Alaska Icebreaking Demands

Alaska is a big state, with vast resources whose development is rapidly accelerating. The development process will, of necessity, create a tremendous demand for transportation services, primarily marine transportation facilities. As this demand increases, the pressure will increase for year-round navigational seasons and, failing that, pressure will be exerted to require the Coast Guard to keep the navigational season, particularly in western Alaska, open as long as economically feasible each year. Also, considerable pressure will be exerted to require the Coast Guard to extend the navigational season from year to year or periodically as has been done on the Great Lakes and major river systems. For purposes of this Section, icebreaker demands and requirements have been separated into Arctic west and Alaska Sub-Arctic.

3-1.1 Arctic Alaska

The best vessel to carry cargo to the western Arctic, and the Arctic as a whole for that matter, has been the subject of considerable operational evaluation over the years. The Defense Department had built two small ships for service in the Arctic. One was a general cargo ship and the other was a tanker. Both were heavily ice strengthened. Both ships participated and were evaluated in a number of DEW line resupply operations. As a result of these evaluations, the use of special small ice reinforced ships to resupply the Arctic was discontinued. The western Arctic for the past decade or so has been resupplied by barges, either pushed or hauser-towed.

A very high percentage of North Slope cargo will move in large relatively shallow draft barges for the duration of this study period. It is expected that all oil development cargo and mineral development cargo will be delivered by barge. Oil and minerals developed and/or produced in western Alaska will undoubtedly be taken out of Alaska in very large ice strengthened bulk carriers. Table 3-1 presents a summary of the overall features considered in the development of the oil activity scenarios, forecast in Task I. It can be seen that they support the probability of further Arctic activity beginning in the later 1980's. Arctic icebreaker assistance will consist of opening convoy routes and providing shipping and SAR assistance for military and commercial vessels.

There presently exists an annual need to provide icebreaking assistance to the commercial shipping voyaging north of the Bering Strait, into the Chukchi Sea, around Point Barrow and into the Beaufort Sea to Prudhoe Bay and the Barrier Islands. In each of the last 10 years, flotillas consisting of a number of barges and tugs, have assembled west of Point Barrow to be convoyed to Prudhoe Bay over a route which is usually ice free for a period of only six weeks each year.

TABLE 3-1

SUMMARY OF ALASKA DEPD ENERGY DEVELOPMENT

SCENARIOS FOR ALASKA OIL AND GAS RESOURCES[a]

REGION[b]	TIME PERIOD	MAJOR ENERGY DEVELOPMENT AND RELATED EVENTS
Arctic	1977-1980	Trans-Alaska pipeline flow reaches 1.2 million barrels per day by mid 1978
		Exploration continues in Arctic Coastal Plain and Northern Foothills, particularly in the National Petroleum Reserve of Alaska (NPRA).
		Exploration begins in Beaufort Sea on Federal-State lands.
	1981-1985	Arctic Coastal Plain petroleum development expands and new development occurs in Foothills provinces and in Beaufort Sea.
		Exploration begins in Chukchi Sea and/or Hope Basin privinces.
		Alcan gas pipeline completed.
	1986-1990	Discoveries are made in Chukchi Sea provinces and onshore in western Arctic Region provinces.
		Construction begins on west to east pipelines in Arctic Coastal Plain to link-up with Trans-Alaska pipelines.
		Development proceeds offshore in Chukchi Sea as border problems with Soviet Union are resolved.
	1991-2000	Oil and gas transportation network completed and various exploration and development programs continued.

Source: Table 1-7, Task 1 Report

The total cargo hauled to the North Slope during the last 10 years has been about 80,000 tons average per year. While the convoy operation has been successful in the more ice free years, the consensus of industry is that the operation will need icebreaking assistance in less ice free conditions.

Ice conditions have been such, that for one to two years out of every four to six, unfavorable ice conditions exist north of Point Barrow for convoying cargo to Prudhoe Bay without assistance. Therefore, Coast Guard icebreaker assistance is required to insure annual cargo deliveries to the North Slope by marine carrier.

From the viewpoint of the shipping companies the ideal icebreaker to assist these barge convoys would be one that cuts a path through the ice in excess of 100 feet in width so that the standard barge in use on the run could follow in its wake. The depth of the icebreakers should not exceed 20 feet as the depth of water to be navigated is quite shallow. The general consensus is that the polar type icebreakers with drafts in excess of 26 feet are too deep to work close to shore with these barge convoys.

Regardless of what happens in the Arctic oil industry (developments and demands are summarized under activities 1 and 2 in Table 3-2) there are present demands for icebreakers with polar capabilities. These demands are a military need to match capabilities with the Soviets and Canadians, a Defense Department requirement to support the DEW line installations, requirements to support other government agencies in their exploration and research activities in the area, and a requirement to provide icebreaker assistance and SAR capabilities in conjunction with Canadian Arctic operations and vice versa.

3-1.2 Alaska Sub-Arctic

The potential for future development of the energy resources in the Gulf of Alaska, particularly those for oil and coal, remains very high, especially in the Cook Inlet area. This has been discussed in Tasks 1 and 2, summarized in Table 3-3, and is activity 4 in Table 3-2. Crude oil development will produce a requirement for substantial increases in the oil and petrochemical, bulk coal, and fish transportation needs in addition to the general cargo and passenger transportation required to support the rapid development of this area. The transport requirement will demand that Cook Inlet and its primary ports remain accessible to merchant ships on a year-round basis.

Generally speaking, the Gulf of Alaska is ice free year-round. However, there are icebreaking demands for short periods of each winter. The primary requirement here is for an icebreaking capability to keep open the Ports of Anchorage and the liquid bulk facilities in Nikiski, Drift River, and Valdez. These requirements were analyzed by the ERCO/EGF Study Team and their conclusions are that: (1) polar icebreakers are too big and too deep to operate successfully breaking ice in Cook Inlet, particularly with the aids to navigation removed for the ice season; (2) the Storis, being underpowered and single screw, is not a satisfactory icebreaker for the fast currents in Cook Inlet; and (3) there remains a reasonable demand for a medium-sized, shallow draft Type B icebreaker with good maneuverability to be available to operate in the Cook Inlet area about 30 to 60 days per year.

The Bering Sea is that area between the Aleutians and the Seward

TABLE 3-2 **Demand for Icebreaking in Alaska**

Number	Activity	Start-up Year[a]	Ice Operation Months	Required Ice Capability	Water Depth	Width of Shipping Channel	Length of Channel	Types of Vessels	Size of Vessels	Service Performed
1	North Slope Oil Field Resupply	1978	July-Sept	2'-3'	20'(-)	100	300 miles	Tug/Barge	15,000 tons	Escort, channel breaking
2a	Oil Drilling Chukchi Sea	1983 No find	May + Oct	2'-3'	20'++	N/A	N/A	Oil Rigs Service Boats	200'	Standby
2b	Oil Drilling Beaufort Sea[b]	1984 1991	July + Sept	2'-3'	20'++	N/A	N/A	Oil Rigs Service Boats	200'	Standby
2c	Oil Drilling Hope Basin	1988 1988	May + Oct	2'-3'	20'++	N/A	N/A	Oil Rigs Service Boats	200'	Standby
3	Military Arctic Research	1978	Jan-Dec	2'-8'+	20'	N/A	N/A	N/A	N/A	Military Presence
4	Bering Sea Fishing	1980	Nov-May	1'-3'	20'	N/A	N/A	Fishing	100'-200'	SAR, ELT
5	Seward Peninsula Minerals	1980 2000	Dec-Mar	2'	30'	100	50-100 miles	Ore Carriers	30,000+ LT	Escort
6a	Oil Drilling Norton Sound	1984 1984	Nov-Apr	2'-3'	30'+	N/A	N/A	Oil Rigs Supply Boats	200'	Standby
6b	Bristol Bay	1980 No sale	Dec + Mar	1'-3'	30'+	N/A	N/A	Oil Rigs Supply Boats	200'	Standby
6c	St. George	1987 No sale	Jan-Feb	1'-2'	40'+	N/A	N/A	Oil Rigs Supply Boats	200'	Standby
6d	Navarin	1992 2000	Jan-Feb	1'-2'	40'+	N/A	N/A	Oil Rigs Supply Boats	200'	Standby
6e	Cook Inlet	1979	Jan-Feb	1'-2'	30'	N/A	N/A	Oil Rigs Service Boats	200'	Standby
7a	Oil Shipping Norton Sound[c]	1992 1995	Nov-Apr	2'-3'	60'+	300'	50-100 miles	Tankers	60,000+ LT	Escort
7b	Oil Shipping St. George	1996 No sale	Jan-Feb	1'-2'	60'+	300'	20-30 miles	Tankers	60,000+ LT	Escort
7c	Oil Shipping Bristol Bay	1996 No sale	Jan-Feb	1'-2'	60'+	300'	20-40 miles	Tankers	60,000+ LT	Escort
7d	Oil Shipping Hope Basin	1997 No find	Nov-May	1'-4'	40'+	300'	100-300 miles	Tankers	60,000+ LT	Escort
7e	Cook Inlet Shipping	1978	Jan-Feb	1'-2'	30'	100' 500'	10-30 miles	Cargo Tankers	20,000+ LT	Channel Clearing Most Winters
7f	Prince William Sound Shipping	1978	Jan-Feb	1'	20'	300'	2-3 miles	Tankers	60,000+ LT	Channel Clearing Severe Winters

[a] Start-up year for each activity under highly optimistic (top year) and pessimistic (bottom year) ERCO/DOI scenarios.
[b] For offshore Beaufort Sea drilling will not occur before 1991.
[c] All ship routes connect to Unimak Straits or Japan.
N/A - Not Available.

