260

MAN IN THE ARCTIC PROGRAM:

ECONOMIC AND ENVIRONMENTAL POLICIES

Further Notes on MAP and the Policy Alternatives Project

George W. Rogers
June 6-7, 1974

TABLE OF CONTENTS

TABLES

TABLE OF CONTENTS CONTINUED

FIGURES

MAN IN THE ARCTIC PROGRAM: ECONOMIC AND ENVIRONMENTAL POLICIES

Notes for ISEGR Workshop, June 3-7, 1974

George W. Rogers
Juneau, Alaska May 30, 1974

I. INTRODUCTION

This report is intended as a contribution to what Tom Morehouse has described as "an intermediate or middle level of research conceptualization" between (1) the general MAP program structure and (2) specific policy questions and research problems.[1] It starts with his general conclusion that "oil and gas development and state revenues are and will be the most important elements of change in Alaska over the next ten years and more." It accepts that Alaska policy alternatives can be broadly divided into "growth conducive" and "growth restrictive" policies. For this workshop this report is concerned with a research approach and methodology which will contribute to an understanding of the range and intensity of economic, social and environmental impacts associated with proposed oil and gas developments and provide a basis for defining realistic (in terms of what is or is not desirable or acceptable) "conducive" or "restrictive" policies.

Oil and gas developments within Alaska and its outer continental shelf have and will increasingly alter local and regional economies and ecosystems in which they take place. Pollution (due to chronic and accidental discharges of oil and other alien matter) and changes in land and water use (due to industrial and community development) will cause both temporary and permanent changes in the physical environment. The economic and social life of the directly affected communities will be changed by the creation of new employment opportunities and the displacement of established employment patterns and economic activities. Social impacts will change the character

---

[1] T. Morehouse, "Notes on MAP and the Policy Alternatives Project," April 24, 1974.

and value systems of Alaskan communities. Basic political changes will result from expansion of the economic influence of the international petroleum industry within Alaska, changes in population distribution, and the need for increased federal and state assistance to affected communities to meet the financial strain of social infrastructure impacts. Finally, these developments will increase revenues to state and local government and greatly expand public services and works throughout the state. Overall is the fact that because non-renewable resources are to be developed in the context of a national policy of accelerated development, these processes of impact and change will expand, decline and terminate within clearly defined time periods.

These impacts and resulting changes may or may not be desirable or acceptable to Alaskans, or only to a degree. This will be evaluated in some way in terms of the potential net economic benefits of the proposed developments and a comparison with the net economic loss due to displacing present or foreclosing future alternative activities (e.g. displacement of commercial fishing at certain lower Cook Inlet and outer continental shelf locations) and environmental and social costs. Because of the non-renewable resource base of these developments, the re-adjustment costs at the end of the process must also be determined. In addition to a determination of the total values of these elements, it is also necessary to consider the distribution of costs and benefits to private developers, the nation, the state of Alaska, different groups of Alaskans (e.g. construction workers, fishermen, Natives and non-natives, etc.), and regional and local levels. Policy issues will be concerned with the regulation of the extent and rate of development in order to maximize net benefits, (economic, social, and

environmental), that benefits be widely and equitably distributed, and that to the highest degree possible no one bears more of the cost than is received as a benefit (e.g. environmental and economic displacement costs will be most heavily born by rural populations at or near the primary development location, while economic benefits will be more heavily distrubted to developers).

The adequacy of such evaluations and formulation of economic and environmental policies depends in large part upon the extent of the knowledge of the key elements--amount and availability of the oil and gas resources (and other resources which would be adversely or positively affected), the social and economic changes required by or attendant to the development, the environmental constrains that will influence the technological operation, the environmental changes that will result, etc. It also depends upon the appropriateness of the methods used in relating the elements and analysing the total processes of development and change. These methods and approaches will be discussed in general and illustrated by application to a specific development as an aspect of Tom Morehouse's "intermediate or middle level of research conceptualization."

Environmental and Economic Development Systems

In its critique of the outer continental shelf oil and gas development environmental assessment by the Council of Environmental Quality, a National Academy of Sciences review committee stressed the failure of the CEQ assessment to consider "the functional dynamics of the ecological systems of estuaries, marshlands, and open waters and their interrelationships...in

various geographical areas."[2] The validity of the CEQ assessments and ranking of development areas by relative risk, in the judgement of the NAS committee, was harmed more by this lack of understanding of the nature of ecosystems than the limits of knowledge, and their outline of an appropriate basis for environmental assessment will serve as an introduction to the present discussion of methodology and research design.

> "A catalog of environmental parameters such as local air and water quality indices, meterorological conditions, acres of land in selected uses, and species of plants and animals is necessary, but not sufficient for an environmental assessment. Further understanding of the productivity and value of discrete ecosystems should be developed. Such an evaluation requires an understanding of the complex interrelationships between living plants and animals and the physical environment in an area large enough to be distinguishable as an ecological system. While it is frequently useful to classify ecosystems geographically into marshes, estuaries, offshore areas, and so forth, it is also important to recognize that within each classification there are both similarities and differences. For example, although intertidal areas consisting of marshlands and shallow estuaries generally are highly productive of renewable resources and serve as important nursery grounds for fisheries, not all of these areas consist of the same types of plants and animals or the same types of interrelationships. Thus, some may be more sensitive to environmental changes than others. It is important, therefore, that each ecosystem be assessed with respect to its uniqueness of character and its productivity, as well as its economic and social value.
>
> "Yet another parameter of each ecosystem should be assessed: its spatial extent. It is conceivable that some areas, although they represent only a small percentage of the area of the ocean or of the coastal zone, are sufficiently important biologically

---

[2] "Issues in the Assessment of Environmental Impacts of Oil and Gas Production on the Outer Continental Shelf," Review Committee of the Environmental Studies Board, National Academy of Sciences, Washington, D.C., 1974, p. 20. Hereinafter this report will be cited simply as NAS (1974). The study which was being critiqued was "Outer Continental Oil and Gas--An Environmental Assessment," a report to the President prepared by the Council on Environmental Quality, Washington D.C. 1974, hereinafter referred to simply as CEQ (1974).

to preclude any serious development in their immediate vicinity.... Conversely, less productive and sensitive areas, where experience indicates that recovery from oil damage may be rapid, could be considered less vulnerable to intrusion and therefore more acceptable for development.

"Economic evaluation of a particular discrete ecosystem should be directed toward analyzing its renewable resources (its fisheries in particular) and its relationship to other areas, e.g., as a nursery ground. For example, the Louisiana delta and marshlands are considered the controlling factors for fisheries production in the northern Gulf of Mexico. The Chesapeake Bay area has a similar relationship with the mid-Atlantic region and, without doubt, there are other such areas along every coastline that can be similarly identified as critically important to production of renewable resources.

"Any stress that seriously alters the dynamics of an ecosystem should be avoided, since critical changes in its productivity may result. On the other hand, specific systems may be subject to varying degrees of natural stress, such as a decrease in the salinity of an estuarian system due to unusually heavy freshwater runoff. A system operating normally can overcome and repair temporary losses of its renewable resources in variable but reasonable periods of time. Therefore, the danger of environmental intrusion by man is not necessarily the temporary loss of populations but rather the loss of or permanent change in the dynamics of the system that supports its productivity. For this reason studies of the recovery of ecosystems from catastrophic damage resulting from natural stress are particularly critical. The Committee therefore recommends that, in order to improve the base of knowledge necessary for understanding and assessing the impacts of man's activities, data be developed to establish the natural ecosystem dynamics associated with production of renewable resources, with particular attention given to the effects of seasonal and occasional episodic changes in environmental parameters."[3]

The above discussion applies to quantitative and qualitative assessment of environmental impacts, but paraphrased (e.g. substitution of economic for environmental parameters, regional economic systems for ecosystems, etc.) it can serve as an approach to economic impact assessment. A suitable methodology, in other words, begins with a regional definition that embraces the entire development process under study in a geographic

---

[3]Ibid, pp. 20-23.

unit large enough to be distinguishable as a complete system. In its outside boundaries the same "development impact region" would serve the economic and environmental assessments, but its internal classification into inter-related areas for specific analysis might differ. In the case of environmental assessment these would be the ecosystems described above classified according to their characteristics and sensitivity to environmental insult or change, while the economic asssessment would require a hierarchy of inter-related areas defined in accordance with their economic characteristics and functions in relation to the specific development process under study.

A further difference between the environmental and economic impact spatial definitions is that the economic must also include an assessment of statewide impacts which will be registered via population and workforce movements in response to the developments, dislocations due to development-induced inflation, changes in the distribution and relative expenditure patterns of state and local governments, etc. Once the primary economic development impact region and its sub-areas are defined, simple but appropriate models of each regional and local economy must be devised which reveal the specific nature of each sufficiently to identify and measure potential impacts.

