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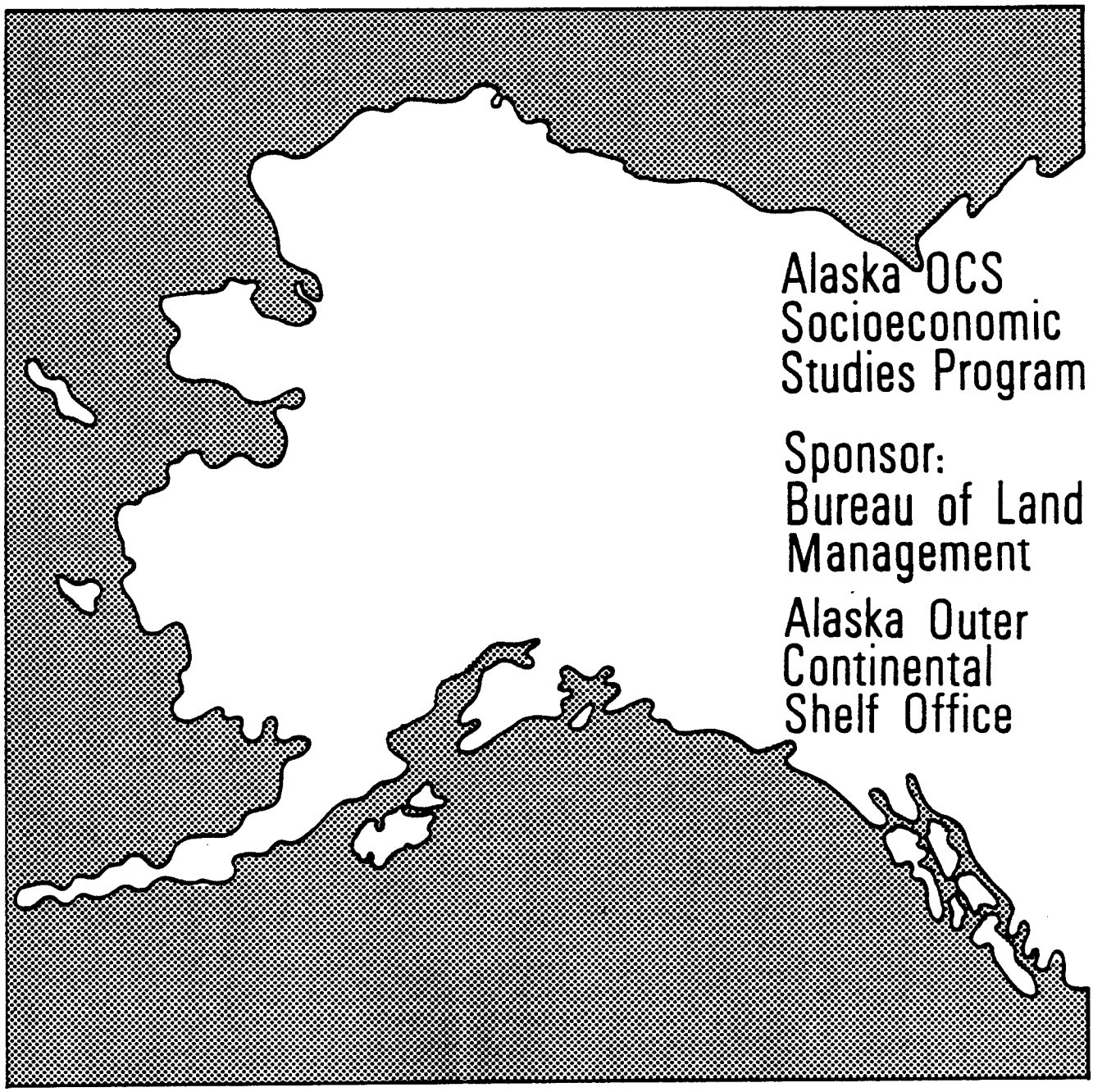

Alaska OCS Socioeconomic Studies Program

Sponsor:
Bureau of Land Management

Alaska Outer Continental Shelf Office

BEAUFORT SEA STATEWIDE AND REGIONAL DEMOGRAPHIC AND ECONOMIC SYSTEMS IMPACTS

The United States Department of the Interior was designated by the Outer Continental Shelf (OCS) Lands Act of 1953 to carry out the majority of the Act's provisions for administering the mineral leasing and development of offshore areas of the United States under federal jurisdiction. Within the Department, the Bureau of Land Management (BLM) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of offshore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socioeconomic and environmental information to improve OCS decision making at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, the BLM has initiated several investigative programs, one of which is the Alaska OCS Socioeconomic Studies Program (SESP).

The Alaska OCS Socioeconomic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS Petroleum Development upon the physical, social, and economic environments within the state. The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, the nature, and the timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, technological, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current endogenous and exogenous sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes also are included.

The third research component focuses on an evaluation of the changes that could occur due to the potential oil and gas development. Impact evaluation concentrates on an analysis of the impacts at the statewide, regional, and local level.

In general, program products are sequentially arranged in accordance with BLM's proposed OCS lease sale schedule, so that information is timely to decisionmaking. Reports are available through the National Technical Information Service, and the BLM has a limited number of copies available through the Alaska OCS Office. Inquiries for information should be directed to: Program Coordinator (COAR), Socioeconomic Studies Program, Alaska OCS Office, P. O. Box 1159, Anchorage, Alaska 99510.

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STATEWIDE AND REGIONAL ECONOMIC AND DEMOGRAPHIC SYSTEMS, BEAUFORT SEA (71) IMPACT ANALYSIS

PREPARED FOR

BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

STATEWIDE AND REGIONAL ECONOMIC AND DEMOGRAPHIC SYSTEMS BEAUFORT SEA (71) IMPACT ANALYSIS

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ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM STATE AND REGIONAL ECONOMIC AND DEMOGRAPHIC SYSTEMS, BEAUFORT SEA (71) IMPACT ANALYSIS

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I. INTRODUCTION

This study is concerned primarily with measuring the economic effects of the proposed Outer Continental Shelf (OCS) petroleum development in the Beaufort Sea (sale 71). This study includes a statewide and regional historic baseline analysis and base case projections against which the direct and indirect economic effects of Beaufort Sea OCS petroleum development are measured. The analysis and projections are carried out on a statewide level for selected regions within the state economy. The regions include Anchorage, Southcentral, Fairbanks, and North Slope regions of the Man-in-the-Arctic Program (MAP) models.

Part II of the study contains the historical baseline analysis for each of the economic areas in question and generally focuses on specific economic and demographic concerns relevant to an understanding of the historic growth of the economies. The baseline analysis also assists in laying the foundation for assumptions regarding future growth of the areas.

Part III contains three important elements. First, the underlying projection methodology is explained and reviewed in terms of the accuracy and limitations of the projection methodology and the projections themselves. Second, the assumptions necessary to "drive" the models are presented. Finally, the base case projections for the respective areas are presented.

Part IV of the study presents a description and analysis of the projected impacts associated with the proposed Beaufort Sea lease sale. Results for the mean and low case scenarios are discussed, both at the statewide and regional levels. Supporting materials are contained in the appendices.

II. STATEWIDE AND REGIONAL GROWTH: THE BASELINE HISTORICAL ANALYSIS

The Statewide Economy: Statehood - 1978

In carrying out the historic baseline studies, either for Alaska or the regions, it is important to keep in mind the purpose of the analysis. There are three primary objectives involved. First, the analysis should provide the uninitiated reader with a general sense of the structure of the economy and how and why it has changed over time. Second, the study should provide some indication of how individuals within the system have benefited from the functioning of the system; i.e., an assessment of economic well-being. Third, the baseline history should provide guidance in developing assumptions regarding future development of the economy.

Hence, the historical baseline study is not simply a description of the economy, but rather provides an analysis of the growth and changes in the system, the dimensions of economic well-being, and its future prospects. With these comments in mind, we can now turn to the baseline study of the state as a whole.

At the risk of oversimplification, the economic history of Alaska can be summarized as one of resources, defense, disaster, more resources, and government. Prior to World War II, interest in the state focused

largely on natural resource exploitation, primarily based on furs, fish, and hard rock minerals. World War II and the cold war aftermath lead to a sizable military-government involvement in the state, both in terms of population and economic activity.

The advent of statehood found an economy reflecting a narrowly based private sector, largely dependent upon limited natural resource activity, and a large federal civilian and military presence. In 1960, for example, federal civilian wages and salaries accounted for 25 percent of the total civilian wage bill, while state government (5.9 percent) and local government (5.1 percent) made up an additional 11 percent of total wage and salary payments. When military payrolls are included, 42.5 percent of wage and salary income was accounted for by government.

Discovery of the Swanson River oil field in 1957 had done much to raise expectations about future economic prospects, but it was not until major discoveries in Cook Inlet during 1965 that the oil and gas industry became firmly established and significant levels of production were assured. The emergence of petroleum resources as a significant factor in the Alaska economy considerably improved the potential for private sector development and, more importantly, helped to shore up the extremely shaky fiscal base of state government.

For the mid- and latter part of the decade of the 1960s, it was to be natural disaster that provided much of the impetus for economic

growth. The Good Friday earthquake of 1964 resulted in a major reconstruction effort which supported levels of economic activity that probably would not have been achieved otherwise. A second disaster, of lesser statewide magnitude but of great consequence for the Fairbanks region, was the flood of 1967. Disaster relief and reconstruction funds, followed later by flood control projects, provided a needed boost for the region's economy.

Discovery of oil at Prudhoe Bay in 1968 marks the beginning of the latest phase of Alaska economic history. Development of the supergiant field, construction of the oil pipeline, and the related flows of revenue to state government are providing the impetus for sustained economic growth and diversification that should carry the state well into the 21st century.

Against this backdrop, we can now look more specifically at several important dimensions of growth and change in the Alaska economy. As suggested earlier, there are certain key measures of economic activity that are central to the analysis. Personal income and employment data provide insight into the overall growth of the economy and changes in the composition of economic activity. In addition, these data can be used as general indicators of changes in economic well-being over time. An important corollary variable is population growth. It is also instructive to review aggregate measures of production for the economy.

In addition to these general measures of economic activity, there are several specific attributes of the economy that need to be considered. These include such topics as secular and seasonal unemployment, the structure of costs and prices, and the role of state government with respect to determining overall economic activity. Finally, we must consider issues related to potential future economic activity. We now turn to specific measures of the economy.

PRODUCTION

Data measuring the gross value of production by industrial classification are not available for recent years. However, various measures of the value of output for selected industries have been compiled and are presented in Table 1. Except for agriculture, the industries reflect the primary "export base" components of the private sector economy. Data on federal and total government expenditures have also been included for comparative purposes. Furthermore, a large portion of federal government outlays indirectly reflects an export of goods and services by the private sector economy of Alaska.

Fisheries and petroleum have clearly dominated growth in the value of production in the private sector. Value of catch to fishermen has grown at an average annual rate of 15 percent over the period, and wholesale value has grown almost as rapidly (14.4 percent), reflecting both the substantial growth of shellfishing and rising product prices. When deflated by the consumer price index (which is appropriate if we are interested in implicit purchasing power), the value of catch grew

Table 1. Value of Production for Selected Industries
Various Years, 1960-1979

(millions of current dollars)

Industry	Agriculture	Forestry	Fisheries				Oil & Gas		Federal Government Outlays in Alaska (FY)	Total Government Spending in Alaska (FY)
			Value to Fishermen			Wholesale Value	Crude Oil	Dry Gas		
Year			Salmon	Shellfish	Total					
1960	5.6	47.3	33.6	3.1	40.9	96.7	1.2	.03	155.8	N.A.
1961	5.7	48.0	35.7	5.1	46.5	128.7	17.7	.129	N.A.	N.A.
1962	5.7	52.3	42.1	7.1	58.4	131.9	31.2	.467	N.A.	N.A.
1963	5.3	54.1	31.3	9.6	46.9	109.0	32.7	1.1	N.A.	N.A.
1964	5.6	61.0	41.4	10.0	56.8	140.9	33.6	1.7	N.A.	N.A.
1965	5.3	57.5	48.3	14.5	70.1	166.6	34.1	1.8	533.7	N.A.
1966	5.3	71.2	54.2	17.6	81.9	197.3	44.1	6.3	N.A.	N.A.
1967	5.2	80.6	24.6	18.3	48.8	126.7	88.2	7.3	N.A.	N.A.
1968	4.9	89.2	49.5	27.9	79.9	191.7	186.7	4.4	N.A.	N.A.
1969	4.3	101.0	40.6	20.8	68.1	144.2	214.5	12.7	N.A.	N.A.
1970	5.2	93.7	68.0	20.5	97.5	213.9	232.8	18.2	728.7	N.A.
1971	5.0	103.5	51.4	26.0	85.5	198.7	234.3	18.0	852.9	N.A.
1972	6.0	82.3	45.3	33.6	92.4	185.7	221.7	18.0	989.4	N.A.
1973	7.0	131.4	60.1	61.4	142.4	283.0	239.6	19.5	1018.6	1592
1974	8.1	154.7	65.7	62.8	144.8	254	347.4	22.5	1135.9	1730
1975	9.2	133.5	55.3	55.4	129.4	293	364.6	42.8	1326.8	2000
1976	8.8	149.5	118.0	96.5	239.6	452	318.8	60.5	1368.1	2226
1977	9.9	179.3	171	157	349	723p	988.9	66.6	1544.9	2524
1978	9.2	N.A.	238p	272p	543p	1118p	2701.5	89.6	1753.0	2845
1979	9.1p	N.A.	317p	231p	606p	1243p	5493.6p	91.5	1932.2	3147e

p = preliminary
e = estimate
N.A. = not available

SOURCE: See Table 1 Notes

Table 1 Notes

The data are primarily obtained from selected tables in The Alaksa Economy: Year-End Performance Report 1978 (Alaska Department of Commerce and Economic Development, Division of Economic Enterprise; Juneau, Alaska) and Alaska Statistical Review (Alaska Department of Commerce and Economic Development, Division of Economic Enterprise; Juneau, Alaksa, 1980). The latter source is a preliminary report. Specific sources for each column of the table follow.