TABLE 3-3

FUTURE DEVELOPMENT OF ENERGY RESOURCES

IN THE GULF OF ALASKA

REGION	TIME PERIOD	MAJOR ENERGY DEVELOPMENT AND RELATED EVENTS
Southcentral	1977-1980	Exploration and development begins in Lower Cook Inlet, onshore and offshore.
	1986-1990	Industrial development and population growth continue in Cook Inlet region, with some added development in Cordova and Valdez.
	1991-2000	All of the above developments continue or are completed.
Southwest	1981-1985	Bristol Bay onshore exploration continues. Exploration for oil and gas continues onshore and begins offshore. If discoveries are made, a trans-shipment port will be developed on the Alaska Peninsula or one of the Aleutian Islands.
		Controversy over offshore activities in Bristol Bay area prevents development of this province, unless confidence in blow-out and spill prevention technology increases greatly,
	1986-1990	Port development for oil and gas shipment is completed.
	1991-2000	Depending on prior developments, the region may become a satellite growth center dependent on oil and gas.

Source: Table 1-7, Task 1 Report

Peninsula that extends westward from Alaska to the international boundary with the Soviet Union. Ice coverage is seasonal and certain possibilities for year-round navigation are forecast to develop before the year 2000. Of immediate importance is the fact that American fishing vessels are now sailing into the Bering Sea ice for crab and bottom fish. The Coast Guard will have to provide SAR coverage for the American fishing vessels working along the ice line. In addition, the Coast Guard will have to provide law enforcement to prevent unauthorized fishing by foreign fishermen with ice-capable fishing boats operating within the U.S. sector of the Bering Sea.

Additional Alaska West Coast marine activity will result from the development of oil and mineral resources located on the Seward Peninsula and in Norton Sound, Bristol Bay, and St. George. A list of oil developments, forecast for this area is found in Table 3-3. The timetable for startup of mineral activity is less precise, but can be incorporated by assuming this activity would start in any year after 1980, with at least 18 months initial development before creating demand on USCG icebreaking assistance.

3-1.3 Summary of Icebreaker Demand Analysis

Table 3-2 reflects the ERCO/EGF Study Team's analysis of icebreaker demands. The quantitative element of the demand forecast is based on scenario, augmented by informed opinion from operating personnel and service personal experience. Assessment was done by matching the assumed capability of the present and near future icebreaker fleet with a subjective estimate of the assistance required. Although the variable demands resulting from different oil development scenarios impacted on this study to a greater degree than anticipated by the study team, this fact was mitigated by the timing of this impact. For example, the exploration for, and development of, oil reserves in Western Alaska will not begin until 1984 at the very earliest and activity will not become heavy until well past this date. It is the opinion of the ERCO/EGF Study Team that Coast Guard ice capability and presence in this area must be well established by this time for reasons other than oil development. However, the preceding uncertainties as well as other important benefit/cost factors have influenced the Study Team's recommendation of an extremely flexible cost effective program to which appreciable additions and changes can be made with minimal strain on existing resources. There are different procurement recommendations proposed for icebreakers as a function of the different ERCO/EGF petroleum development scenarios.

3-2 Current Alaskan Icebreaker Fleet

The icebreakers now stationed in Alaska are the Storis and three WLBs--the Sedge, Citrus, and Sweetbrier. The Storis is over 35 years old, and unless slated for repowering and rehabilitation, will probably retire in another 5 years, although the physical condition of the ship is quite good. As for the WLBs in Alaska, they are all ready to be scrapped unless rehabilitated. In fact, the WLB Citrus in Kodiak is scheduled for replacement by 1980 by CGC Firebush, which has undergone major renovation. The Sedge is stationed in Homer at the Southeast corner of the Cook Inlet, while the Sweetbrier is stationed at Cordova in Prince William Sound, where icing occurs only infrequently.

The findings of the study team concerning icebreakers available for use in Alaska are as follows: First, there is no spare icebreaking capacity in any of the Coast Guard's icebreaking areas (Great Lakes, East Coast), nor will there be any by the year 2000. Second, none of the existing Coast Guard icebreakers except the polar icebreakers, the Mackinaw, and the new class of 140-foot WYTM icebreakers are suitable for use in Alaska. Third, the USCGC Storis, if repowered, would be an asset in the Alaska icebreaking program, but, even if repowered, will probably remain considerably underpowered for maximum utility to the North Slope, where high power and twin screws have been found to be very advantageous in displacing ice to permit vessel passage. There are a number of 180-foot buoy tenders in the U.S. fleet, some with special ice-strengthened hulls. This group of tenders, with their low power, can be of considerable service on the fringes of the ice fields if time is not a prime factor. In capable hands and with sufficient patience, this class of vessel can do many of the ice-related tasks in the southern Bering Sea. However, this class of WLB is now quite old.

3-3 Summary and Procurement Recommendations

Since there is no spare icebreaking capacity available within the Coast Guard, the icebreaking capacity required for Alaska will have to be obtained by a procurement program. As the Coast Guard has a procurement program for all areas but Alaska, the study team limited its procurement recommendations to those considered to be essential to Coast Guard activity in Alaska.

Alaskan demands for icebreaker assistance are quite different from those on the East Coast harbors and the Great Lakes. In sea ice, the facilitation of commerce is largely by escort breaker service rather than channel icebreaking. Alaskan icebreaker needs in the Cook Inlet and Prince William Sound areas most resemble those of the Great Lakes. In developing a procurement program, one must examine each of the demands for icebreaker assistance in order to provide the assistance consistent with the activity levels forecast in the ERCO/EGF scenarios. The demands discussed below are derived from Table 3-2, and the items are numbered consistently with that table:

3-3.1 North Slope Resupply - The annual resupply of the North Slope and the placing of racons must be done by a shallow draft vessel. Generally the ice pack is offshore but perhaps one year in five, ice clearing is necessary. It is the opinion of the study team that two SDIBs are best suited for this task.

3-3.2 Arctic Oil Drilling - The opening of near shore oil drilling in the Beaufort Sea will start, as forecast in Task 1, in 1981. By this time a SDIB as proposed should be available to assist during the summer and fall as part of its escort mission described in item 1 above. The oil activity forecast by 1988 to 1995 in the Arctic areas further offshore will need to be assisted by another SDIB on patrol from spring to fall.

3-3.3 Military and Government Needs - These needs are adequately fulfilled by the Coast Guard program for Type P cutters. Assistance is possible by Type B program should it be needed.

3-3.4 Bering Sea Fishing - The explosion predicted in Bering Sea fishing will consist of more than five hundred boats by 1985. Since fishing will be done near to, and in, the ice pack, ice capabilities exceeding 2 feet are necessary. This will be mostly a winter and spring need, which means I/B will be free for Arctic needs discussed in items 1 and 2.

3-3.5 Seward Peninsula Minerals - It is probable that the activity will shut down over the winter. In any case, traffic will be low enough for escort to multimission with fisheries patrol and OCS supervision.

3-3.6 Subarctic Oil Exploration - The demand for I/B would consist of standby for MEP, SAR for rigs and supply boats as well as providing an inspection base. This could, to a large extent, multimission with fisheries patrol.

3-3.7 Subarctic Oil Shipping - In addition to the oil platform supervision which will demand I/B supervision, oil tankers will move oil from Western Alaska to either the U.S. or Japan.

The recommended procurement program for icebreakers is presented in Table 3-4, according to the three ERCO/EGF petroleum development scenarios. The vessels should have the following capabilities:

1. Icebreaking: 2.5 to 3 feet.
2. SAR: into the Bering Sea during winter.
3. ATON and salvage: equipped with an A-frame derrick or crane with a boom capacity of 10 tons, 20 feet from the side of the ship, and length suitable for handling large sea buoys.
4. MEP: oil spill recovery capability.
5. ELT: suitable for patrols.
6. Scientific exploration platform.
7. Helicopter operations.
8. MP: minimum, small general purpose gun, two .50 caliber.