This use of an ecological explanation of economic (and social) life must be understood to be no more than a device for the guidance of policy making. Its basic assumption is that the subject social and economic groups and individual Alaskans lack the ability to make choices and the calculated changes resulting from the oil and gas development impacts are changes in their "ways of life" representing direct adaptation to the new economic

environment which are analogous to changes in animal and plant communities in relation to physical environment. The approach suggested, in other words, is a means of outlining the probable shape of the future if major exogenous development forces are permitted to operate freely in the Alska socio-economic systems. From these outlines of "natural" economic futures, evaluations can be made in terms of the degree to which this is or is not acceptable to the subject groups and one level of choices made from among Morehouse's alternatives of "growth conducive" and "growth restrictive" policies. A second level of choices of policy alternatives will be made on the basis of the ecological studies. These would seek either to modify design and operating procedures to minimize adverse environmental effects or to postpone or halt developments because the environmental costs are not acceptable.

The trans-Alaska oil and gas pipelines and the Kachemak Bay lease sales have brought forth a range of policy alternatives from different groups of Alaskans, for example, but final decisions are being made without the benefit of adequate study and evaluation of the economic and environmental impacts. Research in this area, therefore, is urgently needed.

Regional Definition of Alaska Oil and Gas Developments

The present and anticipated future oil and gas developments in Alaska will be divided here into three major and not entirely inter-related geographic systems: (1) the southcentral development region, (2) the North Slope trans-Alaska pipeline development region, and (3) the Bristol Bay-Bering Sea development region. The broad regions would embrace the relevant ecosystems as well as the key elements of the economic development process, but for this workshop discussion will be limited only to the employment and

population impacts and changes. At this time only the first region will be considered.

The southcentral Alaska oil and gas development region is the land and waters located south and east of the arc of the Alaska Range and the spine of the Alaska Peninsula, but excluding the areas embraced in the Matanuska-Susitna and most of the Valdez-Chitnina-Whittier 1970 census divisions. Although Valdez is being developed as an oil shipping port, it is excluded because of its primary orientation to North Slope production and the trans-Alaska pipeline. Distance from the probable regional development sites and the existence of more strategically located alternative ports, space and other physical limits would probably rule out the accomodation of Gulf of Alaska related activities at this port. Commercial fishing and fish processing at this port have been minor and erratic and, therefore, insignificant in the economic evaluation of the effects of adverse impacts upon fisheries resources. Part of the Matanusak-Susitna division has been serving as a suburban residential area for a growing Anchorage oriented population, but it is assumed that the relation of this division to the main oil and gas development of the region is not significant enough to warrant its inclusion in the development region.

Analytical units within this region would be the Anchorage census division (headquarters and support area for all Alaska oil and gas development and probable residence of a portion of the platform operatives and their dependents), the Cook Inlet basin (presently developed petroleum, gas and petrochemical industries and location of most immediate future development prospects), the Aleutian and Gulf of Alaska outer continental shelf areas

included in the Interior Department's lease sale announcement, and land areas of probable use and development as oil and gas receiving and processing locales (Alaska Peninsula, Kodiak Island and Gulf of Alaska Coast).

The North Slope-TAP development region would include the entire land area of the North Slope, the outer continental shelf areas included in the Interior Department's lease sale announcement (the Beaufort and Chukchi Seas shelf), the transportation corridor of the trans-Alaska pipeline and related communities, and the communities of Anchorage, Fairbanks and Valdez. A number of studies and evaluations have already been made of the impacts of these developments.

The Bristol Bay-Bering Sea development region would consist of the outer continental shelf inlcuded in the Interior Department's announcement (Bering Sea north of 58° North Lat. and south of 66° North Lat., and Bristol Bay north of Aleutian Islands and south of 58° North Lat.) and the land areas draining immediately into these bodies. (Refer to Figure 1).

II. SOUTHCENTRAL OIL AND GAS DEVELOPMENT REGION

General Regional Background

The development focus of the region are the oil and gas fields and provinces in the Cook Inlet Basin (offshore and onshore) and the outer continental shelf areas included in the Department of the Interior's announced lease sales for 1975 (Southern Aleutian Shelf, West of 153 degrees West longitude and Gulf of Alaska Shelf North of 56 degrees North latitude and East of 153 degrees West longitude).[4] For purposes of assessing the impacts

---

[4] Richard Corrigan, "Feds to Sell Oil off State Coast," Anchorage Daily News, May 25, 1974.

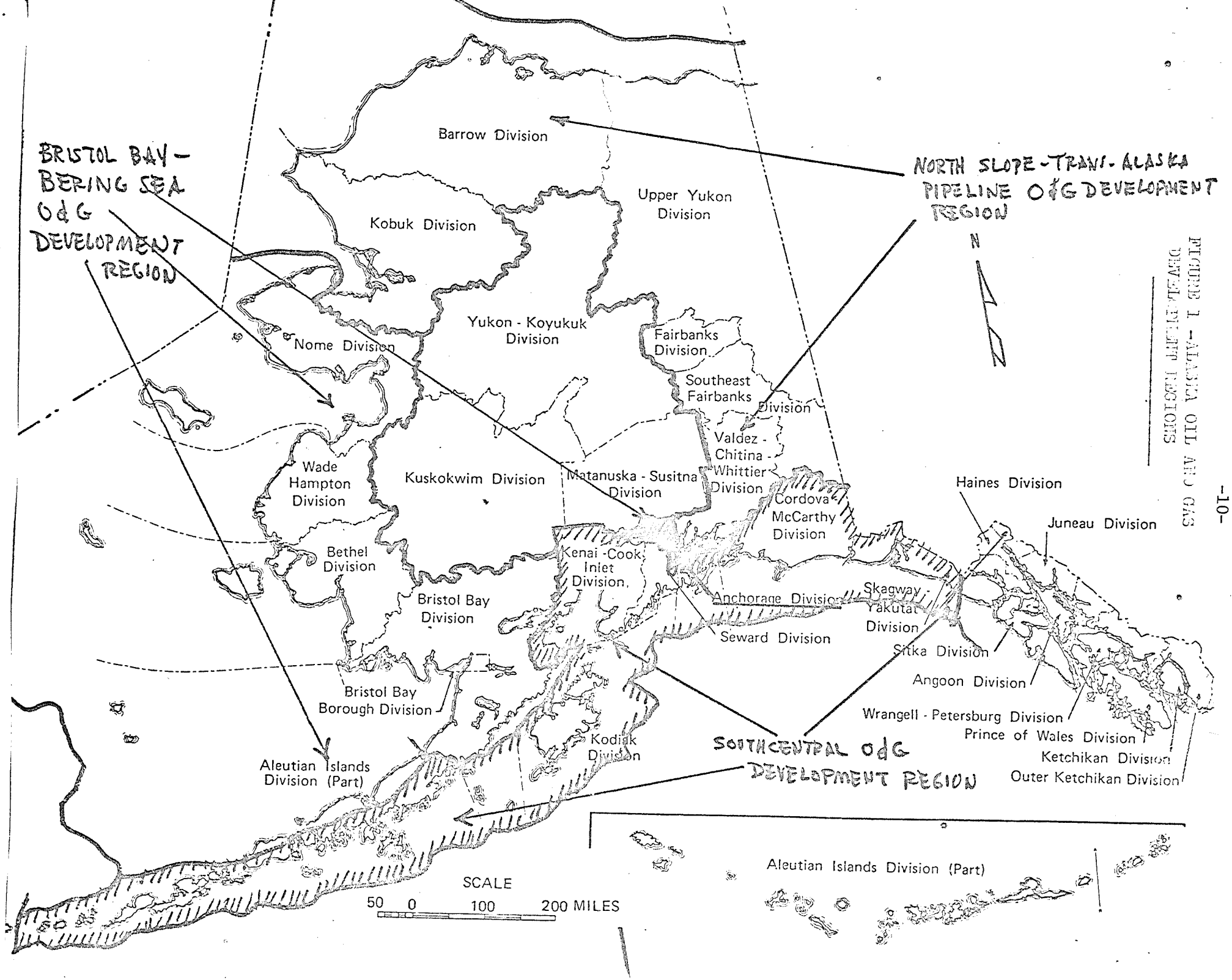

FIGURE 1 -ALASKA OIL AND GAS DEVELOPMENT REGIONS

of development within these areas, the study region (Figure 1) is defined as the combination of the Anchorage, Kenai-Cook Inlet, Seward and Kodiak 1970 Census Divisions, and the Aleutian Islands census division excluding Enumeration Districts 01 through 07 (the Navy portions of the western end of the Chain) and 35-36 (the Pribilof Islands in the Bering Sea), Enumeration Districts 13, 15 and 16 of the Valdez-Chitina-Whittier Census Division and Enumeration Divisions 03-04 of the Skagway-Yakutat Census Division. Valdez and environs and the Port of Whittier have been excluded as they probably will not be participating in the southcentral oil and gas development process. Neither port is strategically located in relation to the probable areas of outer continental shelf development, and there are physical limitations to their ability to accomodate these development requirements over and above those to which they are now committed. Table 1 summarizes the 1970 population of these areas.