Agriculture: page B-13 Alaska Statistical Review (ASR). Value of sales is approximately 74 percent of value of production, with the balance being used on farm.

Forestry: Data from 1960-1971 are from Alaska Statistical Review (1972), p. 90, and reflect total end product value. For 1972-1977, the data are from the 1978 Year End Performance Report and reflect only forest product exports. Here the series are not comparable, but individually reflect growth in the periods in question. Comparable series are not available over the full period.

Fisheries: Data for 1972-1975 are from the 1978 Year End Performance Report, p. 58. 1976 data are from Alaska Catch and Production: 1976 (Alaska Department of Fish and Game). 1977-1979 data are from ASR (1980). 1960-1971 data are from ASR (1972) p. 74. Data for 1960-71, 1976-79 are comparable. Data for 1972-75 represent approximately 92 percent of total wholesale value.

Oil and Gas: ASR (1980) p. B-3. It should be noted that these data do not include value added in transportation and here reflect approximate wellhead value.

Federal Government Outlays in Alaska: 1960-1977 data are from 1978 Year End Report, p. 105. 1978-1979 data are from ASR (1980), p. E-2. Data are for fiscal year ending in given calendar year.

Total Government Spending in Alaska: Data from ASR (1980) p. E-1. The total is net of intergovernmental transfers.

at almost 10.3 percent and the wholesale value by 9.5 percent. Crude oil and natural gas percentage growth rates are relatively meaningless since the base in 1960 is negligible, but their significance is obvious. It is also worth noting that in 1978 (the last year for which data are available) production of minerals other than oil and gas and sand and gravel amounted to 18.4 million dollars, or about 0.6 percent of the total value of mineral production. Neither has there been any significant change in the value of this dimension of mining over the past two decades. In deflated dollars, federal government expenditures have grown at about 9.3 percent.

Government expenditures are not directly comparable to the value of production in other industries since they reflect not only government production (wages and salaries) but purchases of goods and services and transfer payments to individuals. However, in another sense these expenditures do reflect a measure of demand for production of goods and services throughout the economy as a whole and underscore the continuing importance of government spending in the economy.

Of particular significance in overall government spending is the role of state government spending. The state fiscal history can roughly be divided into three periods: early post-statehood, Prudhoe Bay sale to pipeline completion, and Prudhoe Bay production.

During the first period, federal government grants, both statehood transition grants and others, were an important component of state

government revenues. The relative decline in federal grants were more than offset by revenues linked to general economic growth and the development of Cook Inlet petroleum resources, but expenditures were constrained by available revenues.

The $900 million Prudhoe Bay lease sale in the fall of 1969 ushered in the second period and led to an immediate doubling of state government expenditures. Growth in expenditures continued rapidly, although still constrained by available revenues and the rapidly diminishing balance of the lease sale. The third period is marked by the commencement of production from Prudhoe Bay; and, for the first time, the state has significant potential surplus revenues.

The rapid expansion of revenues since 1969 has resulted in a closely correlated growth of state government expenditures. This is reflected not only in expanding state government employment and wages but also by total government expenditures for purchases of goods and services and transfers to local government. The net result has been that state government spending (both directly and through local government) has assumed a significant role in the overall determination of economic activity in Alaska. This is a pattern which will prevail for some time into the future.

In summary, the role of natural resources in the growth of the Alaska economy has been dominated by fisheries and petroleum. Forest products have remained regionally important, primarily for Southeast

Alaska, but have not demonstrated significant growth. Agriculture has remained stagnant, and, in real terms, the value of production has declined. Government has remained a major force in the economy, with state and local government increasing in relative proportion to total government.

EMPLOYMENT, UNEMPLOYMENT, AND WORK FORCE

Analysis of employment, unemployment, and work force data is important for several reasons. First, since labor is one of the key factors of production, employment data provide a general indicator of the growth and composition of production over time. The main deficiency with these data for such purposes is that they ignore changes in factor proportions over time and differences in factor proportions between industries. This omission is particularly important in industries that are highly capital-intensive, such as the petroleum industry. Also, since these data are based on job counts, they do not reflect actual man hours of production and, hence, provide only an approximate measure of labor input.

Second, work force data, in conjunction with total employment data, determine unemployment. It is instructive to observe the patterns of unemployment over time and in response to changes in total economic activity. Third, the data are useful in measuring seasonal patterns of economic activity and how this may have changed over time.

Tables 2 and 3 provide summary data on employment, labor force, and unemployment for selected years over the 1960-1978 period. Total employment over this period grew at an annual average rate of 4.9 percent. However, substantial variation in the growth rate is evident. From 1960-1973, the rate was 3 percent; while for 1974-1978 (reflecting the pipeline boom) the rate was 8.6 percent. The growth of the civilian labor force shows a similar pattern, although increasing at a slightly higher rate. The result of this is that total unemployment has grown at about 7 percent per year over the period and the unemployment rate has also increased.

It is also worth noting that during the pre-pipeline period the unemployment rate was relatively stable and that the somewhat higher rates of 1977 and 1978 reflect in large part a readjustment to a more normal post-pipeline period. These data clearly illustrate the openness of the Alaska labor market. Large variations in the demand for labor are primarily met by significant in- and out-migration and by changes in labor force participation rates. As a consequence, the long-run rate of unemployment is quite stable and the simple expansion of economic activity has little effect in terms of reducing unemployment. The second block of data in Table 2 provides annual average employment data by broad industry classification. In addition to illustrating the sustained growth of employment and production in all industry categories, these data also indicate relative changes in the significance of specific industries.

TABLE 2. CIVILIAN EMPLOYMENT, UNEMPLOYMENT AND LABOR FORCE
1960, 1965, 1970-1978, BY BROAD INDUSTRY CLASSIFICATION
(IN THOUSANDS)

	1960		1965		1970		1971		1972		1973		1974		1975		1976		1977		1978	
Total Civilian Labor Force	73.6		89.8		91.6		97.7		103.6		109.1		125.6		156.0		168.0		174.0		181.0	
Total Unemployment	5.9		7.7		6.5		8.0		8.6		9.3		9.9		10.8		14.0		16.0		20.0	
% of Total Labor Force	8.0%		8.6%		7.1%		8.2%		8.3%		8.5%		7.9%		6.9%		8.3%		9.2%		11.0%	
Total Employment	67.7		82.1		85.1		89.6		95.0		99.9		115.7		145.3		154.0		158.0		161.0	
	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%
Nonagricultural Wage and Salary Employment	56.9	100.0	70.5	100.0	92.5	100.0	97.6	100.0	105.4	100.0	111.2	100.0	129.7	100.0	163.7	100.0	173.5	100.0	166.0	100.0	163.2	100.0
Mining	1.1	1.9	1.1	1.6	3.0	3.2	2.4	2.5	2.1	2.0	2.0	1.8	3.0	2.3	3.8	2.3	4.0	2.3	5.0	3.0	5.6	3.4
Contract Construction	5.9	10.4	6.5	9.2	6.9	7.5	7.4	7.6	7.9	7.5	7.8	7.0	14.1	10.9	25.9	15.8	30.2	17.4	19.5	11.7	12.2	7.5
Manufacturing	5.8	10.1	6.2	8.8	7.8	8.4	7.8	8.0	8.1	7.7	9.4	8.5	9.6	7.4	9.6	5.9	10.3	5.9	10.9	6.6	11.5	7.0
Food Processing	2.8	4.9	3.0	4.3	3.7	4.0	3.6	3.7	3.7	3.5	4.6	4.1	4.3	3.3	4.3	2.6	5.1	2.9	5.5	3.3	6.3	3.9
Logging, Lumber, Pulp	2.2	3.9	2.3	3.3	2.8	3.0	2.8	2.9	2.8	2.7	3.2	2.9	3.6	2.8	3.4	2.1	3.2	1.8	3.5	2.1	1.8	1.1
Transportation, Communications Public Utilities	6.8	12.0	7.3	10.4	9.1	9.8	9.8	10.0	10.0	9.5	10.4	9.4	12.4	9.6	16.5	10.1	15.8	9.1	15.6	9.4	16.4	10.0
Trade	7.7	13.5	10.0	14.2	15.4	16.6	16.1	16.5	17.1	16.2	18.3	16.5	21.1	16.3	26.2	16.0	27.6	15.9	28.5	17.2	28.8	17.6
Finance, Insurance, Real Estate	1.4	2.5	2.2	3.1	3.1	3.4	3.2	3.3	3.7	3.5	4.2	3.8	4.9	3.8	6.0	3.7	7.1	4.1	7.8	4.7	8.2	5.0
Services	5.6	9.8	7.5	10.6	11.4	12.3	12.5	12.8	14.0	13.3	15.2	13.7	18.3	14.1	25.1	15.3	27.7	16.0	27.4	16.5	27.6	16.9
Government	22.7	39.9	29.7	42.1	35.6	38.5	38.0	38.9	41.7	39.6	42.8	38.5	45.3	34.9	49.5	30.2	49.7	28.6	50.7	30.5	52.2	32.0
Federal	15.6	27.4	17.4	24.7	17.1	18.5	17.3	17.7	17.2	16.3	17.2	15.5	18.0	13.9	18.3	11.2	17.9	10.3	17.7	10.7	18.1	11.1
State	3.9	6.9	7.0	9.9	10.4	11.2	11.7	12.0	13.3	12.6	13.8	12.4	14.2	10.9	15.5	9.5	14.1	8.1	13.9	8.4	14.3	8.8
Local	3.2	5.6	5.3	7.5	8.1	8.8	9.0	9.2	11.2	10.6	11.9	10.7	13.1	10.1	15.8	9.7	17.6	10.1	19.1	11.5	19.8	12.1

Table 2 Notes

Sources of data: 1960, 1965 ASR (1972) p. 16. It should be noted that the "labor force" data are actually work force data for these two years and are not directly comparable with the data for 1970-1978. The basic difference between the two series is that work force estimates are based on job counts and, hence, a worker may be counted more than once if holding two or more jobs. Labor force estimates are supposed to eliminate this double counting. Thus, the work force data for 1960 and 1965 somewhat overstate the actual number of employed.

In 1970-1978, labor force and total employment estimates are obtained from Alaska Labor Force Estimates by Area (Alaska Department of Labor), various years.

Non-agricultural wage and salary data are obtained from the Statistical Quarterly (Alaska Department of Labor) for the various years.

TABLE 3. INDEX OF SEASONAL VARIATION IN NONAGRICULTURAL EMPLOYMENT: SELECTED YEARS 1960-1978

	1960	1965	1970	1972	1974	1976	1978
Total Nonagricultural Employment	39.4	30.6	22.7	24.6	32.0	23.1	14.0
Contract Construction	156.2	91.7	69.5	77.6	108.2	64.7	47.2
Manufacturing	136.3	116.3	107.9	105.2	70.8	78.2	86.5
Food Processing	211.5	195.2	196.3	175.3	100.6	112.0	125.0
Trade	20.8	20.0	15.6	14.8	25.1	13.5	12.0
Services	28.4	17.2	10.7	16.2	26.8	13.3	17.8
Unemployment Rate, All Industries	117.5	74.4	59.2	65.1	82.3	45.8	30.0
Labor Force	28.2	26.5	21.8	21.0	27.1	21.2	12.0

SOURCE: Compiled from Statistical Quarterly (Alaska Department of Labor), selected years. Seasonal variation is measured as the high month minus the low month divided by average annual figure, stated as a percent. Unemployment data are from Labor Force Estimates (Alaska Department of Labor), various years.

Employment in mining is the one basic sector industry that has increased its share of total employment. The federal government share has declined substantially over the period, while both state and local government have grown, with much of the growth in state government employment occurring during the 1960s and the early 1970s. Local government growth lagged state government in the early years, but by 1975 local government employment exceeded state government employment. Of particular interest is the growth of support sector activity, including trade, finance, insurance and real estate, and services. This growth reflects a steady diversification of support sector activity and the process of import substitution in response to increasing market size, growth of incomes, and opportunities for specialization. In short, the data reflect a general maturation of the economy.

It is also of interest to consider changes in seasonal patterns of economic activity. Table 3 summarizes seasonal activity in selected industries, as well as for total nonagricultural wage and salary employment, labor force, and unemployment. Seasonal variation is measured as the high month minus the low month divided by the average annual figure for the respective variable. Because of secular growth in the variables, the index tends to overstate seasonality for any given year, but for comparative purposes, over time, the index is satisfactory.

The data reflect two important dimensions of the Alaska economy. First, seasonality varies drastically from industry to industry, with

construction and manufacturing (especially food processing) showing the greatest seasonal swings. Second, while significant seasonality remains in all industry, there has been a major reduction over time.

In summary, the data on labor force, employment, and unemployment illustrate several important features of the Alaska economy. First, while growth has been uneven, aggregate economic activity has increased substantially since statehood. Contract construction, mining, and support sector industries grew rapidly during pipeline construction. With the exception of contract construction, levels of employment achieved at the peak of pipeline construction have generally been sustained or have increased.

Second, structural change that reflects a general maturing of the economy has occurred, as evidenced by the increased share of total employment accounted for by support sector activity, including trade, finance, insurance and real estate, and services. Coupled with the greatly reduced dependence of the state on federal government activity and the growth of petroleum and fisheries, the data indicate a general broadening and diversification of economic activity.

Third, in addition to sustained secular growth, there has been a marked decrease in seasonal swings in economic activity. In part, this reflects the relative growth of industries with smaller seasonal variations. In addition, construction and fish processing seasonality have also reduced substantially.