3-4 Support Facilities for Icebreaking

The problem of providing proper support facilities for the Alaskan

TABLE 3-4

ALASKAN ICEBREAKERS RECOMMENDED PROCUREMENT PROGRAM

YEAR	RECOMMENDATION	RECOMMENDATIONS FOR EACH SCENARIO: PESSIMISTIC	OPTIMISTIC	HIGHLY OPTIMISTIC
1978-2000	Procure Polar I/B per I/O Program Plan	x	x	x
1978	Look into adaptability of standard supply/tug to use as B-SDIB	x	x	x
1979	Procure one SDIB	x	x	x
	Investigate possibility of procuring Manhattan		x	x
	Replace Citrus with rehabilitated WLB Firebush	x	x	x
1980	Evaluate performance of WYTM during ANS resupply. Assess for Cook Inlet, Bristol Bay	x	x	x
1981-1983	Procure one B-SDIB to replace Storis. Retire Storis	x	x	x
1987-1990	Procure Type B SDIB		x	x
1993-1995	Procure Type B SDIB			x
1995-2000	No anticipated additional procurement necessary as indicated by activity forecast			

icebreaker fleet is fairly difficult to solve due to the high costs of living and construction, the likely competition with other users for dock space, and the low attractiveness of a billet in Alaska to many families.

Two polar icebreakers have been assigned to Seattle, the Glacier is assigned to Long Beach, and the Storis and an ice-capable WLB are in Kodiak, which also supports the cutter Confidence. Homer and Cordova have the ice-capable WLBs Sedge and Sweetbrier. The nearest WLB home-port to the Bering Sea is in Adak, about halfway down the Aleutian chain between Cape Saricheff and Attu. However, it must be remembered, Adak is extremely far away from the Bering Sea, three degrees further south than Ketchikan, and over 370 miles from the Pribilof Islands. The Pribilof Islands (St. Paul and St. George) are at the southern edge of the ice pack. They are unsuitable as a docking facility for Coast Guard use. St. Matthew Island in the Bering Sea is 250 miles north of the Pribilof Islands and has no landing facilities whatsoever. Nunivak Island has Nash Harbor, which looks promising as an oil depot, but the logistics are very tenuous since development costs would be extremely high. Closer to the Bering Straits, St. Lawrence Island has a small harbor, but the island is dangerously infested with the eggs of a parasite.

Since Kodiak is almost 500 miles from the Unimak Pass, economies of scale indicate that cutters should be berthed in Dutch Harbor by 1985, with further expansion of a second cutter delayed until at least 1993.

Stationing of SDIBs should be in accordance with the following scenario. The first SDIB would be stationed in Dutch Harbor as soon as possible, with additional support in Dutch Harbor. The second SDIB would replace the Storis. The third SDIB would be in Kodiak and would replace the Confidence. If necessary, capabilities in the Gulf of Alaska would be maintained by use of a 270-foot WMEC in Ketchikan as a replacement for the 210-foot cutter assumed to be stationed in Ketchikan by 1980. The fourth SDIB recommended (only for the highly optimistic scenario) would be assigned to Dutch Harbor in view of the demand for more presence in Western Alaska. The WYTM would be assigned to Nikiski unless the WLB in Homer could be released and replaced by a WYTM and WPB combination, which the study team feels is needed in Homer (but only on the release of a WLB, since support in Homer is limited).

The icebreaker program as recommended involves the following recommendations for the pessimistic scenario (recommendations for the optimistic and highly optimistic scenarios are then added to these):

1. Construct support facility as soon as possible for Dutch Harbor-based SDIB.
2. Procure SDIB in 1980.
3. Replace Storis with new SDIB by 1983.

The optimistic case has the additional recommendation of procuring a WYTM for Cook Inlet in 1981, homeported in Nikiski or Homer (release of a WLB is possible since a WLB in Central Alaska can be relieved of SAR, ELT, and Western Alaska AtoN by use of a SDIB):

4. Procure WYTM in 1981.
5. Procure another SDIB in 1988 (the third SDIB in Alaska). This can be supported in Kodiak by replacement of Confidence by SDIB in Western Alaska, and use of a 270-foot WMEC in Ketchikan for Gulf of Alaska Patrols.

The highly optimistic scenario has two additional procurement recommendations:

6. Construct an additional berth in Dutch Harbor in 1993.

7. Procure another SDIB in 1993 (fourth in Alaska).

The total costs of this program by scenario are shown in Table 3-5. Operating expense for SDIB to replace STORIS not included. STORIS has annual operating expense of $1.2M, which is $.5M above SDIB which has low manning.

4 Summary of Coast Guard Program Requirements

The program requirements for PSS, CVS, and MEP program workloads forecast for Alaska are summarized below. The personnel requirements are the focus of this analysis, but recommendations for establishing bases and acquiring vessels and aircraft are made by the study team as deemed appropriate.

4-1 Port Safety and Security Program

In order to accommodate the expanding oil, fishing, and non-crude cargo activity in Alaska, and associated marine environmental protection and safety responsibilities, it is the conclusion of the ERCO/EGF study team that the Coast Guard PSS presence should be increased from its present base. Table 4-1 presents a forecast of oil and LNG-related port development and expansion activity. The principal features of the highly optimistic forecast are as follows:

1. New full-scale oil terminal facilities expected to be developed in Lower Cook Inlet from 1982 to 1986, in the Gulf of Alaska from 1986 to 1990, and on Kodiak Island from 1985 to 1987.

2. New full-scale LNG terminal complex expected to be constructed

TABLE 3-5

VESSEL COSTS

(1978 Million $)

Year	Pessimistic Scenario		Optimistic Scenario		Highly Optimistic Scenario	
	ACI	OE	ACI	OE	ACI	OE
1980	25	.7	25	.7	25	.7
1981	0	.7	9	1.1	9	1.1
1982	0	.7	0	1.1	0	1.1
1983	25	.7	25	1.1	25	1.1
1984	0	.7	0	1.1	0	1.1
1985	0	.7	0	1.1	0	1.1
1986	0	.7	0	1.1	0	1.1
1987	0	.7	0	1.1	0	1.1
1988	0	.7	25	1.8	25	1.8
1989	0	.7	0	1.8	0	1.8
1990	0	.7	0	1.8	0	1.8
1991	0	.7	0	1.8	0	1.8
1992	0	.7	0	1.8	0	1.8
1993	0	.7	0	1.8	25	2.5
1994	0	.7	0	1.8	0	2.5
1995	0	.7	0	1.8	0	2.5
1996	0	.7	0	1.8	0	2.5
1997	0	.7	0	1.8	0	2.5
1998	0	.7	0	1.8	0	2.5
1999	0	.7	0	1.8	0	2.5
2000	0	.7	0	1.8	0	2.5

TABLE 4-1

ERCO/EGP FORECAST OF ALASKAN OIL AND LNG PORTS AND TERMINALS

ALASKAN OCS AREA	DESCRIPTION OF PORT AND TERMINAL DEVELOPMENT
Pessimistic Scenario	
Lower Cook Inlet	1. Oil - existing facilities at Nikiski/Drift River (expanded, if needed) used for all new crude oil produced in Cook Inlet.
	2. LNG - new LNG plant with marine terminal added to Nikiski complex in 1981-1982.
Northeast Gulf of Alaska	1. Oil - production begins in 1989 and is piped to Valdez terminal for storage and loading.
Bering Sea-Norton	1. Oil - single point mooring system installed in 1994-1995 with onshore storage tanks.
Optimistic Scenario	
Lower Cook Inlet	1. Oil - existing facilities at Nikiski/Drift River are expanded in 1981-1982 to handle production from northern areas of Lower Cook Inlet. For southern areas, new terminal and treatment facilities built in 1984-1987 at Seldovia-Port Graham and/or Cape Douglas.
	2. LNG - new LNG plant with marine terminal added to Nikiski complex in 1981-1982, and then capacity is doubled in 1984-1985.

TABLE 4-1 (CONT.)

ALASKAN OCS AREA	DESCRIPTION OF PORT AND TERMINAL DEVELOPMENT
Kodiak	1. Oil - new oil terminal facility constructed in 1987-1988, with many potential locations, such as Cape Chiniak, Narrow Cape, Ugak Bay, Old Harbor.
Bering Sea-Norton	1. Oil - SPM system installed in 1990-1991, with onshore storage in Pastol Bay region.
Bering Sea-St. George	1. Oil - SPM system installed in 1995-1996, with onshore storage in the Pribilof Islands.
Hope Basin	1. Oil - SPM system installed in 1996-1997, with onshore storage.
<u>Highly Optimistic Scenario</u>	
Lower Cook Inlet	1. Oil - existing facilities at Nikiski/Drift River are expanded in 1980-1981 to receive production from northern areas of Lower Cook Inlet. New facilities are built in 1982-1986 at Seldovia-Port Graham and/or Cape Douglas.
	2. LNG - new LNG plant with marine terminal added to Nikiski complex in 1981-1982, and then capacity is doubled in 1984-1985. In 1995, the capacity is increased 50 percent.

TABLE 4-1 (CONT.)