The continental shelf, coastal waters and river systems are rich in fisheries resources (salmon, halibut and other bottom fish, herring, several varieties of crab and other shellfish) and the land area contains a wide range of minerals and fossil fuels. Gold, copper and coal have played important roles in past economic development of the land areas of the region and areas immediately outside the boundaries described above, but fisheries have been the long-run support of the Gulf coastal areas from the turn of the century until the present. (Table 2) Survival of the Cordova-McCarthy division population and economy following the decline of copper activities in the 1930's was based upon a transition of the role of the city of Cordova from transportation to fishing. The basic development of the region following

Table 1

SOUTHCENTRAL OIL AND GAS DEVELOPMENT REGION
POPULATION - 1970

	AREA	TOTAL POPULATION	MILITARY PERSONNEL	INDIAN, ALEUT, ESKIMO
I.	Anchorage	126,333	13,572	4,795
	Defense reservations	23,339	6,563	131
	Other	102,994	7,009	4,664
II.	Cook Inlet Basin	14,250	484	963
	Upper Inlet (north of 60°N. Lat.)	11,264	484	599
	Lower Inlet (south of 60°N. Lat.)	2,986	---	364
III.	Gulf of Alaska	16,248	1,668	3,986
	Alaska Peninsula, south side, and Aleutian Islands east of 171° West Long.	2,035	48	1,385
	Kodiak Island	9,409	1,491	1,744
	Seward Division	2,336	91	246
	Prince William Sound excluding Valdez and Whittier	226	---	127
	Cordova-McCarthy Division	1,857	38	284
	Yakutat-Ocean Point	385	---	200
IV.	All Other Alaska	145,342	16,389	41,075
V.	Total Alaska	302,173	32,113	50,819

Sources: Alaska Department of Labor, Alaska 1970 Census Atlas, Population by Enumeration Districts.

Alaska Review of Business and Economic Conditions, ISEGR;
Peter C. Lin, "Alaska's Population and School Enrollments," December 1971, Vol. VIII, No. 5.

Ron Evans, Peggy Raybeck, "Age and Race by Sex Characteristics of Alaska's Village Population," September 1973, Vol. X, No. 2.

G. W. Rogers, W. H. Scott, Report of the Masters of the Supreme Court of the State of Alaska, June 13, 1972, pp. 1-8.

Table 2

SOUTHCENTRAL OIL AND GAS DEVELOPMENT REGION--POPULATION TRENDS - 1880-1973

AREA	1880	1890	June 1, 1900	Dec 31, 1909	Jan 1, 1920	Oct 1, 1929	Oct 1, 1939	Apr 1, 1950	Apr 1, 1960	Apr 1, 1970	July 1, 1973
I. Anchorage	200[a	200[a	300[a	500[a	3,130	2,751	4,093	31,545	82,833	126,333	149,440
II. Cook Inlet Basin	689	990	969	980	1,218	1,224	1,613	2,141	6,097	14,250	13,808
Upper Inlet	527	784	600	580	558	546	633	630	3,396	11,264	10,808
Lower Inlet	162	206	369	400	660	678	980	1,511	2,701	2,986	3,000
III. Gulf of Alaska	5,706	6,078	4,444	6,708	7,052	6,401	7,802	12,888	14,225	16,248	15,896
So. Alaska Pen. & East Aleutian Isle	2,242	2,024	2,100	2,095	2,150	1,831	1,957	1,653	2,096	2,035	2,000
Kodiak Island	1,869	3,100[b	1,347	1,579	1,465	1,729	2,094	6,264	7,174	9,409	8,868
Seward Div.	100	100	100	634	766	1,279	1,525	2,708	2,596	2,336	2,446
Pr. Wm. Sd excl. Valdez & Whittier	300[c	300[c	300[c	300[c	300[c	300[c	300[c	300[c	300[c	226	250
Cordova-McCarthy	695	246	300	1,779	2,176	2,257	1,536	1,573	1,759	1,857	1,982
Yakutat	500	308	297	321	195	284	390	390	300	385	350
IV. All Other Alaska	26,831	24,784	57,879	56,168	43,636	48,902	59,016	82,069	123,012	145,342	151,221
V. Total Alaska	33,426	32,052	63,592	64,356	55,036	59,278	72,524	128,643	226,167	302,173	330,365

[a Estimated [b Probable over-count due to summer fisheries activities [c Proxy date to be replaced by more adequate estimate

Source: G. W. Rogers, R. F. Listowski, A Study of the Socio-Economic Impact of Changes in the Fisheries Harvesting Labor Force in Alaska, December 1972.

Alaska Department of Labor, State of Alaska Current Population Estimates by Census Division, July 1, 1973.

the 1939 census, however, has been overshadowed by defense related activities centered in the Anchorage division and to a lesser degree on Kodiak Island (the major naval and Air Force developments on the western end of the Aleutian Islands have been excluded from this region by definition). Of the 1970 census for the region, 15,724 persons were members of the armed forces (Table 1) and an estimated 20,300 were civilian employees of the Department of Defense or dependents (together accounting for 23 percent of the total population of the region). Approximately the same number of employed persons and dependents would be in trade, services and other support industries related to the basic Department of Defense population. From the 1960 census on, the impact of oil and gas developments both within the region and elsewhere in Alaska were registered in further employment and population increases in Anchorage and the upper Cook Inlet area.

Current Petroleum Developments Within the Region

Except for minor quantities produced in connection with the development of North Slope fields and Prudhoe Bay, Alaska's crude oil and natural gas production to date has been from five offshore and one onshore field in the upper Cook Inlet Basin. For 1973, production of crude oil was 72.5 million barrels valued at $246.4 million and 140 billion cubic feet of natural gas valued at $23.1 million. Oil and gas offshore production is gathered by pipeline for delivery to marine terminals or processing plants. Pipelines transport onshore natural gas to domestic users in Anchorage and Kenai and electric power generation at Beluga River. The Standard Oil Company of California and Tesoro Petroleum Corporation operate small refineries producing jet fuel, gasoline and diesel fuels for military and

civilian Alaska markets and ship low-sulfur residual fuels to Japan for industrial use. The petrochemical plant of the Collier Carbon and Chemical Corporation produces ammonia and prilled urea from the onshore gas production for export to Japan. Phillips Petroleum-Marathon Oil Company produce liquefied gas from offshore production for export to Japan. Most of the crude production of the region is exported to West Coast markets.

The major direct impacts of these developments to date have been on the city of Kenai and vicinity (1950 population 1,308; 1960 population 5,191; 1970 population 13,292) which was the closest settled place to the 1957 Swanson River discovery and which has become the supply, servicing, processing, transportation and general support base for subsequent onshore and offshore developments. The change in the Cook Inlet area from a fishing and homesteading economy, with a minor and declining defense input, to a major petroleum and natural gas producing and processing area is traced in the population and employment figures for the period 1960-1972 (Table 3). Average monthly employment in the crude oil and natural gas producing industry rose from 50 in 1960 to 1,099 in 1969 at the peak of the offshore development activities and declined to 528 in 1972 as the fields advanced to the production stage. Construction employment almost exactly matched this trend in absolute figures.

As the administrative and technical backup headquarters for the statewide industry, the Anchorage census district was a further area of direct impacts related to both the Cook Inlet and the North Slope exploration and development activities. Average monthly employment in crude oil and natural gas industries rose from 147 in 1960 to 782 in 1972. Beyond south-central Alaska, Fairbanks, and the North Slope, the further statewide impacts were registered via state revenues realized from leases, royalties, and taxes.

Table 3

COOK INLET AREA--POPULATION, EMPLOYMENT - 1960-1972
(Kenai-Cook Inlet, 1970 Census Division)

12-month averages

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
TOTAL POPULATION	6,097	6,835	7,795	8,370	7,943	8,446	9,020	9,400	11,300	13,550	14,250	14,289	13,923
TOTAL EMPLOYMENT	1,793	1,950	2,286	2,394	2,393	2,689	3,593	5,152	6,157	5,947	5,301	4,908	5,099
Participation (%)	29.4	28.5	29.3	28.6	30.1	31.8	39.8	54.8	54.5	43.9	37.2	34.3	36.6
GOVERNMENT													
Federal: Military[a]	407	403	396	396	300	154	200	250	300	453	484	385	51
Civilian	60	60	85	80	90	90	100	101	115	118	119	123	85
State and Local	220	234	312	323	290	355	495	510	526	583	632	750	861
Sub-Total	687	697	793	799	680	599	795	861	941	1,154	1,235	1,148	997
COMMODITY PRODUCING INDUSTRIES													
Agriculture[b]	106	106	106	106	106	106	106	106	106	106	106	106	106
Commercial Fishing[c]	210	200	200	250	240	158	203	188	212	232	255	190[p]	200[p]
Food Processing	180	170	198	236	226	219	213	216	225	263	347	300	335
Oil and Gas[d]	50	155	169	159	179	212	415	915	1,099	966	652	525	528
Construction	50	57	94	99	128	259	367	821	1,209	736	354	398	433
Other Manufacturing	[g	[g	[g	[g	40	45	45	44	108	219	236	224	218
Sub-Total	596	688	767	850	919	1,002	1,349	2,290	2,959	2,522	1,968	1,743	1,820
DISTRIBUTIVE INDUSTRIES													
Transportation, Comm., & Pub. Util.	80	90	104	94	107	125	141	306	267	273	293	254	280
Trade	100	113	134	152	151	219	303	357	432	528	507	466	502
Services, Finance, Real Estate[e]	230	132	188	179	186	267	391	476	569	540	498	507	680
Unclassified Misc.[f]	200	230	300	320	350	477	614	862	989	930	800	790	820
Sub-Total	510	565	726	745	795	1,088	1,449	2,001	2,257	2,271	2,098	2,017	2,282

(Footnotes on next page)

Footnotes

Principal source of employment data from Alaska Department of Labor, Alaska Workforce Estimates, By Industry and Area, published annually, with the following adjustments:

[a Military personnel stationed in area as of July 1 each year, from Alaska Department of Labor, State of Alaska, Current Population Estimates by Election Districts, published annually.