Finally, the relative stability of unemployment rates over time clearly indicates the openness of the Alaska labor market. The generally higher than national average unemployment rates have not responded to aggregate economic expansion historically and probably will not in the future.

PERSONAL INCOME

Personal income measures that part of the total value of production that accrues to individuals and includes: wage and salary income; other labor income; proprietor's income; income from dividends, interest, and rent; and personal transfer payments. While deficient in many respects as a measure of economic well-being, it is nevertheless a useful indicator of the degree to which individuals share in the total benefits of production. Table 4 presents estimates of personal income for Alaska, by major source, for selected years covering the period from 1960 through 1978.

Personal income has grown steadily over the entire period, at an average annual rate of 11.3 percent, while for the pipeline period the growth was about 17 percent per year. Wage and salary income accounted for the majority of personal income throughout the period, averaging 80 percent. In contrast, about 68 percent of U.S. personal income is accounted for by wages and salaries. Proprietor income as a share of total personal income has declined somewhat; while that of dividends, interest, and rent has increased modestly. The share accounted for by transfer payments has increased substantially but still

TABLE 4. PERSONAL INCOME BY MAJOR COMPONENT:
ALASKA, SELECTED YEARS 1960-1978

(millions of current dollars)

COMPONENT	1960		1965		1970		1975		1978	
	$	% Total	$	% Total	$	% Total	$	% Total	$	% Total
Wages & Salary	567.9	84.1	778.2	88.8	1293.9	84.7	3620	85.0	3954.9	80.6
Private, Total	281.5	41.7	463.2	52.8	773.1	50.6	2771	65.1	2907.2	59.2
Mining	10.3	1.5	14.3	1.6	54.2	3.5	116	2.7	248.4	5.1
Contract Construction	77.3	11.5	98.0	11.2	140.2	9.2	1095	25.7	537.8	11.0
Manufacturing	47.1	7.0	59.7	6.8	90.9	5.9	161	3.8	260.9	5.3
Fisheries	17.7	2.6	22.9	2.6	31.4	2.1	46.2	1.1	100.5	2.0
Forest Products	8.4	1.2	22.8	2.6	38.6	2.5	64.8	1.5	50.0	1.0
Support Sector	142.1	21.1	265.3	30.3	457.4	29.9	1364	32.0	1817.0	37.0
Government	286.6	42.5	376.0	42.9	593.6	38.8	993	23.3	1301.8	26.5
Federal Civilian	104.7	15.5	137.6	15.7	195.1	12.8	308	7.2	383.2	7.8
Military	136.0	20.1	143.9	16.4	225.7	14.8	258	6.1	287.5	5.9
State & Local	45.9	6.8	94.4	10.8	172.9	11.3	427	10.0	631.0	12.9
Proprietors' Income	50.1	7.4	62.1	7.1	73.9	4.8	143	3.4	260.5	5.3
Dividend, Interest & Rent	33.0	4.9	52.1	5.9	81.4	5.3	220	5.2	333.4	6.8
Transfer Payments	24.0	3.6	34.2	3.9	79.3	5.2	274	6.4	358.3	7.3
TOTAL	675.0	100.0	876.6	100.0	1528.5	100.0	4257	100.0	3907.1	100.0
Less										
Cont. for Soc. Ins.	11.0		22.3		49.2		172.0		223.5	
Residence Adj.	31.5		45.9		67.1		637.0		314.6	
Resident Personal Income	632.5		900.2		1412.2		3447.0		4369.0	

Table 4 Notes

SOURCE: Major components of the table are obtained from U.S. Department of Commerce, Bureau of Economic Analysis reports of personal income by state. Wages and salary figures (row 1) include wage and salary plus other labor income components of personal income. Except for 1960, the private, total row and subcomponents thereunder, contain wage and salary income, other labor income, and proprietors' income. Total income is the sum of the wages and salary row plus proprietors' income; dividends, interest and rents; and transfer payments. Resident personal income is equal to total income less contribution for social insurance and the residence adjustment.

remains well below the national figure of 12.6 percent. The data also generally confirm the relative changes in the composition of industry activity that were observed in the employment data.

The growth of aggregate personal income in Table 4 reflects not only aggregate growth of production but also the influence of inflation. Table 5 presents aggregate personal income in both current and constant dollars. Growth of constant dollar personal income has been significant and has averaged 7.8 percent per year. During the 1974-1977 period, the growth was even more dramatic at 11.8 percent in real terms. The combined effects of inflation and the plateauing of economic activity following completion of pipeline construction have resulted in a slight decline in real personal income in 1978.

There are two other dimensions of personal income that are particularly important in assessing individual economic well-being: per capita income and the distribution of income. Table 5 includes data on the growth of per capita personal income in real and current dollars.

Real per capita income from 1960-1973 grew at an average annual rate of 4 percent. The 1973-1978 period, encompassing pipeline construction and the post-boom readjustment, shows rapid expansion until 1976 and then a substantial drop during 1977 and 1978. The net growth over the period is only 2 percent per year. Two points are worth noting in this respect. First, the rapid expansion of activity occurred during a period of high national inflation and was of sufficient magnitude to

TABLE 5. ALASKA RESIDENT ADJUSTED PERSONAL INCOME
IN CURRENT AND CONSTANT 1979 DOLLARS
1960, 1965, and 1970-1978

	Millions of Dollars of Personal Income, Total		Per Capita Personal Income	
	Current $	Constant 1979 $	Current $	Constant 1979 $
1960	632.5	1,470.6	2,797	6,503
1965	858.4	1,982.8	3,168	7,318
1970	1,411.9	2,700.3	4,644	8,882
1971	1,557.2	2,954.8	4,939	9,372
1972	1,698.5	3,036.4	5,234	9,631
1973	2,001.5	3,570.0	6,046	10,784
1974	2,436.7	3,822.9	7,138	11,199
1975	3,527.7	4,493.5	9,673	12,321
1976	4,194.8	5,421.4	10,274	13,278
1977	4,313.4	5,346.5	10,455	12,959
1978	4,369.0	4,875.2	10,849	12,106
	Average Annual Percent Growth			
	11.3	7.8	6.9	3.5

SOURCE: Current dollar personal and per capita income from U.S. Department of Commerce, Bureau of Economic Analysis. Deflated by Anchorage Consumer Price Index, U.S. Department of Labor.

lead to additional regional inflation in the Alaska economy. Thus, the real value of per capita income growth was greatly diminished. Second, the rapid expansion of total economic activity had only a minimal effect in raising per capita income, again reflecting the ease of entry into the Alaska labor market.

Data on the distribution of personal income are not available for recent years, but it is instructive to look at the pattern of wages over time. Table 6 presents data on relative wages, by industry, for selected years over the 1965-1978 period.

The numbers reflect the ratio of the average monthly wage for the respective industry divided by the average monthly wage for all nonagricultural wage and salary employment. The data must be interpreted with caution since several factors are at work that may account for year-to-year variability. First, the average monthly wage data reflect both straight time and overtime earnings and are thus sensitive to variation in the ratio of straight time to overtime work.

Second, the average monthly wage is computed by dividing total wages by average monthly employment; and average monthly employment, in turn, reflects both full- and part-time work. Thus, the employment data are only an approximation of man hours worked. We are also looking at fairly aggregate data. Some of the variation within industries may be accounted for by changes in composition of activity within the broad industry classifications.

TABLE 6. DISTRIBUTION OF RELATIVE WAGE RATES, BY INDUSTRY, FOR ALASKA, SELECTED YEARS, 1965-1978

Industry	1965	1970	1976	1978
Total Nonagriculture Wage and Salary	100	100	100	100
Mining	147	164	140	193
Contract Construction	165	169	210	157
Manufacturing	106	99	73	93
Food Processing	97	78	55	71
Logging, Lumber, and Pulp	115	124	96	119
Other Manufacturing	112	110	83	109
Transportation, Communication, and Public Utilities	115	114	105	128
Wholesale Trade	127	117	94	111
Retail Trade	78	70	50	62
Finance, Insurance, Real Estate	88	81	62	81
Services	74	72	78	75
Government	91	97	74	97
Federal	91	100	70	94
State	91	96	79	111
Local	91	93	72	89

SOURCE: Computed from average monthly wage data from the Statistical Quarterly (Alaska Department of Labor), selected years. Relative wages are the respective industry wage divided by the average wage for all industries x 100.

The data first indicate the growing disparity of average wage rates, which would suggest a trend toward a less equal distribution of income. More significant are the changes that occurred at the peak of pipeline construction in 1976. Major distortions in the structure of wages are present, and this suggests that the distribution of benefits during a boom is not uniform, but rather that a small segment of the economy appears to reap a large proportion of the gains. This feature of boom economics is further demonstrated by an analysis of changes in real wages over the 1973-1976 period.

Table 7 shows average monthly wages, by broad industry classification, deflated by the Anchorage consumer price index (CPI). Use of the Anchorage CPI is dictated because there is no statewide index. Hence, the deflation is subject to some error since price changes are not uniform throughout Alaska. As an approximation, however, the data are adequate.

It is clear that drastic differences exist among industries and that the economic benefits of rapid economic expansion tend to be concentrated in a select few industries. A major portion of income implied in the growth of construction wages was also earned by nonresidents or temporary resident employees. With the exception of business services, all components of the support sector and government badly lagged the average growth of wages and, implicitly, relative income. Federal government and finance, insurance, and real estate real wages actually declined.

TABLE 7. CHANGE IN REAL AVERAGE MONTHLY WAGE 1973-1976, ALASKA (1973 DOLLARS)

Industry	Average Wage 1973	Average Wage 1976	Average Wage Percent Change
Total Nonagriculture Wage and Salary	$1,006	$1,424	12.3%
Oil and Gas Mining	1,661	2,068	7.6
Contract Construction	1,635	2,985	22.2
Manufacturing	961	1,041	2.7
Transportation, Communication, and Public Utilities	1,141	1,494	9.4
Wholesale Trade	1,177	1,341	4.4
Retail Trade	687	709	1.1
Finance, Insurance, Real Estate	897	884	- 0.5
Services	751	1,107	13.8
Hotels, Motels, Lodging	527	537	0.6
Business Services	732	1,706	32.6
Government	1,024	1,047	0.7
Federal	1,062	1,002	- 1.9
State	992	1,132	4.5
Local	1,003	1,024	0.7

SOURCE: Computed from average monthly wage data, Statistical Quarterly (Alaska Department of Labor), selected years.

While much of the inflation that occurred during the period is attributable to national inflation, significant regional inflation resulting from pipeline construction activity also occurred. Prior to pipeline construction, the Anchorage CPI had been growing at a less rapid rate than the U.S. CPI. However, during pipeline construction, this relationship was reversed, and the Anchorage CPI grew more rapidly. Table 8 presents relative rates of growth in the Anchorage and U.S. CPIs for selected years and clearly illustrates the regional inflation associated with pipeline construction.

As one final indication of income distribution patterns, a distribution relating percentage of total wage and salary income to percentage of employment has been constructed for 1965 and 1978 (see Figure 1). The distribution was constructed by ranking industries according to average monthly wage. The percentage of total employment and total wage income accounted for by the respective industry was then computed. The cumulative employment and income percentages were then plotted, yielding the typical Lorenz-type distribution figure.

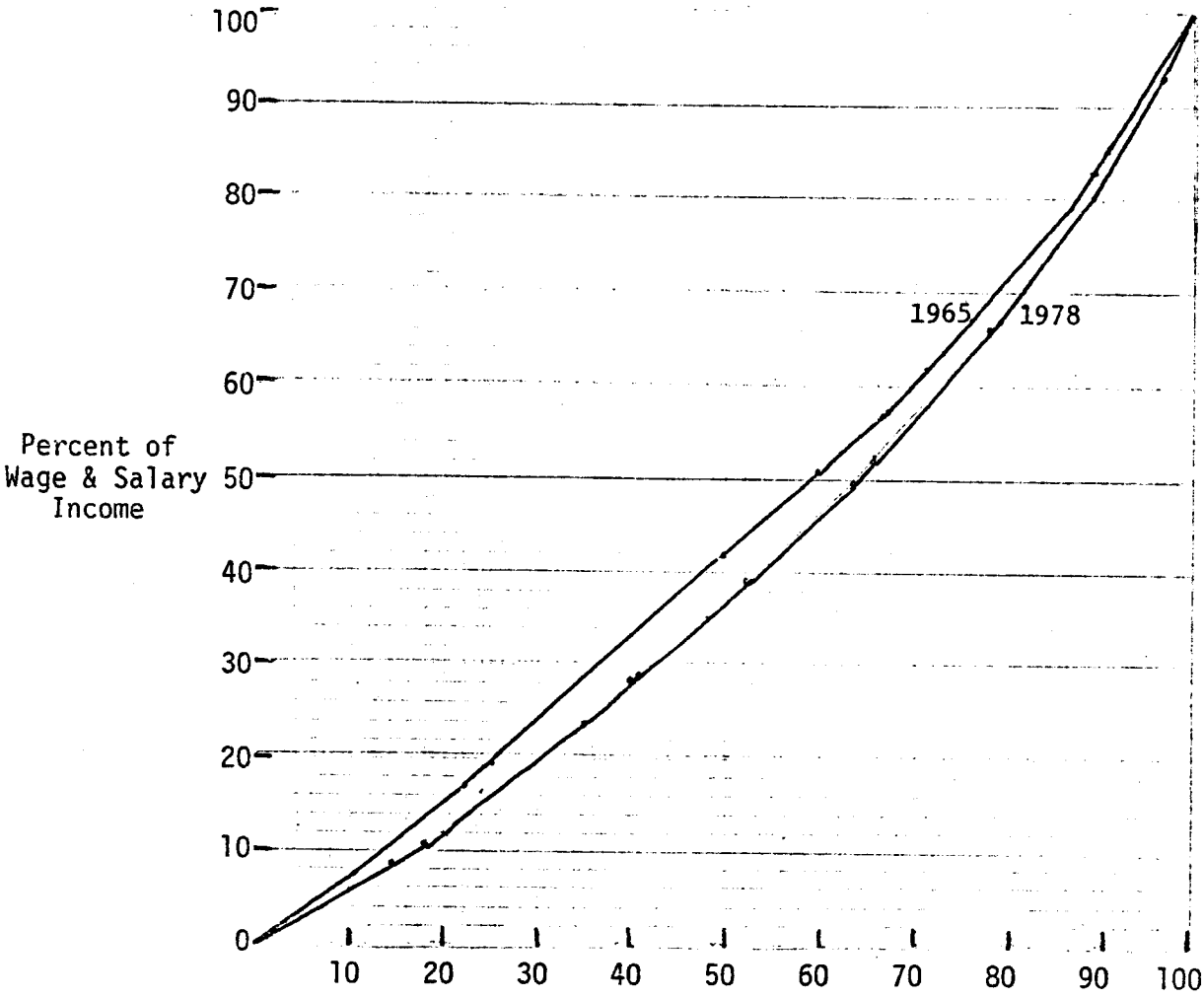
A comparison of the two distributions reveals a clear shift toward a less uniform distribution of income. This shift is probably accounted for by two factors. First, as indicated earlier, there has been a sizable increase in the share of total activity accounted for by support sector industries, and these industries generally have lower than average wage rates. Second, there has been a substantial growth in the range of relative wages between industries over time.