ALASKAN OCS AREA	DESCRIPTION OF PORT AND TERMINAL DEVELOPMENT
Gulf of Alaska	1. Oil - production from sale area 39 begins in 1982 and from sale area 55 in 1987. Pipelines to Valdez terminal are used to supplement storage and treatment capacity at new terminal facilities built in 1986-1990 along the coast or on an island in the Gulf of Alaska.
Kodiak	1. Oil - new oil terminal facility built in 1985-1986 in one of many potential locations on Kodiak island.
Bering Sea-Norton	1. Oil - SPM* system installed in 1990-1991, with onshore storage in Pastol Bay region.
Bering Sea-St. George	1. Oil - SPM system installed in 1995-1996, with onshore storage in the Pribilof Islands.
Hope Basin	1. Oil - SPM system installed in 1996-1997, with onshore storage.
Bristol Bay	1. Oil - SPM system installed in 1995-1996, with onshore storage.

at Nikiski from 1981 to 1982, followed by a doubling of capacity in about 1985.

3. Single point mooring systems with onshore storage facilities are installed in Western Alaska OCS areas beginning with Norton Sound in 1990.

In the pessimistic and optimistic scenarios, the above activities (except for the Gulf of Alaska terminal complex, which is expected only in the highly optimistic case) are forecast to occur according to a slower timetable.

Port development due to fishing activity will occur sooner and more intensely than that due to oil activity, particularly during the 1980s. Major port expansions are expected to eventuate in Unalaska, Dutch Harbor, and Captain's Bay. Kodiak, Homer and perhaps an additional port between Kodiak and Unimak will also experience major expansion, while a lesser degree of development is forecast for Ketchikan, Sitka, and Cordova.

To respond to the expanding PSS requirement, the 17th CG District should consider the alternatives for increasing its PSS capabilities given in Table 4-2. In the near term, the most pressing PSS problem is in Cook Inlet, where new oil and gas activity is expected to increase along with an acceleration of fishing activity. Next in priority is the Unalaska-Dutch Harbor region, a relatively unsupervised area where fishing industry growth is to be tremendous. Also, this area could eventually become a staging area for OCS exploration in the southern Bering Sea. The remaining recommended priority action calls for upgrading the Kodiak MSD to MSO status to handle increased fishing activity

TABLE 4-2

ALTERNATIVES FOR PORT SAFETY AND SECURITY PROGRAM EXPANSION IN ALASKA

RECOMMENDED ACTION	DATE OF ACTION	RATIONALE AND OTHER COMMENTS
Establish MSD at Nikiski and base VVTL supervision in the new MSD	As soon as possible but at least by	1. Increased PSS, CVS, and MEP workloads in Cook Inlet region due to oil and gas development (scenario-related).
		2. Expanded fishing fleet activity in Cook Inlet.
		3. Ongoing oil/fishing waterway user conflict in Kachemak Bay. A patrol vessel should be based in Homer area.
Establish MSO at Unalaska, Dutch Harbor, or other port in vicinity	1980	1. Tremendous fishing expansion is expected in these ports, which are now relatively unsupervised from the distant Anchorage MSO.
		2. Dutch Harbor is attractive as a future supply/support base for OCS oil activities (scenario-related).
Upgrade Kodiak MSD to MSO	1981	1. Potential for significant oil-related development on Kodiak Island beginning in early 1980s (scenario-related).

TABLE 4-2 (CONT.)

RECOMMENDED ACTION	DATE OF ACTION	RATIONALE AND OTHER COMMENTS
		2. Kodiak is the crab capital of the world and will become a major bottom-fishing port. Waterway user conflicts between fisherman and oilmen are highly probable.
		3. General cargo activity is increasing.
Increase Anchorage MSO complement by by two billets to provide a travelling MSD team for Northern Alaska	1980	1. New and expanded oil-related activity on the North Slope OCS (and eventually in Norton Sound area of Western Alaska) will require MSO presence about 25 percent of the time during summer months.
		2. This activity could be the precursor of a permanent MSD at Prudhoe Bay in late 1980s.
Establish MSD at Whittier or Seward	1982	1. Possibility of replacing Anchorage as major Central Alaska port for general cargo and container service is under study by Corps of Engineers.
		2. Movement of Alaskan capitol from Juneau to inland location between Anchorage and Fairbanks would trigger growth in Seward and Whittier.

TABLE 4-2 (CONT.)

RECOMMENDED ACTION	DATE OF ACTION	RATIONALE AND OTHER COMMENTS
Increase Juneau MSO complement by one billet to provide MSO service to Skagway	1981	1. This change would be desirable should Skagway become a major supply port for the Alaska Highway Pipeline Project (gas) or become a terminus for an oil pipeline to the U.S. Northern Tier States.
Upgrade Ketchikan MSD to MSO and establish MSD at Sitka	1982	1. Ketchikan should become MSO if Southeast Alaska fishing industry develops as expected.

and forecast oil-related development.

4-2 Marine Environmental Protection Program

The ERCO/EGF scenarios indicate that the 17th District still has a considerable amount of leadtime to provide for increased levels of MEP service over an expanding area of coverage. The accelerated development schedule in the highly optimistic scenario has only a limited amount of OCS exploration and development activity in Northern Alaska prior to 1986, and no exploration and development activity in Western Alaska OCS areas until 1984. Furthermore, production in Western Alaska is not expected until after 1990, while Northern Alaska production, although starting in 1986, will utilize the trans-Alaska pipeline system. The highly optimistic scenario for Southern Alaska, which will be covered from existing and planned bases, includes vigorous exploration from 1978 to 1985, followed by new OCS production starting in 1981.

During the exploration phase, the MEP responsibility will be limited to occasional surveillance flights in the drilling areas to detect unauthorized discharges. The development phase of OCS activity will require Coast Guard inspection of new tank farms, oil terminal facilities (including single point moorings), production platforms, and submarine pipelines. Routine monitoring and surveillance of all new petroleum-related facilities will also be done. The production phase of OCS development will involve inspection, survey, monitoring, and surveillance programs for platforms, pipeline routes, tanker traffic lanes, and terminals. Finally, as production levels increase, the Coast Guard's ability to provide pollution response services will become increasingly important.

A variety of different types of oil pollution incidents will undoubtedly occur as petroleum development proceeds in Alaska. The number of individual spill events will also increase with expanded levels of oil exploration, production, and transportation. Consistent with the National Contingency Plan, the primary Coast Guard role in the response element of the MEP program will be that of on-scene coordinator of federal involvement. Building upon the management plan now being developed by the joint industry-government Alaska Cooperative Oil Spill Response Planning Committee (ACORP), the considerable spill response capabilities of industry supplemented with improved Coast Guard response preparedness should be sufficient to handle most minor spill situations.

For major spill incidents, which are difficult to define but usually involve substantial volumes (say, more than 1,000 barrels), it may become necessary to call in the National Strike Force. Until the late 1980s at the earliest, no oil production/transportation is likely anywhere other than the Kodiak-Cook Inlet-Gulf of Alaska region. Exploration-related spill problems could occur somewhat sooner in the Beaufort Sea and Norton Sound lease areas. The rate at which Southern Alaska OCS development proceeds will indicate whether an Alaska-based National Strike Force is warranted. If development occurs as represented in the ERCO/EGF optimistic or highly optimistic scenarios, it may become necessary to provide the protection of an Alaska Strike Force. Equipment availability and deployability perhaps will be more critical than having a complete Strike Force present at all times.

The environmental conditions in which spill response actions in Alaska will be undertaken are awesome. In Northern Alaska, including the Beaufort and Chukchi Seas, containment and recovery actions will be limited by ice, low temperatures, and impaired visibility once men and equipment are able to arrive at a spill scene. The ice and temperature constraints will be severe in the Western Alaska OCS areas also, although open water will be present for at least a few months each year. In Southern Alaska, rough seas and storms will be the principal response obstacle, but ice will also be a problem in Cook Inlet and northern portions of Bristol Bay. The extreme tidal ranges of the lower Bering Sea region will also hamper response actions there.

Given that many types of spills are possible under the most adverse conditions imaginable, the question of "what should the Coast Guard MEP program be prepared for?" was addressd. The opinion offered by the ERCO/EGF study team was that: (1) many small volume spills of various types will occur; and (2) the probability of a major spill in Alaska is relatively high over the long-term. Therefore, the 17th District MEP program should stress the following:

A. Prevention of blowouts in ice areas. Drilling of relief wells can require anywhere from 30 to 120 days depending on where and when the blowout occurs. Given the very limited capability to contain and recover such a spill, the probability of an Arctic blowout must be reduced to near zero.

B. Widespread capability to respond quickly and effectively to the many inevitable small spills to be associated with petroleum operations. Under the most rapid development scenario postulated in this study, this capability will be needed in this study, this capability will be needed in Northern Alaska by about 1985 and in Western Alaska by about 1980 as OCS oil production begins in those regions. Of course, exploration activities will precede production by 4 to 8 years, but exploration-related spills will be infrequent.