[b Includes self-employed, unpaid family workers and wage agricultural workers estimates from worksheets of Alaska Department of Labor used in estimating total employment.

[c Fisheries employment estimates from G. W. Rogers and R. Listowski, Socio-Economic Impact of Changes in Harvesting Labor Force in Alaska Fisheries, National Marine Fisheries Service, December 1972. Preliminary estimates for 1971 and 1972 subject to further revision. These estimates were substituted for estimates used in Alaska Department of Labor total employment estimates.

[d Includes only oil and gas production, development, field exploration and other field services. Does not include oil and gas processing (included under "other manufacturing"), transportation, marketing, etc. In order to avoid disclosure, "other mining" (consisting of one sand and gravel firm) is included with oil and gas.

[e Includes domestics from Alaska Department of Labor worksheets, and miscellaneous wage and salary employment.

[f Unclassified non-agricultural self-employed and unpaid family workers, balance remaining of Alaska Department of Labor estimates of non-wage and agricultural workers after deducting estimates in footnotes a, b, c, and e, above.

[g Included with miscellaneous to avoid disclosure.

[p Proxy data to be replaced when adequate estimates have been made. Figures for commercial fishing based upon trends in production, number of licenses and employment in food processing.

During the last decade of this century it is anticipated that production from the already developed fields on the Peninsula and upper Cook Inlet will be running out, but the related decline in employment and income should be more than offset by other oil and gas developments in the lower Inlet and Gulf outer continental shelf and by coal deposit development at Beluga River and elsewhere in the Cook Inlet Basin.

Further Petroleum Development Within the Region

Work started this year (1974) on construction of the trans-Alaska oil pipeline from Prudhoe Bay which should by 1977 establish the port of Valdez as the export point for future North Slope oil production. North Slope natural gas production will be exported either via pipeline through Canada or after liquification via tanker from Cordova or possibly some Cook Inlet terminal. Although not part of the region's oil and gas development process, these projects will increase the presence of the industry in Alaska and the region and increase industry related employment and population in the Anchorage division.

On December 13, 1973, the State of Alaska held an oil and gas lease sale for 98 tracts under the waters of Kachemak Bay in the lower Cook Inlet area and received bids of $24.8 million, the second largest lease sale in Alaska's history. The sale brought protests from commercial fishermen and residents of the area resulting in passage by the 1974 legislature of an act declaring Kachemak Bay to be a "critical habitat area." The United Fishermen of Alaska and others are now asking that the state refund the money received from the sales and halt any further developments. The final outcome of this first major confrontation since the trans-Alaska pipeline controversy between oil and gas interests and those concerned with protection of renewable resources and environmental amenities is uncertain, but for

purposes of this assessment of the impacts if they take place it will be assumed that development will proceed at a regulated rate.

The long-standing dispute between the federal government and the State of Alaska as to ownership of land and resources under the lower Cook Inlet waters should be settled within this year and open up this large area (with an estimated production potential at least equal to that of the developed upper Cook Inlet) for further exploration and development during this decade. These areas are included in the Department of the Interior's announced 1975 lease sales referred to above.

The Interior Department has also announced plans to auction off areas in 1975 or soon after on the Southern Aleutian Shelf and the Gulf of Alaska Shelf. In its year-long study of the environmental risk of 23 hypothetical locations of potential oil and gas accumulations in the Atlantic and Gulf of Alaska continental shelves, the CEQ ranked those in the western Gulf (west of 150 degrees W) and the eastern Gulf (east of 150 degrees W) as presenting the highest "overall degree of risk to marine, coastal and human environment."[5] In spite of these findings, however, the Gulf of Alaska areas top the Administration list of areas to be developed because the Atlantic states are challenging the federal government's claims to offshore lands. According to the Department announcement, "Because legal issues may delay OCS development in the Atlantic, the Gulf of Alaska may be the first frontier area in which OCS sales could be held."[6]

---

[5] CEQ, op. cit. pp. 1-8 - 1-11, 1-20 - 1-23.

[6] Anchorage Daily News, May 25, 1974.

Regional and Area Patterns of Future Oil and Gas Development Impacts

For purposes of assessment of economic, employment and population impacts of oil and gas development, assumptions must be made as to the probable location, extent and rate of specific development sites. In the absence of any existing studies of the probable nature of development of the lower Cook Inlet federal and/or state lands, for present purposes it will be assumed that these impacts will repeat approximately those registered in connection with the upper Inlet developments between 1965-1972. Although the development sites will not be located in the upper Inlet it is assumed that the economic impacts will be registered in the Kenai area primarily, with transportation of production to existing and expanded terminals and processing facilities.

For assessment of the Gulf of Alaska outer continental shelf impacts, this analysis will use the CEQ assumptions that development will take place at a number of locations selected from nine hypothetical areas of possible commercially exploitable resources extending from the southwestern extremity of Kodiak Island on the west to an area off Yakutat on the eastern boundary (Figure 2). Lease sales were assumed by the CEQ to commence in 1976, exploratory drilling in 1977 reaching a peak in the mid-1980's and the production platform development phase in 1980 and lasting about 17 years. Under the assumed "high" case by 1985 there will be 360 oil wells producing from 19 offshore platforms 0.75 million bbl/day of crude oil and 0.9 billion cu.ft./day of natural gas, and by 2000 there will be 960 wells on 60 platforms producing 2 million bbl/day of oil and 7.2 million cu.ft./day of gas. The "low" case assumes 120 wells on 7 platforms by 1985 producing 0.25 million bbl/day oil and 0.3 billion cu.ft./day of gas and 480 wells on 25

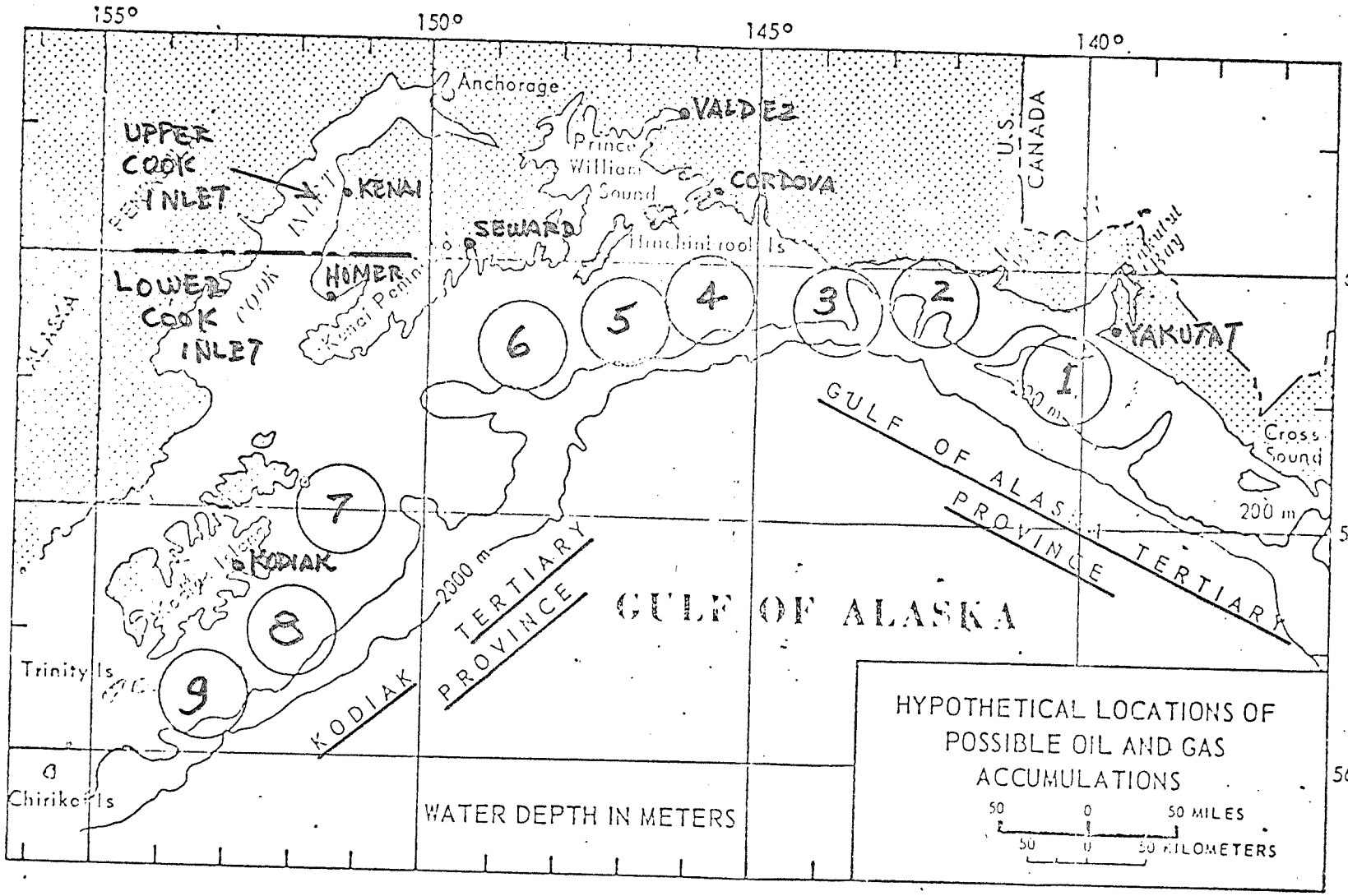
155°
150°
145°
140°
60°
58°
56°
Anchorage
VALDEZ
Prince William Sound
CORDOVA
U.S.
CANADA
UPPER COOK INLET
KENAI
SEWARD
HOMER
LOWER COOK INLET
Kenai Penin.
Hinchinbrook Is.
Yakutat Bay
YAKUTAT
ALASKA
1
2
3
4
5
6
7
8
9
200 m
GULF OF ALASKA PROVINCE TERTIARY
Cross Sound
KODIAK
2000 m
TERTIARY PROVINCE
GULF OF ALASKA
Trinity Is.
Chiriko Is
KODIAK
WATER DEPTH IN METERS
HYPOTHETICAL LOCATIONS OF POSSIBLE OIL AND GAS ACCUMULATIONS
50 0 50 MILES
50 0 50 KILOMETERS