TABLE 8. RATES OF CHANGE FOR THE ANCHORAGE AND U.S. CONSUMER PRICE INDEX, SELECTED YEARS, 1960-1977

	1960-1970	1970-73	1973-74	1974-75	1975-76	1976-77
Anchorage	1.8	4.1	13.3	12.3	6.5	5.8
United States	2.8	5.6	12.0	7.6	5.3	6.5

SOURCE: Derived from the Bureau of Labor Statistics reports on Anchorage and United States CPIs.

FIGURE 1. DISTRIBUTION OF WAGE AND SALARY INCOME
ALASKA, 1965 and 1978



SOURCE: See text.

In summary, real personal income has shown sustained growth over the entire 1960-1978 period, both in aggregate and per capita terms. The growth has not been uniformly distributed, however, and the wage component has become less uniform over time. This was particularly evident during pipeline construction and supports the hypothesis that the benefits of pipeline construction were largely concentrated in a few sectors.

POPULATION

The remaining dimension of growth to be considered is population. Changes in population are divided into two components, natural increase (or decrease) and in/out-migration. Natural population growth results from an excess of births over deaths and is, hence, determined by birth and death rates.

Alaska exhibits both the highest birth rate and the lowest death rate in the United States; and as a result, the rate of natural population increase is the highest in the United States. This phenomenon is largely accounted for by the relative youthfulness of the population, with over 34 percent of the population between the ages of 14 and 30. This age group has both the highest fertility rate and the lowest death rate.

Net migration (in-migration minus out-migration) is the second factor contributing to population change. Many factors influence the migration decision; but for the Alaska case, it appears that (with the exception of military-related migration) migration occurs largely in

response to economic opportunity. In the aggregate, relative rates of unemployment and relative wage differentials in Alaska and elsewhere should be important in determining the migration decision. At the individual level, the economic component of the decision is related to the expected gain resulting from the move. Basically, this is the expected wage differential times the probability of getting a job, less the cost of making the change. Thus, either a change in relative wage rates or relative employment opportunities can influence the decision.

That migration is sensitive to economic opportunity is clearly demonstrated by patterns of migration that occur during and after pipeline construction. Data summarizing population and changes in population for Alaska for the years 1965 through 1978 are presented in Table 9. Both the relative stability of natural increase and the volatility of net migration are clear. Natural increase has averaged about 1.5 percent per year; while large variations, even in pre-pipeline years, are evident in the net migration component.

In summary, Alaska's natural population growth is substantially above that of the nation as a whole. Furthermore, the response of migration to economic opportunity is clearly evident. Once again, this emphasizes the openness of the Alaska labor market.

Regional Economies: Anchorage, Southcentral, Fairbanks, and the North Slope

Potential impacts of OCS development will not be uniformly felt throughout the state. Rather, specific regions within Alaska can be

TABLE 9. ALASKA POPULATION AND COMPONENTS OF CHANGE: 1965-1978

(thousands)

Year	Total	Natural Increase	Total Change	Net Migration
1965	265.2	5.7	10.2	4.5
1966	271.5	5.3	6.3	1.0
1967	277.9	5.0	6.4	1.4
1968	284.9	5.1	7.0	1.9
1969	294.6	5.6	9.7	4.1
1970	302.4	6.1	7.8	1.7
1971	312.9	5.9	10.6	4.7
1972	324.3	5.5	11.4	5.9
1973	330.4	5.1	6.1	0.9
1974	351.2	5.6	20.8	15.2
1975	404.6	5.9	53.4	47.5
1976	413.3	6.3	8.7	2.4
1977	411.2	6.8	- 2.1	- 8.9
1978	407.0	6.7	- 4.3	-11.0

SOURCE: Alaska Department of Labor

expected both to experience the brunt of the impacts and to capture disproportionate shares of the benefits. In the case of the present proposed lease sale, the Anchorage, Southcentral, and Fairbanks regions shown in Figure 2 can expect impacts as well as where the sale would occur. Hence, the baseline analysis must address these regions as well as the state as a whole.

ANCHORAGE AND SOUTHCENTRAL

Anchorage has occupied a central role in Alaska's growth since statehood. It has emerged as a key transportation and distribution center, as well as assuming a dominant role in the growth of other support sector activity. The area has also become the state center for petroleum industry administrative facilities. Its importance as a seat of Federal government activity in Alaska has been supplemented by rapid growth of state and local government. Because of the size of the Anchorage economy, it tends to reflect total state activity as well as to impact upon total economic activity in Alaska. It is because of its central place in the Alaskan economy that economic activity remote from Anchorage is often significantly tied to Anchorage.

Employment, Labor Force, and Unemployment

Direct measures of production for the Anchorage economy are not available. Neither is Anchorage a commodity producer in which resource-based activity is directly important to total economic activity. This makes it particularly important to consider the structure and growth

of employment for Anchorage. While such data are only partially reflective of total production, they do provide meaningful insights into changes that have occurred.

Summary data on Anchorage employment, by broad industry classification, for 1965 through 1978, are presented in Table 10. Overall employment has grown at about 7.3 percent per year, and the rate of growth exceeded the statewide rate of 6.7 percent. While growth has generally been consistently upward, it accelerated substantially during pipeline construction. Since then, growth of employment has moderated; but the level of employment still exceeds that achieved during the period of pipeline construction. It is also worth noting that, in contrast to other parts of the state where pipeline construction played a significant role in the expansion of activity, Anchorage growth during this period occurred more uniformly throughout most sectors, reflecting the region's role as a support center.

Several industries expanded more rapidly than the growth of total employment, including: mining (13.3 percent); transportation, communications, and public utilities (8.9 percent); wholesale-retail trade (9.4 percent); finance, insurance, and real estate (11.0) percent; services (11.5 percent); and state and local government (10.5 percent). Construction, manufacturing, and federal government growth rates were all below the regional average for the period.

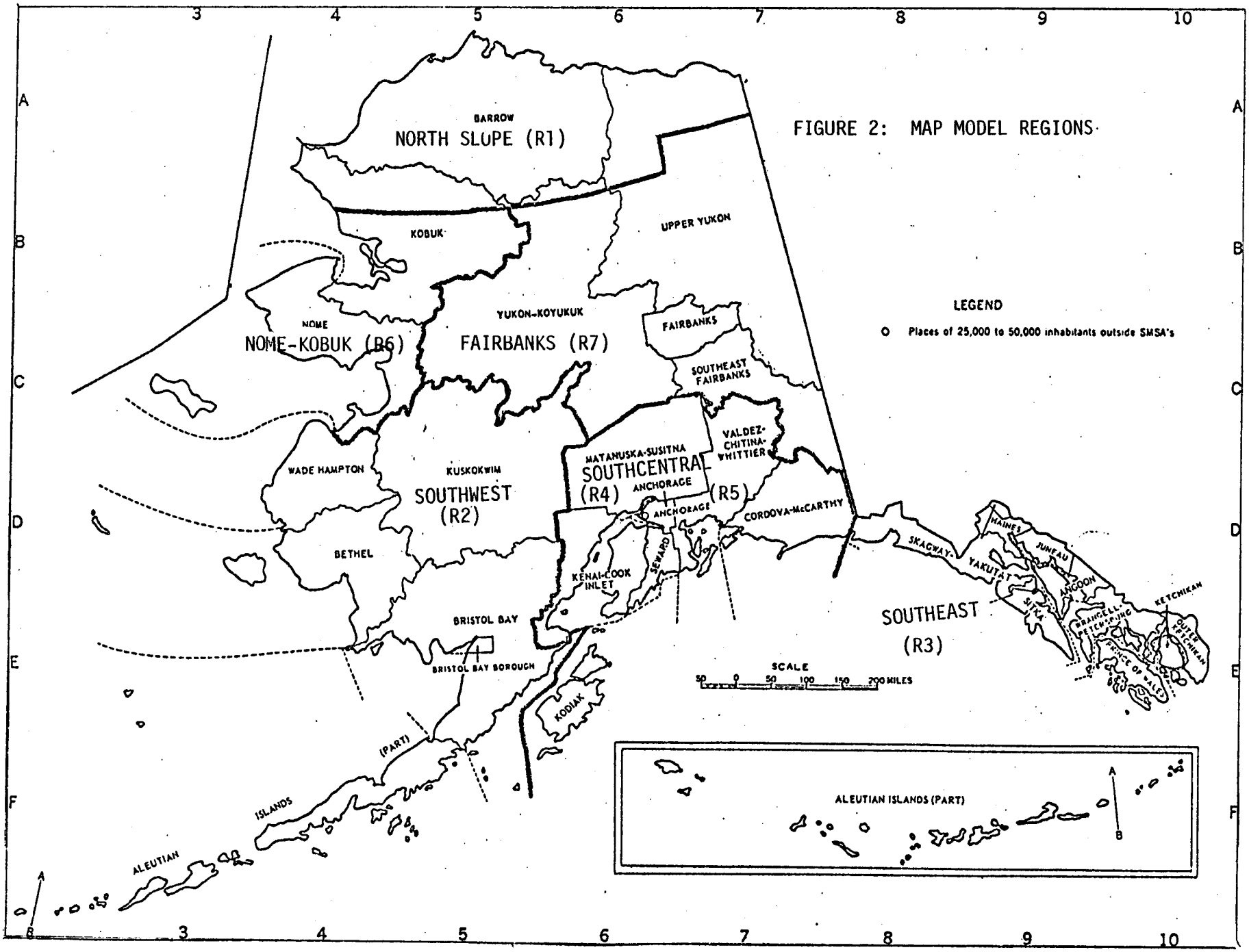


FIGURE 2: MAP MODEL REGIONS
BARROW
NORTH SLOPE (R1)
KOBUK
UPPER YUKON
NOME
NOME-KOBUK (R6)
YUKON-KOYUKUK
FAIRBANKS (R7)
FAIRBANKS
SOUTHEAST FAIRBANKS
LEGEND
Places of 25,000 to 50,000 inhabitants outside SMSA's
WADE HAMPTON
KUSKOKWIM
SOUTHWEST (R2)
MATANUSKA-SUSITNA
SOUTHCENTRAL (R4)
ANCHORAGE
VALDEZ-CHITINA-WHITTIER
(R5)
ANCHORAGE
CORDOVA-McCARTHY
BETHEL
KENAI-COOK INLET
SEWARD
HAINES
SKAGWAY
JUNEAU
YAKUTAT
SITKA
ANGOON
KETCHIKAN
WRANGELL-PETERSBURG
OUTER KETCHIKAN
PRINCE OF WALES
SOUTHEAST (R3)
BRISTOL BAY
BRISTOL BAY BOROUGH
KODIAK
SCALE
50 0 50 100 150 200 MILES
ALEUTIAN ISLANDS (PART)
ALEUTIAN ISLANDS (PART)
A
B
35

TABLE 10. ANCHORAGE NONAGRICULTURAL WAGE AND SALARY EMPLOYMENT, SELECTED YEARS
(thousands)

	1965		1968		1970		1972		1974		1976		1978	
	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%
Total NonAgric Wage & Salary Employment	30.678	100.0	34.019	100.0	42.019	100.0	48.252	100.0	58.713	100.0	73.733	100.0	76.893	100.0
Mining	0.371	1.2	0.781	2.3	0.958	2.3	0.806	1.7	1.036	1.8	1.409	1.9	1.874	2.4
Contract Construction	3.126	10.2	2.438	7.2	3.514	8.4	4.272	8.9	5.882	10.0	7.587	10.3	6.431	8.4
Manufacturing	0.791	2.6	0.834	2.5	1.018	2.4	1.215	2.5	1.379	2.3	1.629	2.2	1.683	2.2
Transportation, Communications, and Utilities	2.618	8.5	3.046	9.0	3.907	9.3	4.522	9.4	5.583	9.5	7.409	10.0	7.950	10.3
Wholesale-Retail	5.279	17.2	6.552	19.3	8.617	20.5	9.948	20.6	12.298	20.9	15.958	21.6	16.865	21.9
Finance, Insurance and Real Estate	1.295	4.2	1.452	4.3	1.980	4.7	2.415	5.0	3.151	5.4	4.257	5.8	5.019	6.5
Services	3.767	12.3	4.652	13.7	6.403	15.2	7.725	16.0	10.119	17.2	15.450	21.0	15.538	20.2
Federal Government	9.394	30.6	9.216	27.1	9.534	22.7	9.435	19.6	9.925	16.9	9.813	13.3	9.896	12.9
State & Local Government	4.001	13.0	5.022	14.8	6.036	14.4	7.839	16.2	9.242	15.7	9.465	12.8	11.266	14.7

SOURCE: Statistical Quarterly (Alaska Department of Labor), various years.