C. Consistent with the pattern of Alaskan OCS development, capability to provide state-of-the-art response in the event of a major spill event. In the near-term, Southern Alaska waters will be the focus of OCS activity and existing and planned Coast Guard installations will suffice. The addition of tanker traffic in the Bering Sea in the early 1990s will necessitate an additional response staging area along the West Coast of Alaska. In Northern Alaska, a base for response to a major well blowout will be needed by 1985. Minimal manning of remote oil spill equipment areas, with air transportation of response personnel in the event of a spill, is indicated.

4-3 Commercial Vessel Safety Program

The CVS workload for the 17th District through the year 2000, resulting from oil, fishing and other (non-crude) vessel traffic, will consist of inspections, reinspections, and investigations of the following:

4-3.1 Rigs, Platforms, and Supply Boats. The CVS workload in terms of inspections of OCS exploration rigs, production platforms, and supply vessels is presented in Table 4-3. This Table is a summary of the inspection/investigation workload in weeks for the period from 1980 to 2000. Individual tables indicating the estimated number of inspections required, the associated inspector time, and the required travel time

TABLE 4-3

NUMBER OF INSPECTION/INVESTIGATION WORKLOAD WEEKS - OCS RIG, PLATFORM, AND SUPPLY BOAT INSPECTIONS AND INVESTIGATIONS

Region	1980	1985	1990	1995	2000
ERCO/EGF Pessimistic Scenario					
Central	8	24	18	22	4
North	0	12	22	20	22
N. West	0	4	6	0	8
S. West	0	0	0	0	0
Total	10	40	46	42	34
ERCO/EGF Optimistic Scenario					
Central	13	50	94	88	56
North	0	12	26	20	30
N. West	0	4	10	42	58
S. West	0	0	10	0	18
Total	13	66	140	150	162
ERCO/EGF Highly Optimistic Scenario					
Central	16	86	194	164	118
North	0	12	36	38	38
N. West	0	10	14	76	102
S. West	0	0	14	4	56
Total	16	108	258	282	314

for each of the years 1980, 1985, 1990, 1995, and 2000 are presented for each ERCO/EGF oil development scenario in Task Reports 6 and 8.

4-3.2 Oil and LNG Tankers. The CVS workload for tanker vessel inspections in Alaska will consist of inspection of U.S. and foreign LNG and crude oil tankers. U.S. tankers operating to Alaska will, in most cases, be operating to the U.S. West Coast and will undoubtedly be inspected and drydocked there. The CVS workload ensuing from U.S. tanker operations to Alaska will consist primarily of reinspections for Lower 48 MIOs/MSOs, investigations, and occasional miscellaneous inspections. It is assumed that each U.S. tanker operating to Alaska will be visited by Alaskan CVS inspectors on an average of once per year.

Foreign flag tankers are presently carrying Alaskan oil to St. Croix in the Virgin Islands, which along with Puerto Rico, are exempt from the Jones Act. Alaskan tanker operations to St. Croix and to the Panama Canal are forecast to stop within 3 to 5 years as East Coast refineries increase their capacity to handle the high sulphur Alaskan oil and a pipeline is built or converted to move Alaskan oil to the U.S. Midwest. Foreign sales of Alaskan crude are almost a foregone conclusion for the optimistic and highly optimistic scenarios for Alaskan oil production for the simple reason that the forecast oil production will be beyond the capacity of the U.S. West Coast refineries and pipelines. In addition, foreign sales of Alaskan crude are very attractive in terms of U.S. foreign trade and shipping economics. In the more optimistic scenarios, Japan is considered to be a likely recipient of Alaskan crude over the last 10 years of this century. Table 4-4 is a summary of the U.S. and foreign flag inspection workload in manweeks for the crude oil

TABLE 4-4

U.S. AND FOREIGN OIL TANKER INSPECTION WORKLOAD (MANWEEKS)[a]

	[illegible]	1985	1990	1995	2000
Pessimistic Scenario					
Central	32	37	30	17	10
Northwest	0	0	0	0	0
Southwest	0	0	0	0	0
Total	32	37	30	17	10
Optimistic Scenario					
Central	32	50	65	42	14
Northwest	0	0	0	21	20
Southwest	0	0	0	0	25
Total	32	50	65	63	54
Highly Optimistic Scenario					
Central	32	61	114	68	55
Northwest	0	0	0	42	28
Southwest	0	0	0	0	22
Total	32	61	114	110	105

[a]Manweeks based on 40-hour week and Coast Guard CVS standards for foreign and U.S. tankers.

ships operating to Alaska. Table 4-5 is an analysis of the inspector manweeks required to inspect U.S. and foreign flag LNG ships expected to be operating in the Cook Inlet region.

4-3.3 Other vessels. Other vessel inspections are not very responsive to the oil production scenarios. Instead, they are driven by population growth in the State, which the DRI model assumes to be about 2.7 percent per year, and by an income growth of about 4.0 percent per year, which produces another vessel cargo increase of about 5.0 percent per year.

There is a surplus capacity for general cargo on the Alaskan run now and SeaLand is expected to put faster and larger containerships on their routes in about 1985. It is expected that for the next 20 years the volume of ship traffic (numbers of ships) will increase by 1 percent per year, and the cargo lifting capacity per ship by about 4.0 per year. Thus the carrying capacity of the Alaskan fleet will double in about 15 years. However, the study team projects that any increase in CVS inspection for vessels operating to Alaska will probably be performed in Lower 48 States and, therefore, the increase in CVS workload in Alaska will hardly be noticed.

There will be an increase in the number of vessels operating intrastate to match the projected 100 percent increase in cargo traffic to Alaska in the next 15 years. The number of intrastate and other vessels operating in Alaska will rise by about 25 percent in the next 20 years. Another factor, which should increase the inspections of vessels in this category, is the expected elimination of fishing vessels carrying freight for hire from the Pacific Northwest to Alaska on waivers. This was not analyzed by the study team by itself, but was assumed that it could be

TABLE 4-5

U.S. AND FOREIGN LNG TANKER INSPECTION WORKLOAD (MANWEEKS)[a]

YEAR	LNG SHIP VISITS - PESSIMISTIC SCENARIO[b]		LNG SHIP VISITS - OPTIMISTIC SCENARIO[b]		LNG SHIP VISITS - HIGHLY OPTIMISTIC SCENARIO[b]		NUMBER OF INSPECTOR WEEKS REQUIRED FOR LNG SHIPS[c]		
	U.S.	FOR-EIGN	U.S.	FOR-EIGN	U.S.	FOR-EIGN	PESSI-MISTIC	OPTI-MISTIC	HIGHLY OPTI-MISTIC
1980	-	67	-	-	-	67	6	6	6
1983	60	67	60	67	60	67	9	9	9
1985	60	67	117	67	117	67	9	12	12
1990	60	67	117	67	117	67	9	12	12
1995	60	67	117	67	207	67	9	12	16
2000	60	67	117	67	207	67	9	12	16

[a]All forecast LNG production occurs in the Cook Inlet region.

[b]Assumes that capacity of LNG ships is 60,000 m^3, or about 30,000 DWT, and that one dedicated LNG tanker will average about 15 trips per year.

[c]Assumes one inspection per day plus 100 percent overhead for travel and administration, and 0.75 week/inspector/year/U.S. ship, 1.25 week/inspector/year/foreign ship, including travel and administration.

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handled by inspectors in Lower 48 States and in Alaska, as assigned for oil-related developments.

4-4 Billet Requirements

4-4.1 Billet Requirements - PSS

To estimate the manning requirements associated with increased PSS workloads, the study team sought answers for the following questions: (1) how many billets are needed to handle a million barrels of oil per day?; and (2) will there be additional needs for dry cargo supervision? They recognized that there are significant economies of scale in cargo transfer supervision, and assumed that the present billet structure was adequate for present levels of cargo. The present billet levels are shown as 1979 levels in the PSS billet requirements forecasts given in Table 4-6.

The billet recommendations in Table 4-6 do not reflect multimission potential and, therefore, are a conservative estimate of PSS billets. A somewhat lower number of PSS billets would be indicated if similar duties, or duties that can be performed simultaneously on routine patrols or field assignments by multimission-trained personnel, are taken into account.

4-4.2 Billet Requirements - MEP

Billet requirements for MEP are assumed herein to be covered in the billets estimated for the PSS and CVS program. The actual Coast Guard MEP plan in Alaska should be closely coordinated with the activities of ACORP, thereby taking advantage of the availability of industry oil spill personnel and equipment.