FIGURE 2

platforms producing one billion bbl/day of oil and 2.4 billion cu.ft./day gas by 2000.[7]

The measurement of the impacts under these two cases of assumed development and production must start with identification of the appropriate regional and local areas within which they will be registered. Platforms and related facilities will most likely be constructed at large shipyards on the West Coast or Japan and towed or barged to sites within the region for erection and equipping. As in present Alaska offshore developments, oil and gas will probably be transported by pipe. During this initial construction phase, existing ports along the Gulf of Alaska (Kodiak, Seward, Cordova, and Yakutat) will be pressed into service as land bases for the storing of materials, supplies, equipment and the temporary housing of construction crews. Offshore construction impacts within Alaska, therefore, will be felt within the Gulf of Alaska area and distributed among these ports.

Onshore construction impacts will depend upon available port and plant sites and the distribution and processing patterns which evolve as production is realized. Of the present Gulf of Alaska ports, Valdez can be ruled out as a possible site for shore-related developments, not only because it is the most remote from possible offshore developments, but more importantly because of the hazardous channels and limited available land (most is subject to serious slippage and slumping during earthquakes), heavy tanker traffic serving the trans-Alaska pipeline and the necessary storage, service and community developments will not allow any further development.[8] Kodiak

---

[7]CEQ, op. cit. pp. 2-13 - 2-17, Chapter 7. Unless specifically stated otherwise, all assumptions in this section are from CEQ sources.

[8]The CEQ Study assumed that Valdez would be the most likely port to handle Gulf OCS development with Cordova as a second choice. The present analysis departs from the CEQ analysis both in the selection of location for onshore impacts and methodology used in calculating impacts. Refer to NAS op. cit. pp. 32-37.

and Yakutat, while possibly serving temporarily during offshore construction, do not have adequate harbors or sufficient land areas and, furthermore, are important fishing and fish processing centers which would present serious economic conflicts. Surplus naval facilities at Kodiak, however, might be converted to use for some OCS developments.

Seward is the most likely port to serve the Gulf OCS developments. It is conveniently location in relation to six of the nine locations (Figure 2) and has a good natural deep water harbor which served as the main port of entry to southcentral and interior Alaska until the 1964 earthquake. The docks and other port facilities were destroyed by the tsunami and fire following the quake, but unlike Valdez the town did survive. Although the port was completely rebuilt by the federal government over the next year and a half, it permanently lost out in the competition with the port of Anchorage as the principal Alaska port. The pre- and post-quake freight patterns indicate the degree to which the Seward port is under-utilized. Freight shipped into the Alaska railbelt in 1961 passed through three ports; Seward accounted for 62%, Whittier 12% and Anchorage 26%. In 1966, after the port of Seward was fully rebuilt and operative, the freight distribution was Seward 4%, Whittier 10% and Anchorage 86%. Workforce, employment and population fell and in an effort to save the town, the state of Alaska has located a number of its programs at Seward (e.g., the major vocational rehabilitation program which would better service its clients if at a more northern location, the transfer of the University of Alaska's marine and fisheries research from southeast Alaska to Seward, etc.) This site, therefore, presents an already developed but under-utilized port and supporting community facilities, suitable for expansion, an all-year paved highway

connecting to Anchorage and the oil and gas areas of the Kenai and Cook Inlet, the railroad connecting with Anchorage and Fairbanks, and a receptive state and local political climate.

Cordova might serve a portion of the offshore developments (locations 1 through 4 in Figure 2, for example) but it presents serious physical drawbacks as an adequate harbor for the type of craft involved and land available for shore facilities is limited. These conditions would be aggravated if the decision is made to export North Slope natural gas via Cordova. It also can be assumed that as the present center of oil and gas production, transportation and processing, Kenai will also share in the Gulf offshore developments. By the year 1985 the entire Cook Inlet oil and gas resources should be fully developed and the onshore and offshore production will be collected from the fields and transported to existing marine terminals and gas liquification and petrochemical plants in the Kenai and upper Inlet area. With offshore developments pushing out beyond Cook Inlet and with an existing (by 1985) gathering, transportation and processing system, it might be assumed that the production from locations 7-9 on Figure 2 will be transported by pipeline into this system at the southern extremity of the Cook Inlet Basin developments. Production from locations 4-6 could be transported by marine pipeline into Seward for export via tankers. If justified by the economics of processing and local markets, overland oil and gas lines might be laid along the existing highway route between Seward and Kenai, unless Cordova is developed as a North Slope gas port. The remaining three locations are quite remote from this existing developed area and suitable land areas do not exist on the adjacent

shore for development of transportation, storage and processing facilities. The cost of transporting production from these locations is here assumed to rule out possible development except in the last stages of the "high" case. For purposes of this analysis, it will be assumed that the impact of onshore construction and natural gas processing will be shared between Seward in the Gulf of Alaska area and Kenai in the Cook Inlet area.

The regional economic impacts of platform operations will depend upon the work shift patterns adopted. It can be assumed that this will follow the plans for production workers on the North Slope (two weeks on the field, one week off with air transportation to Anchorage). The regular air service between Anchorage and main communities in the Gulf adjacent to the probable locations of production would permit shuttling operating crews between platforms and shore via helicopter and continuing travel to and from Anchorage by commercial daily jet flights (Anchorage-Cordova 40 minutes elapsed travel time, Anchorage-Yakutat 1 hour 50 minutes, Anchorage - Kodiak ___ minutes) and by rail or highway between Seward, Anchorage and Kenai. Aside from a minimal labor force at the Gulf transfer points engaged in the shuttle service and those workers who would prefer to live in one of the Gulf communities, therefore, the main employment, income and population impacts of platform operations will be felt at Anchorage.

Employment and Population Impacts of OCS Developments

Population and employment by major industrial classification for year 1970 and the seasonal peak, July 1970, for the above regions and areas are summarized in Table 4. The inclusion of the summer peak employment is to

Table 4

SOUTHCENTRAL OIL AND GAS DEVELOPMENT REGION--POPULATION AND EMPLOYMENT
CALENDAR YEAR AND JULY 1970

	YEAR 1970 (12-month averages)				JULY 1970			
	Cook Inlet	Gulf of Alaska	Anchorage	All other Alaska	Cook Inlet	Gulf of Alaska	Anchorage	All other Alaska
TOTAL POPULATION	14,250	16,250	126,500	145,350				
TOTAL EMPLOYMENT	5,300	8,000	60,690	65,050	7,050	11,980	63,400	77,950
Participation rate (%)	37.2	49.2	47.9	44.8				
GOVERNMENT								
Federal: Military	490	1,670	13,570	16,390	490	1,670	13,570	16,390
Civilian	120	480	9,510	6,990	120	410	9,950	7,320
State and Local	630	780	6,040	11,060	630	730	6,120	11,640
Sub-Total	1,240	2,930	29,120	34,440	1,240	2,810	29,640	35,350
COMMODITY PRODUCING INDUSTRIES								
Agriculture	110	50	50	590	150	60	70	720
Commercial fishing	260	1,280	[a	1,570	1,460	3,560	[a	6,780
Food processing	350	1,410	200	1,740	710	2,880	230	5,380
Logging, lumber, pulp	---	[b	---	2,800	---	[b	---	3,000
Oil and gas	650	100	910	1,050	700	110	970	740
Other mining	[c	[c	50	230	[c	[c	70	410
Petrochemicals	200	---	---	---	200	---	---	---
Construction	350	280	3,510	2,750	360	280	4,470	3,700
Other manufacturing	40	40	820	210	30	50	910	130
Sub-Total	1,960	3,160	5,540	10,940	3,610	6,940	6,720	20,860
DISTRIBUTIVE INDUSTRIES								
Transportation, Comm., and Pub. Util.	290	300	3,910	4,600	260	340	4,030	5,180
Trade	510	550	8,620	5,630	550	610	8,860	5,980
Services, Finance, Real Estate	500	670	9,950	6,680	510	740	10,180	7,380
Unclassified Misc.	800	390	3,550	2,760	890	540	3,970	3,200
Sub-Total	2,100	1,910	26,030	19,670	2,210	2,230	27,040	21,740

[a Commercial fishermen included in area of fish harvesting.