The growth of the support sector illustrates the maturing of the Anchorage economy as was also observed at the statewide level. A comparison of statewide and Anchorage support sector employment as a percent of total employment also indicates the role of Anchorage as a trade, distribution, service, and financial center for the state as a whole. Employment as a percentage of total Anchorage employment considerably exceeds comparable figures at a statewide level in trade, finance, and services. For Anchorage, these industries accounted for 48.6 percent of total employment in 1978; whereas for the state as a whole the figure is only 39.5 percent. The share of total employment accounted for by the federal government in Anchorage is also above the state proportion, and over 50 percent of total federal government employment in Alaska is based in Anchorage.

The data on labor force and unemployment also illustrates the openness of the Anchorage economy (see Table 11). Over the period from 1970 through 1979, unemployment averaged 7.4 percent. While temporarily dropping during pipeline construction, the unemployment rate has risen again to historic levels in the years since completion of the pipeline, averaging 7.7 percent for 1978 and 1979. Hence, while rapid expansion of employment opportunities may temporarily reduce unemployment, the effects are clearly short-run.

Personal Income

Total and per capita personal income for Anchorage are shown in Table 12, both in current and constant (1978) dollars. In current dollars,

TABLE 11. ANCHORAGE LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT, 1970-1978

Year	Employment	Labor Force	Unemployment	Unemployment Rate
1970	45,757	49,024	3,267	6.7%
1971	49,484	53,902	4,418	8.2
1972	52,395	57,535	5,140	8.9
1973	54,299	60,117	5,818	9.7
1974	54,691	58,661	3,970	6.8
1975	64,721	68,481	3,760	5.5
1976	68,420	73,436	5,016	6.8
1977	79,023	84,513	5,490	6.5
1978	74,819	81,551	6,732	8.3
1979	75,424	81,120	5,696	7.0

SOURCE: Alaska Department of Labor, Labor Force Estimates by Area, selected years.

both total and per capita personal income have grown every year (at average annual rate of 14.4 percent and 10.0 percent, respectively) with considerable increases in the rate occurring during pipeline construction. Much of the growth has been negated by inflation, however. In real terms, total incomes grew at 8.2 percent over the period; while per capita income grew at 4.1 percent. However, both real total and per capita personal income have declined slightly since peaks reached during pipeline construction. It is also worth noting that the growth rates of Anchorage personal income exceeded those of the state for comparable periods.

Population

Population for Anchorage has grown from 102.3 thousand in 1965 to 185.5 thousand in 1978, at an average annual growth rate of 4.7 percent (see Table 13). This was substantially in excess of the statewide growth rate of 3.4 percent. As a result, the Anchorage share of total state population rose from 38.6 percent in 1965 to 45.6 percent in 1978. From 1965 to 1969, the Anchorage and statewide populations grew at about the same rate; while for 1969 through the start of pipeline construction, the population of Anchorage grew at about 6 percent. During this period, the state as a whole grew at about 3.6 percent. Both the state and Anchorage populations grew rapidly during the 1974 through 1976 period (17.7 percent and 20.1 percent, respectively), but the Anchorage population did not peak until 1977; whereas the statewide population reached a peak in 1976. However, the decline in Anchorage population has been proportionately greater than that for

TABLE 12. ANCHORAGE PERSONAL INCOME
1965-1978

	Current Dollars		Constant (1978) Dollars	
	Total (millions)	Per Capita	Total (millions)	Per Capita
1965	371	3,412	767	7,056
1966	398	3,595	722	7,153
1967	462	4,061	900	7,911
1968	502	4,228	953	8,027
1969	570	4,622	1,035	8,391
1970	635	4,997	1,109	8,730
1971	733	5,469	1,248	9,313
1972	800	5,631	1,333	9,383
1973	880	6,031	1,385	9,490
1974	1,114	7,402	1,550	10,299
1975	1,625	10,070	2,011	12,463
1976	1,903	10,579	2,212	12,296
1977	2,109	11,592	2,317	12,736
1978	2,128	11,839	2,128	11,839
	Average Annual Percent Growth			
	14.4%	10.0%	8.2%	4.1%

SOURCE: Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE 13. ANCHORAGE POPULATION
1965-1978

(thousands)

1965	102.3
1966	105.9
1967	107.8
1968	111.6
1969	114.2
1970	126.3
1971	135.8
1972	144.2
1973	149.4
1974	153.1
1975	177.8
1976	185.2
1977	195.8
1978	185.5

SOURCE: Alaska Department of Labor.

the state as a whole. In 1978, statewide population was 6.3 thousand below the pipeline peak; while the Anchorage population was 10.3 thousand below its peak.

In summary, the Anchorage economy has shown substantial growth over the entire period reviewed. Steady diversification of the economy is evident, and the role of Anchorage as an economic center for the state is clear. Furthermore, economic activity remote from Anchorage is nevertheless often significant for the Anchorage economy because of Anchorage's central role.

The Southcentral economy includes primarily the Kenai-Cook Inlet, Seward, Matanuska-Susitna, Valdez, Chitina, Whittier, Kodiak, and Cordova-McCarthy Census Division. Economic ties exist between the Kenai-Cook Inlet, Seward, and Matanuska-Susitna Census Divisions and Anchorage. Anchorage is the primary distribution point for commodity flows to those areas. Second, the Anchorage population utilitizes the surrounding areas for recreational purposes. Finally, the surrounding areas (and in particular the Matanuska-Susitna Valley area) constitute an important component of the Anchorage labor pool. More broadly, the Southcentral region as a whole constitutes a labor pool for economic activity throughout the state. This last tie is the most significant in terms of linkages between the proposed OCS lease sale and the Southcentral regional economy.

FAIRBANKS

The Fairbanks region in the MAP model includes the Upper Yukon, Yukon-Koyukuk, Southeast Fairbanks, and Fairbanks Census Divisions, and comprises Alaska's geographic interior (see Figure 2). The distribution of economic activity among these regions remains fairly stable during the 1970s. The Fairbanks Census Division which includes the city of Fairbanks captured about 85 percent of regional personal income in both 1970 and 1978. The remaining 15 percent was distributed in diminishing amounts among the Yukon-Koyukuk, Southeast Fairbanks, and Upper Yukon Census Divisions.

Until the mid-1970s, the government sector, consisting primarily of defense, communications, and the University of Alaska, was the largest producer of income and employment in the region. Between the late-1960s and mid-1970s the construction employment, as a proportion of regional employment, grew from less than 10 percent to more than 25 percent and temporarily became the largest determinant of overall economic activity. Headquartered in the Fairbanks Census Division, the northern half of the Trans-Alaska Pipeline System was the principal source of direct and multiplier construction employment in the mid-1970s. The role played by Fairbanks during the oil pipeline construction reflects the importance of Fairbanks as a center of transportation, distribution, and other economic support for the interior region.

Employment

Nonagricultural wage and salary employment by industry in the Fairbanks region is shown for selected years between 1965 and 1979 in Table 14. Over the 11-year period from 1965 to 1976, total wage and salary employment more than doubled from 13 to 32 thousand jobs, averaging yearly growth of 8.5 percent. Over this period, contract construction employment as a proportion of the total increased from 11 percent to 27 percent at the height of TAPS construction in 1976. Over the same period, federal, state, and local government declined sharply from nearly half to only a quarter of total wage and salary employment. The data in Table 14 indicate that employment in the other industries (e.g., mining, manufacturing, transportation, communications, public utilities, finance, insurance, and real estate) remained fairly stable between 1965 and 1976. Service sector employment increased modestly over this period. During the post-pipeline decline of the late 1970s, total wage and salary employment declined 23 percent to 24,700 persons. Total government employment increased slightly in the midst of this decline implying that the recession was concentrated in other nongovernment sectors of the economy.

Although the data on total employment in Table 14 and 15 differ, the trends indicated from each data source are similar. Employment increases gradually through the early 1970s prior to a cycle of abrupt growth followed by gradual decline to roughly pre-pipeline levels of employment. The unemployment rate declines during the period of rapid growth in the mid-1970s, but increases to higher levels in the late

TABLE 14. NONAGRICULTURAL WAGE AND SALARY EMPLOYMENT IN THE FAIRBANKS REGION, SELECTED YEARS

(Persons)

	1965		1968		1970		1972		1974		1976		1979	
	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%	Emp	%
Total NonAgric Wage & Salary Employment	13107	100	13828	100	15770	100	17258	100	24443	100	32195	100	24704	100
Mining	270	2	180	1	181	1	211	1	*	*	283	1	*	*
Contract Construction	1393	11	997	7	*	*	1208	7	5360	22	8647	27	*	*
Manufacturing	250	2	*	*	248	2	245	1	307	1	*	*	*	*
Transportation, Communications, and Utilities	1722	13	1736	13	2119	13	1969	11	2476	10	3725	12	*	*
Wholesale-Retail	*	*	2152	16	*	*	*	*	*	*	4588	14	*	*
Finance, Insurance and Real Estate	386	3	458	3	*	*	562	3	656	3	*	*	859	3
Services	*	*	1575	11	1794	11	2515	15	3546	15	5420	17	*	*
Federal Government	3181	24	2931	21	2905	18	3262	19	3131	13	2974	9	2946	12
State & Local Government	2745	21	3524	25	4034	26	4652	27	4646	19	5162	16	6136	25

*Withheld under nondisclosure regulations.

SOURCE: Alaska Department of Labor tabulations.

TABLE 15. LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT IN THE FAIRBANKS REGION, 1970-1978

Year	Employment	Labor Force	Unemployment	Unemployment Rate
1970	15,772	17,317	1,545	8.9%
1971	15,706	17,609	1,903	10.8%
1972	16,453	18,600	2,147	11.5%
1973	16,225	18,423	2,198	11.9%
1974	18,238	19,660	1,422	7.2%
1975	25,691	27,189	1,498	5.5%
1976	25,864	28,251	2,387	8.4%
1977	24,342	27,884	3,542	12.7%
1978	22,043	26,722	4,679	17.5%
1979	21,857	24,958	3,101	12.4%

SOURCE: Alaska Department of Labor, Labor Force Estimates by Area, selected years (1970-1977). Alaska Department of Labor, special tabulations, 1978-1979.

1970s than levels experienced prior to pipeline construction. Hence, labor force increases during and immediately after the pipeline boom were not matched by comparable, sustained increases in total employment during the period of post-pipeline decline.

Personal Income and Population

As shown in Table 16, personal income expressed in current dollars grew at varying rates from the mid-1960s to the late 1970s. The eight percent average annual rate of growth between 1965 and 1970 nearly tripled to 23 percent per year from 1970 to 1976. Personal income in 1976, $916 million, expanded over five times the 1965 level. Although regional income dropped 19 percent to $768 million between 1976 and 1977, the data suggest that this decline was short lived as income increased slightly thereafter. Over the entire 13 year period, personal income grew at an average annual rate of 11.9 percent.

Expressed in constant, 1978 dollars, personal income grew at about half its nominal rate, suggesting a 6.1 percent average annual rate of inflation over the same period. After adjusting for population expansion (Table 17) per capita personal income grew at a real rate of 3.5 percent per year.

Population growth is similar to the varied pattern of income and employment growth in the Fairbanks region except that regional population peaks one year earlier than personal income at nearly 79,000 persons in 1975. Over the 10-year period preceding 1975, population grew

TABLE 16. PERSONAL INCOME IN THE FAIRBANKS REGION
1965-1978

	Current Dollars		Constant (1978) Dollars	
	Total (millions)	Per Capita	Total (millions)	Per Capita
1965	180	3,545	372	7,326
1966	190	3,715	345	6,746
1967	191	3,718	372	7,242
1968	206	4,016	391	7,622
1969	233	4,410	423	8,007
1970	265	4,726	463	8,257
1971	282	5,129	480	8,731
1972	305	5,370	508	8,944
1973	343	6,061	540	9,542
1974	446	7,062	621	9,834
1975	779	9,909	964	12,262
1976	916	13,358	1065	15,531
1977	768	13,194	844	14,500
1978	773	11,452	773	11,452
		Average Annual Percent Growth		
	11.9%	9.4%	5.8%	3.5%

SOURCE: Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE 17. POPULATION IN THE FAIRBANKS REGION
1965-1979
(Persons)

1965	50,779
1966	51,139
1967	51,369
1968	51,300
1969	52,830
1970	56,077
1971	54,977
1972	56,797
1973	56,593
1974	63,151
1975	78,614
1976	68,572
1977	58,208
1978	67,500
1979	66,314

Average Annual Percent Growth

1965-1975	1965-1979
4.5%	1.9%

SOURCE: Alaska Department of Labor, Alaska Population Overview, December 1979 (estimate for 1979 is provisional).

at 4.5 percent per year. Between 1975 and 1977, population declined 35 percent, but stabilized at about 67,000 in the late 1970s. Over the entire period, 1965 to 1979, population grew at an average rate of 1.9 percent per year.

NORTH SLOPE REGION

By most traditional measures, the North Slope region of Alaska has experienced rapid growth in the past decade. Special characteristics of this economy make the interpretation of this growth in economic welfare or development terms less than straightforward. Two characteristics of the regional economy influence the interpretation of this growth, the importance of the subsistence sector and the frontier nature of the economy. This section will describe the recent growth in the region in terms of its unique character.

The North Slope has a transitional economy. The transition from a pure isolated subsistence economy to full linkage with the monetized market exchange system is a continuing process. Fisk (1975) describes four stages of the transition,

1. Pure subsistence in isolation;
2. Subsistence with supplementary cash activity;
3. Cash orientation with supplementary subsistence; and
4. Complete market specialization.