TABLE 4-6

FORECAST MARINE SAFETY OFFICE BILLET REQUIREMENTS FOR PORT SAFETY AND SECURITY IN ALASKA[a]

YEAR	ANCHORAGE	JUNEAU	VALDEZ	KODIAK	KETCHIKAN	NIKISKI	DUTCH HARBOR	WHITTIER/ SEWARD	SITKA
Pessimistic Scenario									
1979	20	9	41	4	7	0	0	0	0
1980	20	9	41	4	7	4	4	0	0
1981	22	10	41	6	7	4	4	0	0
1982	22	10	41	6	9	6	4	4	0
1983	22	10	41	6	9	6	4	4	4
1984	22	10	41	6	9	6	4	4	4
1985	22	9	41	6	9	6	4	4	4
1990	22	9	41	6	9	6	4	4	4
1995	22	9	41	6	9	6	4	4	4
2000	22	9	41	6	9	6	4	4	4
Optimistic Scenario									
1979	20	9	41	4	7	0	0	0	0
1980	20	9	41	4	7	4	4	0	0
1981	22	10	41	6	7	6	4	0	0
1982	22	10	41	6	9	6	4	4	0
1983	22	10	41	6	9	6	4	4	4
1984	22	10	42	6	9	7	4	4	4
1985	22	9	43	6	9	8	4	4	4
1990	22	9	45	7	9	8	5	4	4
1995	23	9	44	8	9	7	6	4	4
2000	23	9	41	6	9	7	7	4	4

[a]See notes to Table 8-18 for clarifications regarding the development of Table 8-18.

TABLE 4-6 (CONT.)

YEAR	ANCHORAGE	JUNEAU	VALDEZ	KODIAK	KETCHIKAN	NIKISKI	DUTCH HARBOR	WHITTIER/ SEWARD	SITKA
Highly Optimistic Scenario									
1979	20	9	41	4	7	0	0	0	0
1980	20	9	41	4	7	4	4	0	0
1981	22	10	41	6	7	6	4	0	0
1982	22	10	41	6	9	7	4	4	0
1983	22	10	41	6	9	7	4	4	0
1984	22	10	42	6	9	8	4	4	0
1985	22	9	45	6	9	9	4	4	4
1990	22	9	47	7	9	9	5	4	4
1995	24	9	45	7	9	9	7	4	4
2000	24	9	42	6	9	9	18	4	4

NOTES TO TABLE 4-6

1. 1979 billets are equal to present billets and include all unit personnel allowance billets as set forth in the Personnel Allowance System, 17th Coast Guard District, computer printout of 31 January 1978.

2. Adopting 1978 as the standard year, the ratio of oil shipments to PSS billets was estimated to be approximately as follows:

Oil shipments (MMbbl/day)	:	PSS Billets
0.5	:	1
1.0	:	2
2.0	:	3
3.0	:	4
4.0	:	5

3. Additional billets for LNG shipments were based on the following ratios of LNG throughput to PSS billets:

LNG throughput (MM m^3/year)	:	PSS Billets
5	:	1
10	:	2
15	:	3

4. Responsibility for the various OCS oil production areas has been allocated to MSOs or MSDs as indicated below:

- Norton Sound and Hope Basin areas are initially assigned to MSO Anchorage, with possibility of eventual assignment to a new MSD in the Nome/Pastol Bay area (in the mid 1990s).

- St. George and Bristol Bay areas are initially assigned to MSO Anchorage, with possible eventual assignment to new MSO in Dutch Harbor area.

5. Personnel increases shown in Table 8-18 are considered adequate for oil-, fishing-, and non-crude cargo-related PSS workloads.

NOTES TO TABLE 4-6 (CONT.)

6. It has been assumed that OCS supply port inspections will be handled by CVS personnel cross-trained in port facility inspection.

7. The billet assignments have been based on the PSS standard requirement to supervise 100 percent of LNG loadings, 50 percent of crude oil loadings and unloadings, and over 50 percent (approaching 100 percent) of all loadings of volatile distilled products. Generally, there is little slack in this billet structure; however, it is probable that some PSS help will be available from CVS assigned officers whose workload in many cases is highly seasonal. The values of cargo throughput to ship calls is as shown below (given average ship size):

Oil - 1 MMbbl/day equals 1.3 ship calls/day

LNG - 10 MMm^3/year equals 2.5 ship calls/week

4-4.3 Billet Requirements - CVS

Table 4-7 and Figure 4-1 present a summary compilation and graphing of the CVS inspector manweeks required to handle the workload forecasts discussed above. This section analyzes the CVS inspector personnel requirements for the 17th Coast Guard District through the year 2000. The analysis starts with an allocation of present CVS billets from the 17th District's Personnel Allowance System, to which is added the billets assumed to accrue to CVS as a result of the expansion of the non-oil development-related maritime fleet operating to and within Alaska. The inspector manning for the above workload is given in Tables 4-8 through Table 4-11 and are summaries of CVS marine inspector requirements for the various scenarios. The combined tables present the CVS inspector personnel requirements by scenario and year with the personnel distributed into the existing and/or recommended MSOs and MSDs.

Further details on the assumptions used in the development of these sections, on distribution by season and transportation requirements can be found in the Report for Task 8.

TABLE 4-7

SUMMARY OF CVS INSPECTION WORKLOAD (MANWEEKS)

REGION	1980/81	1985	1990	1995	2000
Pessimistic Scenario					
Central Alaska[a]	46	70	57	48	23
Northern Alaska	0	12	22	20	22
Western Alaska	0	4	6	0	8
Totals	46	86	85	68	53
Optimistic Scenario					
Central Alaska[a]	51	112	171	142	82
Northern Alaska	0	12	26	20	30
Western Alaska	0	4	20	63	116
Total	51	128	217	225	228
Highly Optimistic Scenario					
Central Alaska[a]	54	159	320	250	189
Northern ALaska	0	12	36	38	38
Western Alaska	0	10	28	122	206
Total	54	181	384	410	435

[a]Also referred to herein as Southern Alaska (see Table 8-2).

Note: 1980 was used for vessels due to assumption that in 1981 tankers would begin to ship oil to Sohio pipeline in Southern California. For this table, the 1981 figure for tankers was added to the 1980 figures for OCS rigs and platforms supply boat inspections.

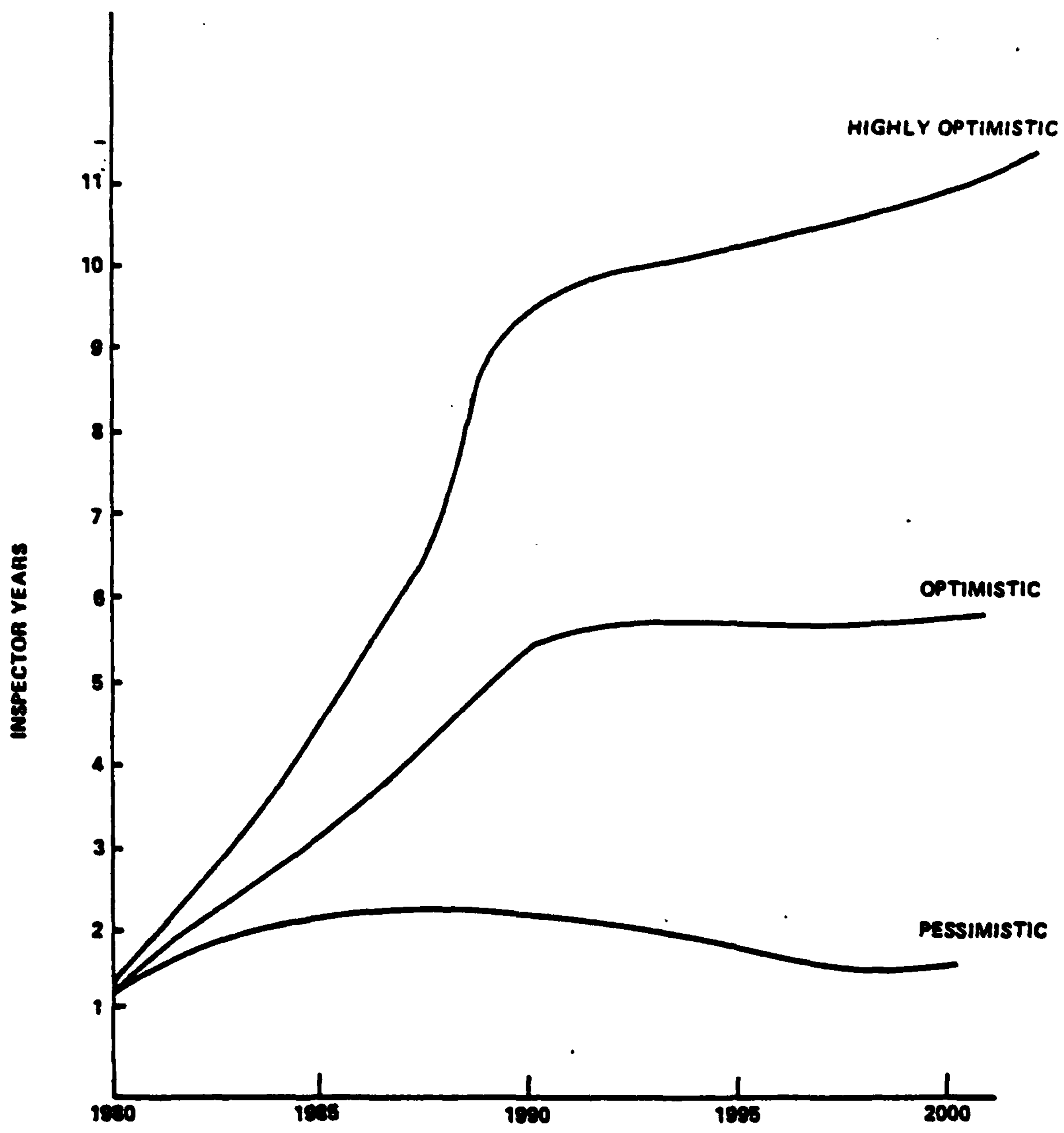

Figure 4-1 Summary of needed CVS inspector time (Based on 40 weeks per year).