[b Combined with "other manufacturing" to avoid disclosure

[c Combined with "oil and gas" to avoid disclosure

reveal the importance of fishing and fish processing in the Gulf of Alaska. Although these two categories of employment accounted for 33.6% of total employment on the basis of twelve-month averages, they accounted for 54.6% of total July employment. For the year they accounted for only 11.4% of total Cook Inlet employment, because of the existance of oil and gas producing and petrochemical employment in that region, and in July 26.6%. Since 1970 the population and employment statistics for Cook Inlet and Gulf of Alaska have registered very little change although there has been steady rises in both the remainder of the southcentral region and the State.

From these data it is possible to construct a simple economic (employment) base model for purposes of calculating the probable employment and population impacts of projected high and low developments. This is done by dividing employment into two sources--that which originates within the region or area (local or endogenous employment) and that which originates outside the region or area (non-local or exogenous employment). Expressing the endogenous as a ratio of exogenous employment results in a regional or area "base multiplier" which when applied to estimated primary employment created by oil and gas developments will calculate probable induced or local employment. Although a more precise disaggregation would be desirable, for present rough estimating purposes it is assumed that the exogenous employment is represented by Federal military excluding those housed in barracks and ships, civilian federal government employment, and all commodity producing employment. Endogenous employment includes State and local government employment and all distributive industries employment. A portion of Federal employment would be endogenous rather than exogenous, and a portion of transportation and communications (under distributive industries) exogenous, but it is here assumed that

these adjustments would balance each other out. Table 5 presents these calculations for the three main areas within the southcentral oil and gas development region.

Assuming that the lower Cook Inlet developments will commence in 1976 and repeat the upper Cook Inlet experience between 1966-1971, the peak activity will pass by 1978. The increased employment in 1980 over 1975 will be 300 workers in oil and gas and 100 in construction. By 2000 it is assumed that this increase will be cancelled out by comparable declines in upper Inlet related employment.

Primary employment from OCS development under the high and low case for 1985 and 2000 have been estimated in the CEQ report for construction, natural gas processing, and platform operation employment (90 workers per platform). Allocation of these estimates among the three areas is made on the basis of the discussion in the previous section. It is assumed that two-thirds of the platform operation employment would elect to reside in the Anchorage area with its broader range of urban amenities and the remainder would choose the rural amenities of living in smaller communities within the Gulf area.

In addition to these positive employment and population impacts, there will be significant negative impacts resulting from the effects of lower Inlet and OCS development upon fisheries resources. It is possible that onshore developments could be constructed in a way which would minimize damage to fish nursery areas, but offshore operations and transportation would result unavoidably in varying degrees of fisheries resource destruction or contamination through chronic discharges and accidents. The errection of platforms, tanker mooring facilities, submarine pipeline systems, etc. would eliminate areas of

FOR DISCUSSION ONLY - NOT TO BE QUOTED

Table 5

ECONOMIC (EMPLOYMENT) BASE MODELS OF IMPACTED AREAS - YEAR 1970

	Cook Inlet	Gulf of Alaska	Anchorage	All Other Alaska
		(12-month averages)		
NON-LOCAL (EXOGENOUS) SECTOR				
Federal government [a	470	1,370	19,200	11,531
Commodity producing industries	1,960	3,160	5,540	10,940
TOTAL	2,430	4,530	24,740	22,470
LOCAL (ENDOGENOUS) SECTOR				
State and local government	630	780	6,040	11,060
Distributive industries	2,100	1,910	26,030	19,670
TOTAL	2,730	2,690	32,070	30,730
AREA BASE MULTIPLIERS	1.123	0.594	1.296	1.368
[a Excludes military personnel in barracks, on board ships, etc.	142	776	3,892	11,849

Rogers and Scott, op. cit Table 7, Members of Armed Forces by Type of Living Quarters.

the sea and sea bed from harvesting operations and otherwise restrict and interfer with the free and efficient movement of domestic and foreign fishing fleets. Not reflected in employment or income statistics is the displacement of local fishermen by oil workers who operate as "sports-commercial" fishermen in their off-time.

Because of the locations of possible OCS developments there will be significant dislocations in commercial fisheries and fish processing employment (Figure 3) and in subsistence fishing all of which are basic to the way of life of the majority of residents of the Gulf of Alaska. From past experience with forest industry developments in southeast Alaska, it cannot be assumed that these Alaskans will shift their employment and change their way of living in accordance with the new industrial developments. They will continue the attempt to maintain their traditional ways in the face of increased difficulties. (The extreme conservatism of fishermen and their communities is universal). Although fisheries related employment will eventually be reduced (initially decrease in fish catch simply means the same number of fishermen getting less fish), population adjustment will take a longer time because of a combination of increasing dependence on subsistence activities and welfare during bad times and the effects of the operation of the village corporation programs under the Alaska Native Claims Settlement Act.

The actual adverse impacts upon the fisheries resource will be dependent upon a number of factors not presently known (i.e. actual locations of the platforms and transport facilities, operating practices, adequacy of protection measures, etc.), but for present purposes it will be assumed that under the "high" OCS case fishing and fish processing employment will decline 25% from

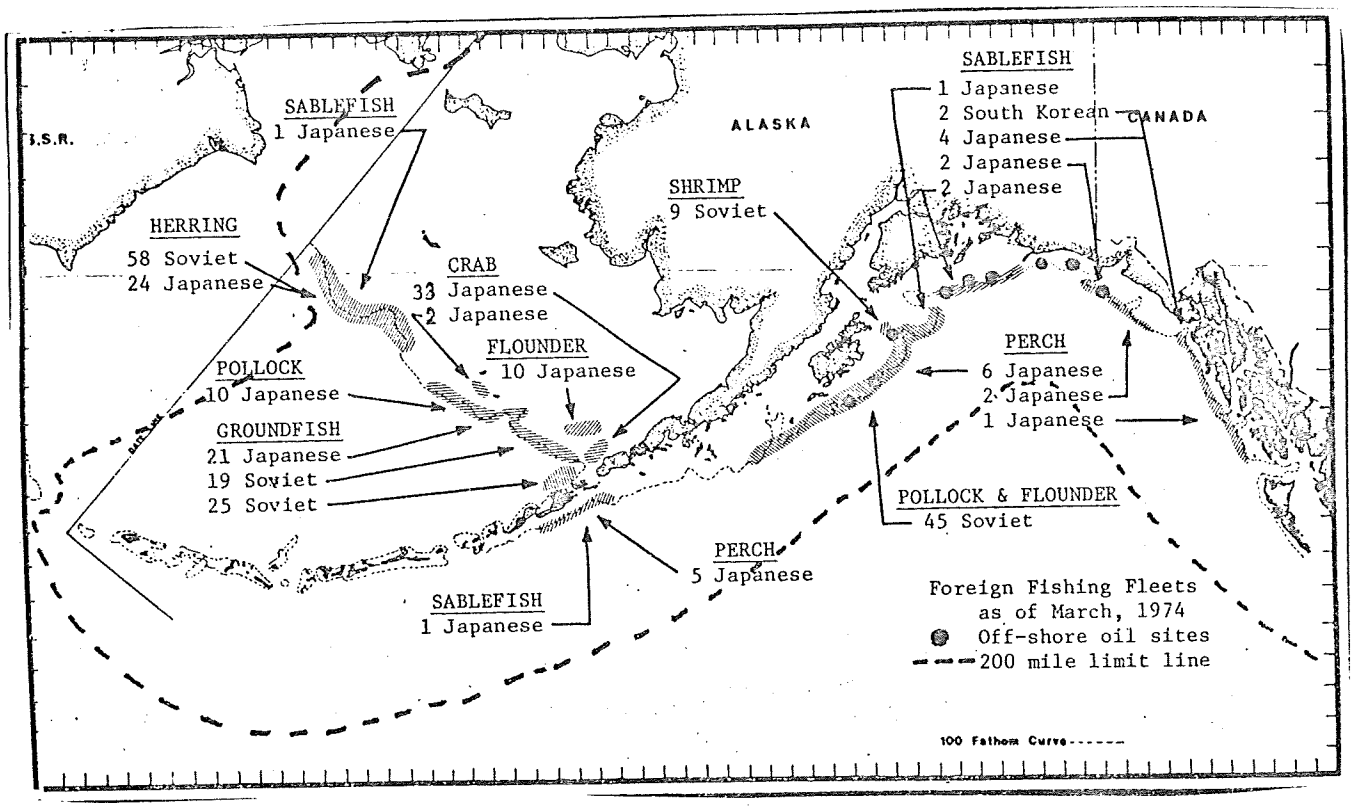

FIGURE 3 -- OUTER CONTINENTAL SHELF FISHERIES AREAS AND GULF OF ALASKA OIL AND GAS POTENTIAL DEVELOPMENTS

1970 levels by 1985 and 50% by 2000 and that under the "low" case the declines will be 10% and 20%. It is further assumed that the fifteen-year periods (1970-85, 1985-2000) will have been sufficient for the slower and more painful population changes to have taken place. These assumptions provide only proxy or rough token estimates of actual impacts, but even if they were accurate they would not begin to measure the full extent and impact of the social and economic costs to the local area and the State.