The majority of the North Slope economy is in stage two or three.

Subsistence continues to play a important role in the economy. A recent survey in the region showed that over 70 percent of the Native residents participated in subsistence activities during the year. Over 45 percent of the residents got at least half of their food through subsistence activities (Kruse, 1981). Although the same survey found little negative association between working and participation in subsistence activities, the importance of subsistence as an economic activity does affect the local market economy. The subsistence economy will affect the response to market sector opportunities by influencing such things as, the demand for market goods, the labor force participation, and the seasonality of participation.

The second important factor to consider when analyzing the North Slope economy is its frontier or remote nature. The North Slope is a remote, low density region. In relation to its population, the region possesses a large amount of resources (see example, Kreitner, 1978). In regions such as the North Slope with a high resource to population ratio, economic growth is primarily determined by the development of the resources.

The pattern of growth in such regions is described by the Staple Theory of growth (Watkins, 1972). Staple or natural resource exports in economies like the North Slope are the leading sector of growth. Most capital and labor used in the production of the natural resource

must be imported. Economic development is the process of diversification around the staple or natural resource base. The staple theory provides a basis for analyzing the unique pattern of growth found in this region.

The spread of development associated with the natural resource production is determined primarily by the characteristic of the exported natural resource. The nature of production--the technology, degree of factor substitution, and the nature of returns to scale--determine the extent of economic development. The way the resource is produced determines the demand for labor, the types of inputs used, and the distribution of income. These determine the linkage between further economic activity and natural resource production.

One final remark must preface this discussion; the nature of the region's economy also affects the quality of the data used to analyze it. The reliability of data provided for remote regions with limited market economies is questionable. Because of this, the analysis presented below is intended to present trends and major patterns. It should not be interpreted as providing an exact description of the magnitude of growth.

Historic Interaction

The interaction of the North Slope subsistence and market economies dates from the 1870s. Historical contact was the result of the production of the region's natural resources. Interaction began with the

opening of whaling grounds in the 1870s. North Slope natives participated in the whaling industry both as crews for wages and as entrepreneurs who organized their own crews. With the decline in whaling, trapping for furs rose as the predominant industry in the cash economy. Furs replaced whaling in the early 1900s (historical information from Sonnenfeld, 1957).

The effect of the way the natural resource is produced on the economic growth of the region can be examined by looking at the effect of whaling and trapping on population concentration. Because of the need for crews and the physical advantage of Point Barrow, whaling led to a concentration of the population at Barrow. Trapping of furs requires a large territory per trapper, so this production reversed the trend toward concentration and led to population dispersal.

Whaling and fur production linked the North Slope economy to the broader market economy. These activities represented the beginnings of dependency of the region, as locally produced goods were replaced by imported goods. In many cases these goods increased the efficiency of subsistence activity (Sonnenfeld sights the introduction of the shoulder gun for whaling), but increased the dependence on outside markets to obtain subsistence. These activities also introduced the vagaries of natural resource markets. Both whaling and fur production experienced rapidly fluctuating prices which affected regional production but were determined by outside factors.

More recent interaction has been the result of large construction projects. Two major projects were the exploration of petroleum in the Naval Petroleum Reserve and the construction of DEW line. In both cases, these activities resulted from the exploitation of the region's natural resources: petroleum and polar location. NPR4 was created in 1923, but the first major exploration occurred between 1944 and 1953. This exploration was conducted by the Navy and employed Eskimos in the crews (Department of Defense, 1977). The DEW line was constructed in the mid-1950s being completed between 1954 and 1957. This project also employed many local Eskimos. These two projects introduced true wage employment into the region (Chance, 1966).

Recent Economic Growth

The remainder of this section will describe recent economic growth in the region. In this section we will concentrate on the growth which occurred between 1970 and 1979. We will examine the major determinants of growth and the linkages between sectors of the economy.

Recent growth has not been qualitatively different from the historical growth described above. Growth during the 1970s has been generated by the production of natural resources in the region. These resources are the petroleum reserves at Prudhoe Bay. The major linkage between this development and the growth of the local economies has been the result of the formation of the North Slope Borough. The Borough is a local government with the power to tax Prudhoe Bay petroleum facilities.

Prudhoe Bay is the largest known petroleum reserve in North America; it contains reserves estimated at 9.6 billion barrels of oil and 25 trillion cubic feet of gas. Development of the field began in 1969. The development of Prudhoe Bay resulted in the construction of considerable infrastructure including major projects such as the Trans-Alaska Pipeline and the Prudhoe Bay haul road, as well as airports, port facilities, and employee living quarters (Alaska Consultants, 1978).

The prevailing conditions in arctic regions--remoteness, lack of infrastructure, and separation--dictate the production attributes of successful arctic commercial activity. Such enterprises must be large, have access to large amounts of capital, import technologies, and export the product in the most easily transportable form (Rea, 1976). The high costs of production in the arctic also dictate that only bonanza resource deposits will be developed. The petroleum development at Prudhoe Bay fits this description.

Prudhoe Bay development has three potential linkages with the local regional economy. The first linkage is its effect on the production of other petroleum resources in the region. The large cost of infrastructure development which is absorbed by the Prudhoe Bay development, allows smaller arctic fields near this existing infrastructure to be developed. Prudhoe Bay has changed the cost of petroleum development in the region making more resources economic (Kreitner, 1978). This will affect future development.

The remaining linkages reflect the past effect of Prudhoe Bay development on the growth of the regional economy. The second linkage concerns the employment of other regional resources, primarily labor and capital. This has been limited in the past. The final linkage is the government linkage which allows residents of the region to tax the petroleum operation and limit the flow of economic resources from the region. The next sections will describe recent changes in the North Slope regional economy in terms of these linkages.

Population Growth

Table 18 illustrates the growth of the population in the North Slope region. Total population between 1970 and 1979 has grown at a very rapid pace; population grew by 150 percent between 1970 and 1979 compared to 54 percent between 1950 and 1960 and 33 percent between 1960 and 1970. The rapid growth of the population in this recent period can be explained by the development of Prudhoe Bay.

Growth in the traditional communities over this period has been closer to the historic pattern. Barrow grew 26 percent between 1970 and 1979; 64 percent between 1960 and 1970; and 38 percent between 1950 and 1960. The other traditional communities grew 70 percent between 1970 and 1979; fell by 25 percent between 1960 and 1970; and grew by 74 percent between 1950 and 1960. The 1970-1979 population growth reversed a trend found in the 1960s of concentration in the population in Barrow. This is partly a result of the resettlement of some

TABLE 18. NORTH SLOPE REGION POPULATION GROWTH

Year	Total	Barrow	Other Traditional Communities	Prudhoe Bay and Other Industrial Areas
1950	1678	951	727	-0-
1960	2577	1314	1263	-0-
1970	3423	2152	945	326
1979	8695	2715	1606	4374
1980[1]	4199	2207	1992	-0-

[1]1980 census resident population. Excludes population working in the region with residence outside the region.

SOURCE: Table 3-1. Kruse, et al. 1981.

smaller villages in response to the Native Claims Settlement Act (1980 Census estimates show similar trends).

The population at Prudhoe Bay was a few hundred in 1970 and over 4000 in 1979. This population has fluctuated during the period as the petroleum facilities and pipelines were developed; population was estimated to be apporximately 8800 in July of 1976. This pattern is typical of resource projects with much higher employment in the development phase.

Prudhoe Bay population can be considered resident in only a very restricted sense. Prudhoe Bay is an industrial enclave with only minimal interaction with the local economy and the local population. The enclave nature of the development is a result of the lack of local infrastructure, the separation of communities, and the fixed location of the resource. The major links of the enclave are with the markets outside the region. With arrangement in worker schedules, workers can live in outside communities and only reside in the North Slope while they work. It has been estimated that less than one percent of employees at Prudhoe Bay are from the North Slope. Because of this pattern the Prudhoe Bay population contains virtually no dependents.

Table 19 shows how the demographic structure of the Eskimo population has changed. This describes the major component of the resident population. The major change is the aging of the population. The population over seventeen increased from 47 percent in 1970 to 56 percent in 1977. The aging of the high birth cohorts will continue this process

TABLE 19. NORTH SLOPE REGION DEMOGRAPHIC STRUCTURE OF NORTH SLOPE ESKIMOS (Percent of total)

	1960		1970		1977	
Age	Male	Female	Male	Female	Male	Female
< 10	22	20	17	16	11	11
11-17	7	6	10	10	11	11
18-24	5	5	6	5	8	7
25-34	9	6	5	5	10	6
35-44	5	3	5	4	5	4
45-54	3	3	3	4	4	3
55+	4	2	6	4	5	4

SOURCE: Figure 3-1. Kruse, et al. 1981.

One result will be that a large proportion of the future population will be of working age.

Employment Growth

Table 20 shows that employment growth mirrors the pattern of growth in population. (A complete analysis of employment growth is hindered by a change in reporting districts in 1974.) Total employment grew from 977 in 1970 to 5549 in 1979 (this assumes a very small annual average employment in 1970 at Prudhoe Bay). A large proportion of this employment occurs in Prudhoe. Until 1977 at least one-half of the employment in the region was at Prudhoe Bay; since then at least 40 percent of employment was in Prudhoe Bay.

Prudhoe Bay is only one of many similar enclaves in the North Slope region. The non-Prudhoe employment shown in Table 19 contains this other enclave employment. The extent of this employment can be was estimated to be about one-third of the level of Prudhoe Bay in 1980. North Slope Borough estimates population in these encalves as of July 1980 as Prudhoe Bay (3054), Alyeska Pipeline (537), NPRA (125), DEW line (144), and other petroleum exploration (114).

The extent of employment growth could be expected to generate major changes in the structure of the economy. The structure of the economy describes the relation between sectors and the local provision of goods. Tables 21 and 22 illustrate two measures of structural change.

TABLE 20. NORTH SLOPE REGION EMPLOYMENT GROWTH
(Annual average employment)

Year	Total Employment	Prudhoe Bay	Net
1970	--	--	977[1]
1975[2]	6172	3820	2352
1976	6932	4444	2488
1977	5674	2723	2951
1978	6059	2493	3566
1979	5549	2282	3267

[1]Prior to North Slope Borough formation, employment district did not include Prudhoe Bay.

[2]1975-1979 employment estimates from Alaska Department of Labor communications.

Table 21 compares the distribution of employment across industries in 1970 and 1979. If growth did not change the structure of the economy, we would expect the distribution of employment to be similar. The major change in the distribution of employment is the increased importance of the basic sectors of government and mining. These sectors increased from 46 percent in 1970 to 67 percent (excluding Prudhoe Bay employment). The employment shares seem to suggest that the support sector has expanded less rapidly than the baisc sector. In fact, the share of trade-finances-services has been reduced from 27.9 percent in 1970 to 14.9 percent of total employment in 1979.

The pattern of response in the support sector is affected by the enclave nature of much of the employment. In addition employment may not be the appropriate measure of structural change. Table 21 also shows the per capita level of support sector employment (trade-finances-services). Examining the non-Prudhoe component of the economy shows this per capita level has increased. Support sector employment grew more rapidly than the resident population over the period.

One important reason for the growth of the local support sector was the formation of the Arctic Slope Regional Corporation (ASRC) as a result of the Native Claims Settlement Act in 1971. This corporation not only provides employment directly but also influences the level of employment in the support sector through establishment of subsidiary. ASRC has provided capital for development of the local sector (McBeath, 1981).

TABLE 21. NORTH SLOPE REGION STRUCTURE OF EMPLOYMENT
(Percent of total)

Industry	1970	1979	
		Total	Net of Prudhoe
Mining	28.6	46.3	21.6
Construction	17.7	7.5	9.7
Transportation	8.8	6.4	8.5
Trade & Finance	13.4	7.0	11.5
Service	14.5	5.8	3.4
Government	16.9	27.0	45.7
Per capita support sector employment	.088	.082	.113

SOURCE: Base of Alaska Department of Labor communications.

TABLE 22. NORTH SLOPE REGION SEASONALITY INDEX*
(Percent of annual average employment)

Quarter	1970	1973	1979	
			Total	Prudhoe Bay
1	1.22	1.06	1.08	.95
2	1.04	.99	1.02	.95
3	.99	1.02	.92	1.19
4	.75	.93	.98	.91

*Seasonality index for each quarter equals the average quarterly employment divided by the annual average.

SOURCE: Derived from Alaska Department of Labor employment estimates.

Table 22 shows the seasonality of employment. Seasonality is compared in three years; 1970 and 1973 exclude Prudhoe Bay activity. The pattern of seasonality is much less in 1979 than in 1970. The pattern of seasonality does not vary significantly between 1973 and 1979. There seems to be little seasonality evident in the employment figures. This may be partly a result of complementary seasonal patterns in different mining phases: exploration, development, and production. The small size of the economy means that this pattern can be easily changed by some major activity, such as a large construction project.

Economic-Demographics Linkage

Traditionally regional population growth has been assumed to be related to the change in employment opportunities. An increase of jobs over residential labor force results in an increase in population, and population is reduced if labor force is greater than the available jobs. This pattern does not describe the growth of rural regions in Alaska. In the North Slope while the resident population (non-Prudhoe Bay) increased by forty percent between 1970 and 1979, non-Prudhoe employment increased by over two hundred percent.

Four factors make the relation between employment and population growth less direct than traditionally assumed. First, the enclave nature of employment in the region means many workers come to the region simply to work, and jobs are filled by nonresidents. The short-term nature of much of the employment in construction and resource development makes this nonresident pattern of employment possible.