TABLE 4-8

CVS INSPECTION WORKLOAD FOR OTHER VESSEL TRAFFIC, MISCELLANEOUS CARGO, UNINSPECTED VESSELS AND OTHER MSO-CVS RELATED FUNCTIONS

REGION	MSO OFFICE	PRESENT INSPECTION STAFF	INCREASE IN CVS WORKLOAD (NOT SCENARIO ORIENTED) 1980/81	1985	1990	1995	2000
Central	Anchorage	4	4	4	5	5	5
	Kodiak	0.5	0.5	0.5	0.5	0.5	0.5
	Nikiski	0	0	0	0	0	0
	Valdez	1	1	1	1	1	1
	Juneau	2	2	2	2	2	2
	Ketchikan	1	1	1	1	1	1
North	Anchorage	0	0	0	0	0	0
	Prudhoe Bay	0	0	0	0	0	0
West	Anchorage	0	0	0	0	0	0
	Nome	0	0	0	0	0	0
	Dutch Harbor	0	0	0	0	0	0

TABLE 4-9

SUMMARY OF CVS MARINE INSPECTOR REQUIREMENTS BY MSO AND BY YEAR

PESSIMISTIC SCENARIO

REGION	MSO OFFICE	1980/1981 BASIC CVS	1980/1981 OIL DEVEL CVS	1980/1981 TOTAL CVS	1985 BASIC CVS	1985 OIL DEVEL CVS	1985 TOTAL CVS	1990 BASIC CVS	1990 OIL DEVEL CVS	1990 TOTAL CVS	1995 BASIC CVS	1995 OIL DEVEL CVS	1995 TOTAL CVS	2000 BASIC CVS	2000 OIL DEVEL CVS	2000 TOTAL CVS
Central	Anchorage	4	0	4	4	0	4	5	0	5	5	0	5	5	0	5
	Kodiak	0.5	0	0.5	0.5	0	0.5	0.5	0	0.5	0.5	0	0.5	0.5	0	0.5
	Nikiski	0	1	1	0	1	1	0	1	1	0	.5	1	0	1	.5
	Valdez	1	0	1	1	1	2	1	1	2	1	.5	1.5	1	0	1.5
	Juneau	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
	Ketchikan	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
North	Anchorage	0	0	0	0	.25	.25	0	0.5	0.5	0	0.5	0.5	0	0.5	0.5
	Prudhoe Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest	Anchorage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southwest	Anchorage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dutch Harbor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		8.5	1	9.5	8.5	.25	10.75	9.5	2.5	12.0	9.5	1.5	11.5	9.5	1.5	11.0

TABLE 4-10

SUMMARY OF CVS MARINE INSPECTOR REQUIREMENTS BY MSO AND BY YEAR

OPTIMISTIC SCENARIO

REGION	MSO OFFICE	1980/1981 BASIC CVS	1980/1981 OIL DEVEL CVS	1980/1981 TOTAL CVS	1985 BASIC CVS	1985 OIL DEVEL CVS	1985 TOTAL CVS	1990 BASIC CVS	1990 OIL DEVEL CVS	1990 TOTAL CVS	1995 BASIC CVS	1995 OIL DEVEL CVS	1995 TOTAL CVS	2000 BASIC CVS	2000 OIL DEVEL CVS	2000 TOTAL CVS
Central	Anchorage	4	0	4	4	0	4	5	0	5	5	0	5.0	5	0	5
	Kodiak	0.5	0	0.5	0.5	0	0.5	0.5	0.2	0.7	0.5	0.2	0.7	0.5	0	0.5
	Nikiski	0	1	1	0	1.5	1.5	0	2.5	2	0	1.5	1.5	0	1.0	1.0
	Valdez	1	0	1	1	1.5	2.5	1	2.5	3.5	1	1	1	1	1	2.0
	Juneau	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
	Ketchikan	1	0	1	1	0	1	1	0	1	1	0	1.0	1	0	1
North	Anchorage	0	0	0	.25	.25	0	0.6	0.6	0.6	0.5	0.5	0.5	0	.5	0.5
	Prudhoe Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest	Anchorage	0	0	0	0	0	0	0	.2	.2	0	2	0	0	-	1.5
	Nome	0	0	0	0	0	0	0	0	0	0	1.5	1.5	0	2.0	2.0
Southwest	Anchorage	0	0	0	0	0	0	0	.2	.2	0	0	0	0	2.0	0
	Dutch Harbor	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total		8.5	1.	9.5	8.5	3.25	11.75	9.5	5.7	15.7	9.5	5.7	15.7	9.5	5.7	15

TABLE 4-11

SUMMARY OF CVS MARINE INSPECTOR REQUIREMENTS BY MSO AND BY YEAR
HIGHLY OPTIMISTIC SCENARIO

REGION	MSO OFFICE	1980/1981 BASIC CVS	1980/1981 OIL DEVEL CVS	1980/1981 TOTAL CVS	1985 BASIC CVS	1985 OIL DEVEL CVS	1985 TOTAL CVS	1990 BASIC CVS	1990 OIL DEVEL CVS	1990 TOTAL CVS	1995 BASIC CVS	1995 OIL DEVEL CVS	1995 TOTAL CVS	2000 BASIC CVS	2000 OIL DEVEL CVS	2000 TOTAL CVS
Central	Anchorage	4	0	4	4	0	4.0	5	0	5	5	0	5.0	5	0	5.0
	Kodiak	0.5	0	0.5	0.5	0	0.	0.5	1.0	1.5	0.5	0.75	1.25	0.5	0.5	1
	Nikiski	0	1	1	0	2	2	0	2.5	2.5	0	2.0	2.0	0	1.5	1.5
	Valdez	1	0	1	1	2	3	1	3	4	1	3.0	4.0	1	2.5	3.5
	Juneau	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2
	Ketchikan	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
North	Anchorage	0	0	0	0	0.25	0.25	0	1.0	1.0	0	1.0	1.0	0	1.0	1.0
	Prudhoe Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest	Anchorage	0	0	0	0	0.25	0.25	0	1	1.5	0	0	0	0	0	0
	Nome	0	0	0	0	0	0	0	0	0	0	3.0	3.0	0	3.5	3.5
Southwest	Anchorage	0	0	0	0	0	0	0	.5	.5	0	.25	.25	0	0	0
	Dutch Harbor	0	0	0	0	0	0	0	0	0	0	0	0	0		2.0
Total		8.5	1	9.5	8.5	4.5	13	9.5	9.5	19.0	9.5	10.0	19.5	9.5	11.0	20.5

5 Summary of Other Program Requirements

The program requirements for Search and Rescue, Aids to Navigation, Marine Science and Communications are summarized below. Recommendations are given by the study team as deemed appropriate for additional personnel requirements, for establishing cases and for requiring vessels and aircraft.

5-1 Search and Rescue

Search and Rescue programs will be affected by four important factors in the pattern of Alaskan Marine Activity. The first is the general support of annual North Alaska resupply missions. This subject is addressed in detail in Task III, with the conclusion made that shallow draft ice-breaker (SDIB) escort of this annual convoy would reduce SAR needs and perform SAR as necessary. The second factor is the forecast OCS oil development activity. Table 5-1 presents a summary of this development. Generally, the oil industry has a high capability to do its own SAR and the design of facilities and vessels minimizes needs for SAR. The survival potential of OCS supply vessels is generally good, particularly those built for use in ice conditions. Strict regulatory standards and industry safety concerns have made the rescue needs of the OCS platforms very low in non-ice areas. In western Alaska, the ice operations problem would be resolved by SDIB support. However, the two factors which caused great concern to the study team were the large increases projected for fishing and recreational boating. SAR in Alaska presents exceptional difficulties. The low population and long coastline decrease boat-to-boat contact and lead to less efficient search patterns. The probability of loss of life resulting from a marine

Table 5-1

Summary of Oil Development, Marine Traffic Increases by Scenario, Area and Year

Region	Scenario	Oil Development Activity Increase 1980/1981	1985	1990	1995	2000
Central	Pessimistic	SI	SI	SI	SI	SI
Gulf of Alaska	Optimistic	SI	SI	MI	MI	MI
Cook Inlet	Highly Optimistic	SI	MI	LI	LI	MI
North	Pessimistic	NC	SI	SI	SI	SI
Prudhoe Bay	Optimistic	NC	SI	SI	SI	SI
	Highly Optimistic	NC	SI	SI	SI	SI
Northwest	Pessimistic	NC	NC	NC	NC	NC
Norton Sound and	Optimistic	NC	NC	SI	MI	MI
Hope Basin	Highly Optimistic	NC	SI	SI	MI	MI
Southwest	Pessimistic	NC	NC	NC	NC	NC
Saint George	Optimistic	NC	NC	NC	NC	SI
	Highly Optimistic	NC	NC	NC	NC	SI

SI = Small increase - all increases are relative to present production

NC = No change

MI = Moderate Increase

LI = Large increase

casualty is several times greater in Alaska than in the U.S. as a whole.