Table 6 summarizes the resulting net employment and population impacts. Induced employment was calculated by applying the appropriate "area base multipliers" from Table 5 to the net primary employment increases and population increased by dividing total employment increase by the appropriate participation rates from Table 4. Not only will the final net increases in Alaska employment and population be modest, but it appears that population groups effected would be different and that there would be a major upheaval of population with attended large out and in migrations.

To more fully evaluate these employment and population impacts, they must be related to projections of what the area levels would have been in 1985 and 2000 without these developments. For each of the study areas Table 7 summarizes total employment and population for 1961, 1970, 73 and projections for 1980, 1985 and 2000 assuming no further regional oil and gas development. The 1980 estimates are based upon annually revised projections by the Alaska Department of Labor published as part of their "Alaska Manpower Outlook '79's" program and more detailed projections by Mathematical Sciences Northwest, Inc. prepared for Alyeska pipeline consortium. 1980 military and fisheries employment (not included in the published sources) are assumed at the 1970-73 levels.

FOR DISCUSSION ONLY - NOT TO BE QUOTED

Table 6

PRIMARY AND INDUCED EMPLOYMENT AND POPULATION--FROM SOUTHCENTRAL OIL AND GAS DEVELOPMENT, 1985 and 2000

	Lower Cook Inlet	GULF OF ALASKA				(Loss of fisheries and processing employment)	Net Induced Employment[c	Total Employment	Total Population[
		Construction [a		Platform	Nat. Gas				
		Offshore	Onshore	Operation [b	Processing [a				
				(12-month averages)					
I. High Case - 1985									
Cook Inlet	400	--	195	--	40	(100)	600	1,135	3,050
Gulf of Alaska	--	920	195	570	50	(950)	470	1,255	2,550
Anchorage	--	--	--	1,140	--	--	1,480	2,620	5,470
TOTAL	400	920	390	1,710	90	(1,050)	2,550	5,010	11,070
II. High Case - 2000									
Cook Inlet	--	--	60	--	280	(100)	270	510	1,370
Gulf of Alaska	--	330	60	1,800	130	(1,900)	250	670	1,360
Anchorage	--	--	--	3,600	--	--	4,665	8,265	17,255
TOTAL	--	330	120	5,400	410	(2,000)	5,185	9,445	19,985
III. Low Case - 1985									
Cook Inlet	400	--	30	--	--	(100)	370	700	1,880
Gulf of Alaska	--	340	70	210	30	(250)	240	640	1,300
Anchorage	--	--	--	420	--	--	540	960	2,000
TOTAL	400	340	100	630	30	(350)	1,150	2,300	5,180
IV. Low Case - 2000									
Cook Inlet	--	--	10	--	--	(100)	(100)	(190)	(510)
Gulf of Alaska	--	100	30	750	140	(500)	310	830	1,690
Anchorage	--	--	--	1,500	--	--	1,940	3,440	7,180
TOTAL	--	100	40	2,250	140	(600)	2,150	4,270	8,360

[a Estimates for CEQ (1974) by Resources Planning Associates, Inc. Vol. II of V., p. 7-17
[b Assumes 90 operating and support employees per producing platform (RPA, Vol. III, p. 7-7
[c Primary employment x area base multiplier (Table 5)
[d Calculated on bases of area participation rate (Table 4)

FOR DISCUSSION ONLY - NOT TO BE QUOTED

Table 7

PROJECTED TOTAL EMPLOYMENT AND POPULATION - WITH AND WITHOUT FURTHER SOUTHCENTRAL OIL AND GAS DEVELOPMENT, 1985 and 2000

	EMPLOYMENT (12-MONTH AVERAGE)			POPULATION (JULY 1)		
	Cook Inlet	Gulf of Alaska	Anchorage	Cook Inlet	Gulf of Alaska	Anchorage
			WITHOUT FURTHER OIL AND GAS DEVELOPMENT			
1961	1,950	7,900	40,900	6,835	15,000	89,300
1970	5,300	8,000	60,700	14,250	16,250	126,500
1972	5,100	7,700	67,600	13,900	15,600	144,200
1980	5,500	7,900	95,000	14,800	16,000	198,300
1985	5,700	8,000	116,200	15,300	16,300	242,600
2000	6,000	8,400	142,500	16,100	17,000	297,500
			WITH FURTHER OIL AND GAS DEVELOPMENT - HIGH CASE			
1985	6,835	9,255	118,820	18,350	18,850	248,070
2000	6,510	9,070	150,765	17,470	18,360	314,755
			WITH FURTHER OIL AND GAS DEVELOPMENT - LOW CASE			
1985	6,400	8,640	117,160	17,180	17,600	244,600
2000	5,810	9,230	145,940	15,590	18,690	304,680

Fisheries employment from existing territorial waters probably will decline as a result of limited entry programs in Alaska, but it is assumed that extension of territorial water will provide offsetting increases.

The 1985 and 2000 projections for Cook Inlet assume the full development of the lower Cook Inlet offshore oil and gas resources by 1980 with resulting declines in fisheries related employment, and development of coal resources by 2000 offsetting declines in oil and gas employment. The peak employment periods of development booms are assumed to fall between the 1980, 1985 and 2000 years and the levels projected are on the basis of production phases of development of oil and gas. With the exception of the boom-bust copper developments in the 1920's and 1930's and the defense related activities on Kodiak, the Gulf of Alaska has been a no-growth area for most of this century.[9] The future projections assume that the only disturbance of this state would be some minor expansion of fisheries through diversification and extension of the limits of territorial waters. The Anchorage division will continue to reflect state-wide development trends in its growth pattern as it has for the past three decades. Projections are made at the approximate rate of employment growth periods 1961-73, 1961-80, 1970-80.

Adding the net employment impacts of the lower Cook Inlet and the high and low OCS development cases indicates that for the Cook Inlet basin the net employment changes would range between 12-20 percent increase in 1985 and 8% increase to 3%decrease in 2000 (due to decline in upper Cook Inlet oil and gas activities and adverse effects upon fisheries), the Gulf of Alaska between 8-16 percent net increase in 1985 and 8-10 percent net increase in 2000 (the low OCS case resulting in the higher net increase because of the lesser

---

[9] For example, the Seward census division declined from 3,038 in 1961 to 2,245 in 1970, Kodiak from 9,406 in 1970 to 8,703 in 1972, and Cordova-McCarthy rose from 1,152 in 1909 to 1,167 in 1970.

adverse impact in fisheries), and Anchorage between 2-8 percent in 1985 and 2-6 percent in 2000. (Table 7).

These relative net employment changes, however, seriously understate the full extent of the economic and social impacts. Table 6 gives an indication of the labor dislocation which would be involved in expansion of oil and gas related activities and a decline in fisheries related activities. This will not be accomplished by a simple conversion of fishermen and processing workers into oil well operatives and plant workers, but by the movement of one group of people out of and a different group into the area workforces. The attendant economic and social costs will be born by the displaced workers and their families and the local and state governments .

Comparative Economic Value of Alternative Cook Inlet and OCS Resource Use

The discussion of employment and population impacts of oil and gas developments above touched on the conflicts with continuing or expanding harvest of fisheries resources. As a start toward evaluating the broad economic dimensions of this conflict the potential yields of these two groups of natural resources must be given values which can be compared. The Gulf of Alaska has an estimated potential annual sustained yield harvest of commercially valuable food products of over one million metric tons (140 thousand metric tons of salmon; 450 thousand metric tons of herring; 124 thousand metric tons of halibut, sole and other flat fish; 141 thousand metric tons of other demersal fish; 165 thousand metric tons of crustaceans and molluscans).[10]

---

[10] These sustained yield harvest estimates are based upon stock estimates and harvest data from the 1960's in United States and FAO sources. The adequacy of basic data varies and the above are informed professional guesses for the most part. The amounts quoted above are from Tussing, Morehouse, and Babb, Alaska Fisheries Policy, Institute of Social, Economic and Government Research, University of Alaska, 1972; pp. 75-116.

Substantial proportions of these potentials are being harvested by the fishing fleets of the states of Alaska and Washington, the province of British Columbia, Japan, the U.S.S.R. and the Republic of South Korea. Salmon, halibut and most of the shellfish are presently harvested at (or in some periods above) the estimated sustained yields, while other demersal fish are only beginning to be harvested.