The second factor is the ability to adjust labor force participation. Labor force is not a static concept; many factors influence the decision to participate. The availability of the subsistence sector provides opportunity to withdraw from the labor force and remain in the region. Another determinant of labor force participation is availability of employment. In regions with low employment opportunities many residents do not seek employment because they know no jobs are available. As jobs become available, these discouraged workers enter the labor force and eliminate the necessity to import population to fill the increased employment. Kruse, et al. (1981) describe this pattern in the North Slope region. Those in the labor force in March (census month) increased from 61 percent in 1970 to 73 percent in 1977 for men. A more dramatic increase in labor force participation was found for women; the share who were in the labor force rose from 33 percent in 1970 to 54 percent in 1977. Although many factors influence the participation in the labor force, increased job opportunities were partially responsible for the increase. This increased labor force participation explains the unequal population and employment growth in the region.

The final factor which influences the economic-demographic linkage is a function of the small size of the population and the technical skills required for mining and construction jobs. The technical nature of many of the jobs in resource development industries means that employees will be imported even though unemployed workers are in the region. By comparing the occupational distribution of non-urban

employment in the oil and gas industry in Alaska (Alaska Department of Labor, 1978) with job descriptions supplied by the U.S. Department of Labor (U.S. Labor Department, 1974), we found no more than 25 percent of the jobs could be considered unskilled or semiskilled. If clerical positions are removed, this figure would be approximately 17 percent. This illustrates the natural resource jobs available to North Slope residents may be limited.

Government Growth

The major linkage between the resource development at Prudhoe Bay and the local North Slope economy was the government linkage. The formation of the North Slope Borough in 1972 provided residents with the ability to maintain some of the income arising from petroleum production in the region through taxation of petroleum facilities. One of the main features of the Borough is that it has used the tax resources not only to provide services and public facilities but also to provide jobs. Growth of local government employment is the major determinant of economic growth in the local economy.

The North Slope Borough collects a property tax on Prudhoe Bay facilities. This tax is limited in two ways. First, the state places a 20-mill ceiling on all taxation of oil and gas property which both the state and local governments can collect. Second, the local government share of this property tax is determined by a formula determined by either population ($1500 per capita) or a formulate accounting for the average statewide per capita property assessment. As a way around

these limits G.O. bonding has been used to provide funds for capital projects, since there is no legal limit to taxation to pay debt service (McBeath, 1981).

Table 23 shows the Borough's revenues which rose from $529,000 in 1973 to $74.3 million in 1980. As the table shows, the major source of these revenues has been the property tax. The major source of these property tax revenues is from taxes on real property at Prudhoe Bay.

Table 24 shows the Borough's expenditures throughout this period. Estimated 1980 expenditures are almost one hundred times the 1973 expenditures. Using census figures, the 1980 expenditures equal $17,700 per capita. For the period between 1975 and 1979 capital expenditures accounted for the majority of the Borough's expenditures. The 1980 budget shows the beginning of what may be a new trend, the increased importance of debt service. In 1980, thirty-nine percent of the Borough's expenditures was for debt service.

Table 25 illustrates the magnitude of the Borough's Capital Improvement Program (CIP). The CIP between 1975 and 1985 will authorize the sale of $511 million in G.O. bonds. The three major components of the CIP are schools, housing, and water and sewer facilities; each of which accounts for over $100 million in projects.

TABLE 23. NORTH SLOPE REGION BOROUGH REVENUES
(Thousands of dollars)

		Source			
FY	Total	Property Tax	Sales Tax	Transfers	Miscellaneous
1973	528	79.0%	7	9.0	5.0
1974	6,143	57.8%	16.9	22.6	2.7
1975	11,719	46.9%	10.1	34.7	8.3
1976	16,634	44.5%	--	39.6	15.9
1977	29,999	63.9%	1.3	30.5	4.3
1978	45,259	60.4%	3.2	25.0	11.4
1979	59,392	71.1%	3.1	23.8	13.1
1980	74,280	65.6	2.0	18.7	8.2

SOURCE: Table 3. McBeath. 1981.

TABLE 24. NORTH SLOPE REGION BOROUGH EXPENDITURES
(Thousands of dollars)

FY	Total	Areas			
		General Government	Education	Capital Projects	Debt Service
1973	788	96.0	4.0	--	--
1974	5,845	42.7	37.3	20.0	--
1975	16,404	20.2	35.8	44.0	--
1976	40,904	13.5	16.8	65.0	4.7
1977	35,861	22.5	27.9	39.2	10.4
1978	64,771	20.0	19.1	53.4	7.5
1979	117,208	14.3	11.4	61.4	12.9
1980	74,280	33.0	22.4	5.4	39.2

SOURCE: Table 3. McBeath. 1981.

TABLE 25. CAPITAL IMPROVEMENT PROGRAM
FY 1975 to FY 1985
(Millions)

Function	G.O. Bonds Authorized and to Be Authorized
Schools	$131.6
Roads	43.7
Housing	111.7
Water & Sewer Facilities	106.6
Airports	15.9
Urban Development	3.1
Light and Power	34.2
Public Safety	13.1
Communications	1.1
Prudhoe Bay Sanitary Facilities	38.9
Health Facilities	9.4
Library/Cultural Facilities	1.7
Total	$511.0

SOURCE: Table 4. McBeath. 1981.

The creation of employment opportunities through the North Slope Borough government is one major effect of the expansion of government. Table 26 shows the growth of government in the North Slope. Total government employment in the region increased from 165-to-1498. During this period the local government increased from 19 employees in 1973 to 1183 in 1979. Federal government employment increased by 94 percent over the period, while state employment declined. The decline in state government resulted from the transfer of functions to the Borough. Borough employment consists of three major sectors, general government, school district, and CIP employees. A survey of Borough employment in 1980 found employees distributed as follows: general government - 37 percent, school district - 34 percent, and CIP - 29 percent (McBeath, 1981).

Both the operation of the Borough government and the capital improvement program create jobs, increase incomes, and strengthen the local demand for goods and services. The importance of these programs for local residents can be seen by contrasting the 14 percent of Borough residents who had worked for oil or pipeline companies in 1977 with the 57 percent who had worked for the Borough (Kruse, et al., 1981).

Income Growth

Table 27 illustrates the change in the structure of income in the region over the period. Regional personal income increased at an annual average rate of 23 percent over the period from $7.5 million in 1970

TABLE 26. NORTH SLOPE REGION GOVERNMENT EMPLOYMENT GROWTH

	Government			
Year	Federal	State	Local	Total
1970	128	---37--		165
1971	168	--114--		282
1972	173	142	19	334
1973	171	118	106	395
1974	283	86	272	641
1975	265	93	432	790
1976	239	79	573	892
1977	240	71	766	1078
1978	256	77	1140	1473
1979	248	67	1183	1498

SOURCE: Alaska Department of Labor Employment estimates.

TABLE 27. NORTH SLOPE REGION PERSONAL INCOME
(Thousands of dollars)

Year	Net Labor & Proprietors Income: Place of Work	Net Labor & Proprietors Income: Place of Residence	Transfer Payments	Personal Income
1970*	36,089	6,252	1033	7,466
1975	231,839	22,843	4986	28,415
1976	317,397	32,524	3846	37,220
1977	225,176	37,783	3862	42,600
1978	248,610	42,998	3802	47,661
1979	119,867	42,842	3971	47,794

*Old definition of North Slope region which excludes Prudhoe Bay.

SOURCE: Bureau of Economic Analysis, Personal Income Statistics.

to $47.8 million in 1979. If the cost of living in the region increased at the same rate as the Anchorage CIP (7.2 percent per year), real personal income increased at a rate of 16 percent per year.

Two major structural changes can be observed over the period. The share of labor and proprietor income created in the region which stays in the region changes significantly over the period. In 1970 eighteen percent of the income earned in the region stayed in the region; in 1979 the figure was twenty-one percent. The share of resident income was less than ten percent in 1975 at the height of Prudhoe Bay development and pipeline construction. The other structural change is the reduction in the share of transfer payments in personal income from 14 percent in 1970 to 8 percent in 1979. As employment opportunities increase in the region this trend would be expected.

Summary

The economic growth of the North Slope region has been and will continue to be determined by natural resource production. The primary determinant of growth in the recent past has been the development of petroleum resources at Prudhoe Bay. The enclave nature of development meant that the linkages between Prudhoe Bay and the local economy were less than direct. The major link was the government link; the North Slope Borough translated tax revenues from property tax at Prudhoe Bay into employment opportunities in the local economy. Future economic activity in the region wll follow a similar pattern. One major new

factor will be the involvement of the local Native corporations in the resource industries, which will increase the linkage between natural resource production and the local economy.

III. THE BASE CASE

Methodology

In this part of the report we deal with three critical elements of the base case. The first of these is the underlying methodology used to develop the base case. The second element concerns the assumption regarding the future economic activity used to develop the projections. The third is the set of projections themselves.

Impact analysis, as carried out in the present study, is based upon a comparison of sets of economic and demographic projections, where one set is the standard or base case set. The base case serves as a frame of reference against which the economic and demographic changes resulting from the proposed OCS lease sale can be measured and evaluated.

There are two components of this process that are of particular concern. First the question of the accuracy and consistency of the projections. Generally speaking, this is dependent upon the validity of the assumptions utilized regarding future economic growth of the exogenous variables and the projection methodology employed. More will be said on both of these points below.

The second concern relates to the degree of information contained in the projections. Specifically, do the projections contain the information that is necessary to adequately interpret and evaluate the impacts?

While aggregate data on economic and demographic variables generated using the projections methodology employed in this study will answer many questions, it must be recognized that there will be omissions as well.

At the root of impact analysis is the issue of how economic well-being, both individually and collectively, will be affected by the proposed action. Two major problems are associated with this process. First it is not possible to measure all impacts that will result from the lease sale. In part this is due to the volume of information that would be required and the inadequacy of the existing methodology to capture all effects at an acceptable level of cost.

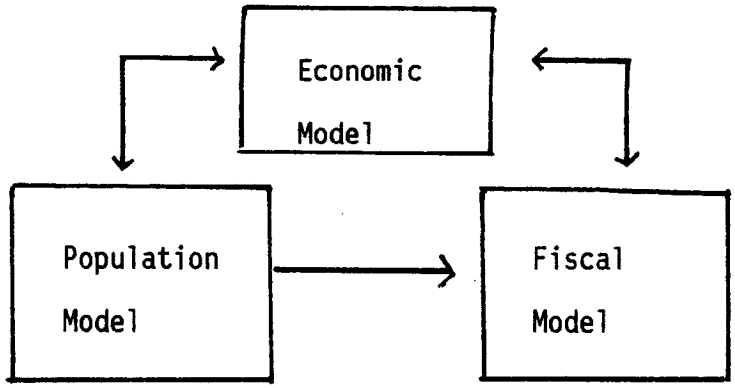
The more serious problem is that many of the effects are not measurable. While reallocation of resources within the context of the functioning of the market, in response to economic change, is desirable from the perspective of efficiency, change on the order of magnitude implied by OCS activity may also lead to situations of market failure and the presence of externalities. These are often difficult to identify and are certainly difficult to measure.

Even if these effects could be isolated they are usually inseparable from a further problem, that of income redistribution. Changes in income distribution and the relative economic position of individuals resulting from OCS activity necessarily imply that there will be losers and gainers and associated changes in economic welfare. These

are problems that involve normative economic judgments and cannot be dealt with by impact analysis alone. In short, comparative impact analysis provides only part of the information necessary for decision making.

We can now turn to a discussion of the specific methodology employed in developing the present base case projections (and associated OCS impacts projections). At the statewide and regional level two models have been utilized, the MAP statewide econometric model and the MAP regional econometric model. For documentation see Goldsmith, Man-in-the-Arctic Program: Alaska Economic Model Documentation. The MAP statewide model is actually a system of models composed of economic, fiscal, and population models. The three are interdependent, as shown schematically in Figure 3.

FIGURE 3: MAP SUBMODELS



In essence, this states that the economic model receives input from the fiscal and population models, the fiscal model receives input from the economic and population models, and the population model utilizes input from the economic models, but not directly from the fiscal model. Thus, when we talk about the economic model we are really describing the interaction of three models. To simplify things somewhat we can describe the important linkages between submodels and then consider the economic model in more detail.

The population-economic model link is the source of population estimates that are of direct interest, and reflect both natural population change and migration induced by changes in economic conditions. The population estimates are also used by the economic model for purposes of computing various per capita values for economic variables.