Although most recreational boating does take place in areas of high population density by Alaskan standards, the boating density is still very low compared to the rest of the United States. The 17th District has indicated that, generally, assistance can be rendered by other boats. There is a low probability that this will change greatly over the rest of this century, but recreational boating will grow and spread geographically over the next 20 years.

5-1.1 SAR Recommendations 1980-2000

Generally speaking, the consensus of the ERCO/EGF study team is in agreement with the Alaskan District Ten Year Plan. However, there are several areas of divergent opinions which arise when considering the study period of 1980-2000. These are summarized in Table 5-2 which presents the ERCO/EGF Study Team recommendations and are given in detail in Task 7 Report.

5-2 Aids to Navigation

Recommendations concerning aids to navigation will necessarily be significantly influenced by the optimistic and highly optimistic oil development scenario forecasts for levels of activity in the waters of Western Alaska. However, since most of the Bering Sea is an ice area during the winter season, it is expected that AtoN in the Bering Sea will be installed on shore. There may be a need for additional racons depending upon the location and volume of activity in a given area if and when either of the more optimistic scenarios becomes apparent.

There is a need for additional AtoN equipment to provide better marking of the southern Kachemak Bay traffic lane in order to assist

Table 5-2

ERCO/EGF SAR RECOMMENDATIONS

1980	Establish a Coast Guard Support Center in the Dutch Harbor - Unalaska area. For SAR and MSO activities. Using existing ALPAT for SAR coverage.
1982 (1)	Add SDIB at Dutch Harbor (2)(5)(6)(7). Construct hangar facilities for housing, maintenance, and repair of shipboard base helicopters as forerunner of eventual helicopter facility at Dutch Harbor or vicinity (Cold Bay).
1983 (1)	Add SDIB at Dutch Harbor (3)(4)(5)(6)(7)(8).
1986	Establish air station in the Dutch Harbor Area (Cold Bay).

NOTES

(1) It is assumed that each SDIB's will be equipped with one small helicopter.

(2) It is assumed that this SDIB will patrol in the southern Bering Sea during the ice seascn thus relieving some of the ALPAT WHEC's from winter patrols in ice regions.

(3) This assignment assumes a WYTM is assigned to Nikiski for Cook Inlet icebreaking, ATON and SAR if the WYTM is not assigned to Nikiski one of the Dutch Harbor SDIB's will have to be made available on a need basis to break ice in Cook Inlet.

(4) The assignment of the SDIB's at Kodiak or some other port in lieu of Dutch Harbor will be discussed in Task 8.

(5) It is assumed that the SDIB's will go north in the summer season for SAR and IO off the Alaskan North Coast.

(6) An important consideration in assigning SDIB to Dutch Harbor was SAR, ELT for the forecasted boom in Bering Sea fishing. The needs for SDIB are highly multimission and the full reasoning behind their procurement is discussed in Tasks III and VI, where its use as for transportation of CVS inspectors of OCS oil rigs is discussed. The study team simply will point out that potential fishing and oil developments in Southwest Alaska are enormous, and this potential indicates one or even two highly (including ice) capable cutters, if activity even approaches its potential, will be needed in Southwest Alaska.

(7) The decision of the exact location of the proposed air station and the assignment of SDIB is sensitive to scenarios concerning oil developments in West Alaska. Whether the air station should be located in the Aleutians or on the Alaskan peninsula is a decision which cannot be made given the limitations of the subtask. The 17th District feels that Cold Bay is more physically suitable for an air station, and the study team concurs in this opinion.

the crabbers in placing their crab gear outside of the agreed upon voluntary vessel traffic lanes. The major AtoN need for Cook Inlet is the establishment of a number of racon stations, particularly in upper Cook Inlet, such that ships can find their way by radar in the wintertime when the normal aids are removed and the shoreline is obscured by snow and ice.

Despite the study team's prediction that commercial traffic to Southeast Alaska will not grow to the same extent as traffic to Central Alaska, it is forecast that the numbers of people coming in from British Columbia and Puget Sound to cruise Southeast Alaska will steadily increase over the next 20 years. As for recreational boaters there will be a large increase in Prince William Sound-Seward area and in Cook Inlet, particularly in the Kachemak Bay area. In addition there are likely to be AtoN needs for some of the Alaskan native port settlements in Western Cook Inlet and along the Alaskan Peninsula.

Western Alaska, including the Aleutians and the Bering Sea, has been identified as an area of growth for fishing and oil activity. The fishing activity in the Bering Sea has historically been the salmon fisheries of Bristol Bay and the Yukon, and the crab fisheries in the Bering Sea; crabbers arrive to catch tanner in spring, then change to king crab in summer and early fall. Added to this will be the year round bottom fishing activity, expanded tanner catches and a steady increase in red salmon effort. The Ten Year Plan recognizes these needs and recommends increasing aids in the Alaskan Peninsula/Bristol Bay harbor areas and placing seasonal aids along the retreating ice edge with removal as the ice returns.

5-2.1 Aids to Navigation Equipment

One of the topics of prime interest to this study is the program for replacing and/or rehabilitation of the aging fleet of 180 foot WLBs (seven in Alaska). The ERCO/EGF Study Team compared the present tender fleet and the 17th District proposed Ten Year Plan with their recommendations. These comparisons are discussed in detail in Task 7 Report and are summarized in Table 5-3.

5-3 Marine Science

In the process of analyzing the effect upon the Coast Guard of the development of the oil industry in Alaska as forecast from 1980 through the year 2000, it was evident that certain additional study and/or research could perhaps ease the burden of ice and cold weather operations, particularly off the North Slope of Alaska. Problems in Alaska such as ice and difficult cold weather are unique in this country. Coupling this with optimistic and highly optimistic forecasts of oil development and movement especially in Northwestern and North Alaska OCS and the desirability of increased data and knowledge of the ice movements, pressures become of paramount importance. The Coast Guard, with primary responsibility for activities in the US Outer Continental Shelf and for ice breaking in general, has a vital interest in Western Arctic ice and weather research and in particular with research having to do with the long range forecasting of ice conditions in the Beaufort, Chukchi and Bering Seas. All of the scenarios predict oil drilling, oil production and transportation in ice areas, although the transportation forecast in the pessimistic scenario is fairly low. The basic ability to forecast the thickness and movement of ice flows is going to

TABLE 5-3

LOCATION AND TYPE BUOY TENDERS - ALASKA

PRESENT AND PROPOSED

Item No.	Location	Present Equipment Assignment	17th District Ten Year Plan Proposed Equipment Assignment
1	Ketchikan	WLB-Laurel	WLM TANB
2	Sitka	WLB-Clover	WLB-Laurel TANB
3	Juneau	WLB-Planetree	WLB-Planetree TANB
4	Petersburg	WLI-Elderberry	63' ANB
5	Cordova	WLB-Sweetbrier	WLB-Sweetbrier
6	Homer	WLB-Sedge	WLB-Sedge
7	Nikiski	-	-
8	Kodiak	WLB-Citrus	WLB-Firebush
9	Dutch Harbor	-	WLB-Ironwood
10	Adak	WLB-Ironwood	Discontinue*

*Recent information indicates Ironwood will be moved to Kodiak.

be important to the development of Western and Northern Alaska.

Better basic knowledge is required for information reporting, on ice surveillance, hydrographic surveys, meteorology data and in long range weatehr and ice forecasting in order to deal with the difficulties of the region.

5-4 Communications

Communications in Alaska is much better than apparent; the Coast Guard usually has excellent communications and relies on them extensively. The great distances and the attenuation of signals in and around mountains are problems. Information obtained by the study team in interviews of Coast Guard personnel in the 13th and 17th Districts indicated that the present communications to and within Alaska was inadequate but that by the year 1980, when an expanded *VHF-FM system is* installed, the communications deficiencies in Alaska will arise and should be corrected.

The overriding issue of communications in Alaska is how can coverage best be extended to Western Alaska to meet the general Coast Guard and SAR communication needs for the increasing fishing activity, forecast oil exploration and transportation needs. Unless there are rapid developments in communications technology, no changes in the Alaskan communications are recommended by the study team, unless activity in Western Alaska (oil and fish) reach the point where communications are strained with the existing facilities.

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