The fact that portions of this fisheries resource harvest are international does not warrant adjustment to a regional harvest basis for purposes of present comparisons. The future inter-national mix of the total harvest is uncertain and subject to wide fluctuation, and the activity is international when viewed in terms of final consumption. A significant amount of the Japanese catch (e.g. crab and pollock) is sold immediately in United States markets,[11] and there is a growing Japanese investment in Alaska based processing plants exporting products based upon fish caught by Alaskans. If the U.S. territorial seas are extended to 200 miles of course, these fisheries would be totally within Alaska waters. Similarly the present and future Alaska oil and gas production is inter-national. The natural gas presently being produced in the Cook Inlet Basin fields and not consumed locally is being exported in Japan in the form of liquified gas, ammonia and prilled urea and residual fuels from regional refineries are going to Japan markets. It is anticipated that some portion of the North Slope production will likewise be shipped to Japanese ports. If OCS platforms are manufactured in Japan, they will be paid for in Gulf oil and gas.

[11] The executive-secretary of the UFA testified before Senator Steven's committee that such sales amount to $1 billion annually. The Alaska Fisherman, May 7, 1974.

In dealing with gross values of alternative uses, therefore, the total production which takes place within the region of this analysis is considered regardless of market location and nationality of those engaged in production. Table 8 compares the gross economic value of the potential (not the actual) annual sustained yield production of Gulf of Alaska fisheries and lower Cook Inlet OCS potential oil and gas production (the high and low cases for 1985 and 2000 from CEQ) at various average values. Further calculations are required to estimate the state revenues from these activities.

Although this very crude attempt at comparative evaluation indicates that oil and gas resources appear to have a higher gross value than fisheries, it does suggest that further consideration of the economic and social value of Gulf of Alaska outer continental shelf oil and gas production cannot ignore adverse impacts on fisheries as being insignificant. Economic value (which is not calculated above) is the value product contribution to the economy less the value of all resources used in the process and the net economic loss from conflicts with other economic activities (commercial fishing, tourism, etc.) Social value deducts further from this net figure the costs attributable to reduction of other economic activities, degradation of the environment and other public costs. The costs of reduction of other economic activities, furthermore, is not a simple calculation of loss of economic value in that activiity. In the case of replacement of fishing by oil and gas production, we are considering the reduction of a labor-intensive by a capital-intensive activiity and consideration must be given to the social dislocations and income redistribution which results. Social values should obviously be the basis of final decisions concerned with broad public policy, but data available for such a calculus at present are fragmentary and even cruder and more inadequate than that used in this first approach.

FOR DISCUSSION ONLY - NOT TO BE QUOTED

Table 8

COMPARATIVE PRODUCTION AND ANNUAL VALUE OF
REGIONAL FISHERIES AND ADDITIONAL OIL AND GAS RESOURCES

Resources	Potential Annual Production	Value of Annual Production at: 1973 prices	Case A prices	Case B prices
Fish Catch (thousand metric tons, millions $) [a				
Salmon	140	$162.8		
Herring	450	59.8		
Halibut	18	32.4		
Other	247	91.2		
Shellfish	165	110.3		
TOTAL	1,020	$456.5	$ 547.8	$ 639.1
Annual Oil and Gas Production (millions bbl's., billions cu. ft., millions $)				
1985				
Lower Cook Inlet				
Crude	72.5	$ 246.4	$ 380.6	$ 514.0
Nat. Gas	140.0	23.1	27.7	32.3
Gulf OCS - High Case				
Crude	273.8	930.8	1,437.5	1,941.2
Nat. Gas	328.5	54.2	65.0	75.9
Gulf OCS - Low Case				
Crude	91.3	310.3	479.3	647.3
Nat. Gas	109.5	18.1	21.7	25.3
Total Value				
High		$1,254.5	$1,910.8	$2,563.4
Low		597.8	909.3	1,218.9
2000				
Gulf OCS - High Case				
Crude	730.0	$2,482.0	$3,832.5	$5,175.7
Nat. Gas	2,628.0	433.6	520.3	607.0
Total Value		$2,915.6	$4,352.8	$5,782.7
Gulf OCS - Low Case				
Crude	365.0	$1,241.0	$1,916.3	$2,587.9
Nat. Gas	876.0	144.5	173.4	202.3
Total Value		$1,385.5	$2,089.7	$2,790.2

1973 Prices: Crude oil $3.40 per bbl., natural gas $1.65 per thousand cu. ft., salmon $0.5275 per pound, halibut $0.8176 per pound, herring $0.0603 per pound, other fish $0.1674 per pound, shellfish $0.3033 per pound.

Case A Prices: Crude oil $5.25 per bbl., all other prices 20% above 1973.

Case B Prices: Crude oil $7.09 per bbl., all other prices 40% above 1973.

[a Value at price paid fishermen for raw fish.

The life of the oil and gas production is limited to a specific time span. For the Gulf outer continental shelf, the CEQ studies assumed that after reaching peak production at some point between 1994 and 1998, annual production "will level off for a period and then decline slowly as the deposits are exhausted." On the average, the maximum life span of each field is assumed to be about twenty years.[12] The fisheries resources, on the other hand, are renewable resources and in theory, at least, could provide perpetual yields. The total long-run economic value of the two sets of resources, therefore, could be the reverse of that suggested by a comparison of annual production values during the peak of oil and gas production.

Finally, the world-wide food crisis will be increasingly brought home to the people of the United States and will eventually supplement the energy crisis as our dominant national concern. This will result in some basic changes in the comparative economic values of fossil fuels and food. From the national point of view (as contrasted with the industry's point of view), the optional timing of the exploitation of a reserve may be one of holding it as a stockpile for use in an emergency or as a hedge against future demand for feedstocks.[13] In this context, the southcentral region's fisheries resources will assume a greater relative economic value than at present.

---

12 RPA, "Potential Onshore Effects of Oil and Gas Production on the Atlantic and Gulf of Alaska Outer Continental Shelf," Vol. III, pp. 7-7 - 7-11.

13 Attention is only beginning to be given to the fact that the principal raw material of U.S. agricultural production is fossil fuel, either in the form of energy or chemicals. See Science, Nov. 2, 1973, pp. 443-449.

Impact Upon the Future of Small Communities

The small communities of the lower Cook Inlet and Gulf of Alaska do not present an outstanding record of growth, but they have exhibited a remarkable survival power. During the 1964 earthquake and following tsunami, for example, a number of the Gulf villages were seriously damaged or destroyed. Despite this physical disaster, for the most part they were able to recover and resume something resembling their past existence because the social and economic structure of the villages did survive.

Following the State's oil lease sales in Kachemak Bay it became obvious that continued commercial fishing and seismic and other exploratory activities could not co-exist. Other residents of the area looked forward to a future when the construction and operation of offshore oil platforms and related onshore facilities would degrade the environmental amenities which brought them to this place. In varying degrees, oil and gas exploration, development and production at other locations in the Gulf of Alaska will similarly undermine the basic support of other small communities. Like a natural ecosystem, a small community may be able to overcome and repair the losses of a catastrophic event, such as the 1964 earthquake, but like the ecosystem it cannot survive the loss of or permanent change in the dynamics of the system that supports its economic and social productivity.

It is not possible to put or devise an economic indicator adequate to evaluate the loss or change of existing communities. In some cases and at certain levels, the result may be a clear net benefit. In its impact assessment, the CEQ report was concerned not only with guidelines for managing OCS developments in order to avoid permanent degradation of the environment,

but also to avoid "unnecessary disruption of traditional local values and life styles." The economic, employment and population assessment of change attendant upon oil and gas development provide a first step in such an assessment, but the full assessment requires an expression of what the members of these communities prefer.

Environmental Impacts

The CEQ assessment of environmental impacts was largely confined to a ranking of potential development sites on the basis of the predicted probability and simulated trajectories of oil spills, the distance of the resource sites from shore, the incidence of unusual natural phenomena in each area, and the translation of onshore development and population increases into estimates of land requirements and air and water pollution loadings. Lacking from this assessment was any consideration of the impact of oil on marine environments and other ecosystems, the permanent effects of loss of water bottoms to structures, dredging operations, and spoil placements, the chronic pollution by operational discharges (as differentiated from the accidental spills considered), and the impacts upon the dynamic support of ecosystems referred to in the introduction above. In the face of what was left out, the chairman of the NAS review committee in a newspaper interview likened the CEQ assessment to an attempt to "rank National League teams on the basis of the performance of their short stops."

In spite of the limitations the NAS committee found in the CEQ report, they fully agreed with the recommendation that the Gulf of Alaska OCS not be developed and summarized the CEQ reasons:

"First, data on weather conditions, sea states, ocean currents, ecological system dynamics, fisheries resources, and the sensitivity of indigenous species to oil pollution are not well known. Second, operating conditions due to weather and sea states will be difficult, because storms are frequent, and their forecasts are less reliable. Third, the economic and social impacts of development on Alaskan coastal communities will be extreme. Finally, the frequency and severity of earthquakes and tsunamis in the area pose costly problems in engineering."[14]

---

[14] NAS (1974) pp. 24-25.