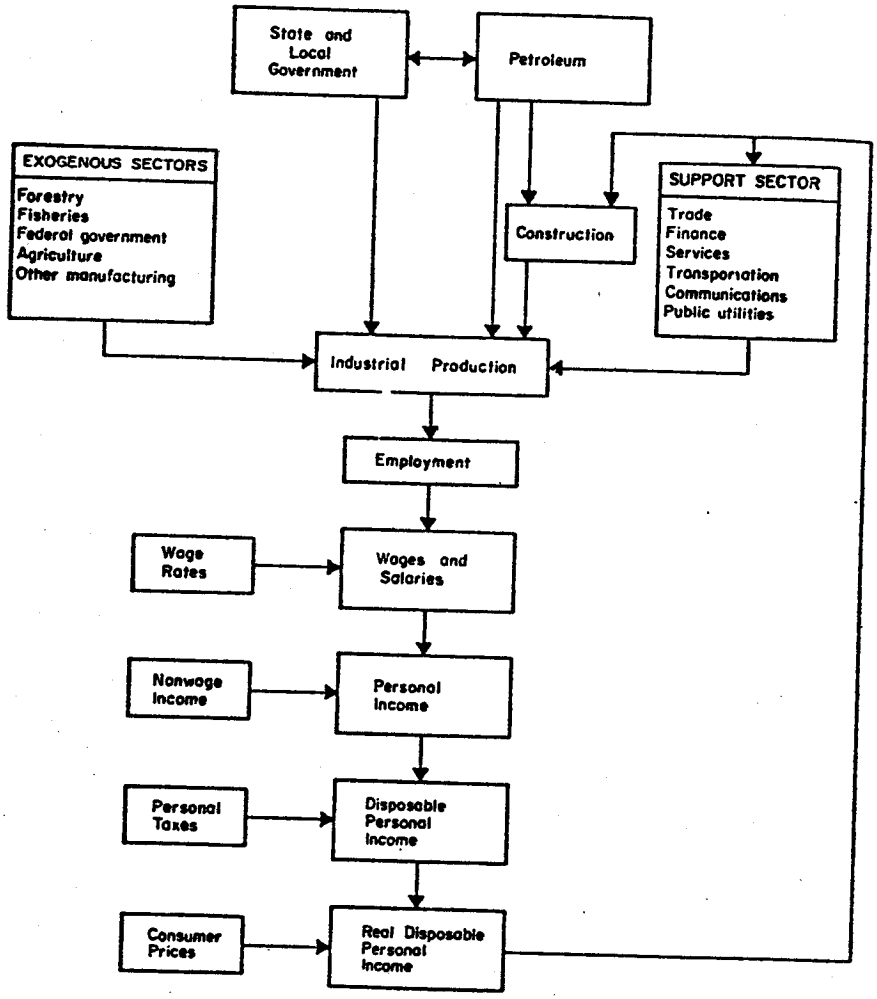
The significant link with the fiscal model relates to the role of state government expenditures as a source of major economic stimulus to the aggregate level of economic activity. In turn, state government (and local government) expenditures are dependent upon two key factors, the overall level of economic activity and the level of activity in the petroleum industry. The system allows for a variety of policy choices regarding state government spending and is one of the key points to consider in assessing economic forecasts.

We can now turn to a consideration of the economic model component of the system.

The MAP statewide and regional models belong to a class of econometric models that are known as disaggregate economic base models. In essence, economic activity is classified as either endogenous or exogenous (or basic). Exogenous activity determines the level of endogenous activity, and the specific relationships between the two components of economic activity are what make up the system of equations that are the econometric model. These models can be quite simple or rather complex, and the MAP models fall in this latter category. It is possible to get a feel for the models by considering the MAP statewide model.

As can be seen in Figure 4, determination of industrial production involves the impact of exogenous sector activity, which includes forestry, fisheries, agriculture and other manufacturing, as well as federal government wages and salaries. Other exogenous sector activity includes the petroleum industry and components of contract construction, such as major pipelines. State and local government expenditures may also be considered as exogenous for discussion purposes, although there is some interdependence between these expenditures and total economic activity. It should be noted that in constructing scenarios for forecasting or projection purposes it is primarily these exogenous variables that must be provided.

FIGURE 4. MAP STATEWIDE MODEL



SOURCE: Man-In-The-Arctic Program Alaskan Economic Model Documentation (ISER, 1979).

These exogenous variables combine with demand from the support sector and endogenous construction to generate total industrial production. Industrial production, through a series of steps, determines employment and income, and finally real disposable personal income, which in turn is a determinant of support sector and endogenous construction economic activity. This means that aggregate production depends on both exogenously determined and endogenously determined economic activity, where endogenous activity depends on total activity. As such, the system is a simultaneous equation structure.

It should also be noted that certain other variables enter the model as well. In particular, wage rates are used in determining total wage and salary payments, where the wage rates are in part dependent upon U.S. wage rates, which are determined exogenously. It should also be observed that the model is particularly sensitive to the wage rates used.

The MAP regional model is structurally similar to the statewide model except that the model is disaggregated to seven regions. (See Figure 4) This means that scenarios (or future values for exogenous variables) must be specified on a regional basis and that forecasts of endogenous variables (such as income, employment, and population) will be generated on a regional basis. Otherwise the models are similar.

The Base Case Development Scenario Excluding OCS Activity

The impact of OCS development on the economy will be measured as the change from the level of activity from the base case. The base case is defined as the level of activity which is projected to occur without the OCS lease sale of interest. This section describes the base case which will be used in this study.

A set of assumptions about the future level of various exogenous economic activity defines a development scenario. A development scenario is required to forecast the future level of activity in the economy with each model used in the analysis. There are three major types of assumptions required for a development scenario. First, the models require assumptions about the future level of national variables which directly or indirectly affect Alaska economic activity. Secondly, assumptions about the future development of the exogenous sectors of the Alaska economy are required. These assumptions can be separated into OCS and non-OCS assumptions; the major difference between the base case and the impact case is the addition to the OCS assumptions of the OCS lease sale of interest. Finally, the models require assumptions about the state government finances. These include both assumptions about state expenditure decisions and assumptions about the level of exogenous state revenues.

NATIONAL VARIABLES ASSUMPTIONS

Inasmuch as Alaska is an open economy, it is affected by changes in the national economy. Consequently, several assumptions about the future growth of the U.S. economy are required. The assumptions needed are threefold. First, a forecast of average weekly earnings in the United States is required as an input into the estimation of Alaskan wage rates. Second, the Alaskan price level is tied in part to the national price level so that a forecast of the U.S. consumer price index is needed. Finally, inasmuch as a major determinant of migration to Alaska is the income differential between Alaska and the lower 48, a forecast is required of real per capital disposable income in the United States.

The long-run assumptions for these national variables are based on long-term forecasts prepared by Data Resources, Inc., in their September 1979 forecast of U.S. economic activity (TRENDLONG0979). This forecast predicts a long-run average rate of increase in the U.S. consumer price index of 8.85 percent through 1990. A rate of 8.3 percent (the 1990 value) is used for the 1991-2000 period. Real disposable per capita income is forecast to increase at a 3.38 percent average annual rate. Hourly earnings are forecast to increase at 10.2 percent, while average hours worked are forecast to decline slowly at -0.23 percent.

Consequently, average weekly earnings may be expected to grow at an annual rate of 9.97 percent (i.e., 10.2 percent minus 0.23 percent).

These long-term average growth rates were adopted as the three national variable assumptions utilized in the analysis.

THE ECONOMIC SCENARIOS

The economic scenarios consist of time series on employment and output in certain export base or exogenous industries. This does not mean that we are predicting that all or any of these events will occur since there is a highly variable degree of uncertainty with respect to the levels and timing of the events in these scenarios. What it does mean is that with a certain degree of probability, we expect the general level of economic activity to follow this scenario. We assume that there is a medium probability that the level of activity will be at least as great as that described by this scenario.

The major exception to this important assumption is related to the exogenous series in fisheries-related activity. These series were developed by Sea Grant and Earl Combs, Inc., under contract with the BLM/Alaska OCS Office. The components related to bottomfishing, in the opinion of the ISER staff, are greatly in excess of what can reasonably be expected to actually occur. To the extent that these series do in fact turn out to be too high, then the aggregate projections will also be high and the probability that they will be achieved must necessarily be reduced. Since we have been specifically instructed to use the series by the Alaska OCS Office we have done so, but we are not in agreement with the assumptions.

Primarily as a result of the uncertainty attached to the occurrence, magnitude, and timing of any particular event, agreement about particular scenarios is hard to achieve even among those most knowledgeable about the Alaska economy. Emphasizing our concern mainly with general levels of activity, the probabilistic nature of the specific scenario should reduce the disagreement. In an attempt to reduce even further the disagreement, the scenario was developed based upon existing scenarios which have attained some measure of consensus. The most important source for these scenarios were the scenarios developed in the Level B Southcentral Water Study (Scott, 1979) and the Susitna Dam feasibility study (Goldsmith and Huskey, 1980). The major exception is the series related to bottomfishing activity, as commented upon above.

The economic scenario is described in Table 28. The assumptions are described below; these discussions are organized by industry.

Mining

Currently, the mining sector in Alaska is dominated both in employment and output by the petroleum industry. This is assumed to continue in the future.

The scenario includes production at Prudhoe Bay and in the Upper Cook Inlet. Production from the Sadlerochet formation at Prudhoe is assumed to include both primary recovery and secondary recovery using water flooding. Development of the water flooding facilities begins in 1982.

The Kuparak formation is also assumed to be developed with production rising to 120,000 barrels per day by 1984. Employment associated with these developments peaks in the early 1980s with the development of Kuparak and the water flooding project. Upper Cook Inlet employment is assumed to remain at its existing level throughout the projection period. This assumes a rising level of exploration, development, and production of gas in the Kenai fields which would replace employment lost because of declining oil production. Also included is exploration, development, and production in NPRA, beginning in 1985.

TABLE 28. SCENARIO ECONOMIC ASSUMPTIONS

Special Projects	Description	Dates & Employment	Location	Source
Trans-Alaska Pipeline	The construction of the TAPS was completed in 1977. Additional construction of four pump stations is assumed as well as pipeline operations.	1979-1982 - Pump station construction of 90/year 1977-2000 - Operations employment of 1500/yr.	Operations employment allocated: 1/3 to Southcentral 1/3 to Fairbanks 1/3 to N. Slope	E. Porter, Bering-Norton Statewide-Regional Economic and Demographic Systems, Impact Analysis, Alaska OCS Socioeconomic Studies Program, Bureau of Land Management, 1980.
Northwest Gasline	Construction of natural gas pipeline from Prudhoe Bay which includes construction of an associated gas conditioning facility on the North Slope.	1982-1986 - Construction peak employment of 10,589 (1985) 1986-2000 - Operations begin employing 200 petroleum and 119 transport workers	2/3 of pipeline construction and transportation employment in Fairbanks. 1/3 in North Slope. All gas conditioning employemnt in North Slope.	Mogford and Goldsmith, 1981 (Forthcoming)
Prudhoe Bay Petroleum Production	Primary recovery from Sadlerochit formation, secondary recovery using water flooding of that formation and development of the Kuparuk formation.	1982-1984 - Construction of water flooding project peak employment of 2,917 (1983) 1980-2000 - Mining employment long-run average of 1,802/year	All in North Slope	E. Porter, 1980.
Upper Cook Inlet Petroleum Production	Employment associated with declining oil production is assumed to be replaced by employment associated with rising gas production maintaining current levels of employment.	1980-2000 - Mining employment of 705/year	All in Southcental region	E. Porter, 1980

TABLE 28. SCENARIO ECONOMIC ASSUMPTIONS (cont.)

Special Projects	Description	Dates & Employment	Location	Source
Beluga Coal Production	Moderate development of Beluga coal resource for export.	1985-1990 - construction - peak employment of 400 (1987) 1988-2000 - operations employment of 210/year long-run average	Located in Southcental region	Pacific Northwest Laboratory, Beluga Coal Field Development: Social Effects and Management Alternatives, 1979.
Pacific LNG Project	Construction of current proposal by Pacific LNG	1982-1985 - Construction peak employment of 1,323/year (1984) 1986-2000 - Operations employment of 100/yr.	Located in Southcentral region	E. Porter, 1980.
Petrochemical Development	Development includes refinery and petrochemical facility using states royalty has as feed stock.	1984-1986 - construction employment of 2400/year 1987-2000 - operations employment 1118/year	Southcentral	Based on modifed Alpetco proposal (E. Porter, 1980) and J. Kruse, Fairbanks Petrochemical Study, 1978.
Susitna Project	Construction of two dams on the Susitna River for a major hydroelectric project.	1984-1998 - construction peak employment 1414 (1992). 1991-2000 - operations employment 19 per dam.	Southcentral	E. Porter, 1980.
National Petroleum Reserve in Alaska	Petroleum production in NPRA. Production in five fields with a total reserve of 2.5 billion bbls equivalents of oil and gas. Construction of 525 miles of pipeline.	Leases held between 1983-1990. Development and exploration begins in 1985. Average mining employment of 460/year.		Based on mean scenario under Management Plan 2 in Office of Minerals Policy and Research Analysis, U.S. Department of Interior, Final Report of the 105(b) Economic and Policy Analysis, 1979.
Bradley Lake	Construction of hydroelectric facility	1981-1985 - construction - peak employment of 300 (1983) 1986-2000 - operations employment (10)	Southcentral	

TABLE 28. SCENARIO ECONOMIC ASSUMPTIONS (cont.)

Industry Assumptions	Description	Dates & Employment	Railbelt Location	Source
Fisheries/Food Processing	Small increase in employment in traditional fishery. Major expansion of domestic groundfish industry. Expansion to replace foreign fishery in the 200 mile limit by 2000.	Fishery employment expands to 9638 by 2000 (resident). Processing employment expands to 10,420 by 2000 (resident).	Resident regional employment in year 2000: F / P Southcentral 2658/2405 Southeast 1376/538 Northwest 57/17 Southwest 5547/7306 Anchorage 0/154	Sea Grant, 1980; Earl Coombs, Inc., memo to OCS; OCS.
Forestry/Pulp and Paper Manufacturing	Employment expands to accommodate 960 million board feet of lumber.		Approximately 11% of activity in Fairbanks region. Remainder in Southeast.	M. Scott, 1979.
Other Manufacturing	Expansion of existing manufacturing of locally consumed goods.	Growth of output at 4% per year.	Regional distribution based on existing distribution of employment.	
Federal Government	Civilian employment assumed to grow at recent historical rate. Military declines at 0.05%	Civilian employment grows at 1.0%/year	Existing regional distribution.	M. Scott, 1979.
Other Mining	No expansion of existing nonspecial projects.	Employment constant at 1979 level, 2,350/yr.	Regional allocation constant	
Agriculture	Assumes that a relatively low priority is given to agriculture development because of priorities for recreation and wilderness or the lack of markets.	Employment grows to 1,037 by 2000.	71% of growth located in Fairbanks region and 29% in Southcentral region. Other regions remain the same.	M. Scott, 1979.

In addition to the petroleum development, some other mining is assumed to take place. Development of the Beluga coal resources is assumed. In this scenario, coal is assumed to be produced for export.

The special projects described above do not exhaust the mining employment in the state. Additional employment occurs in the exploration, development, and production of nonpetroleum minerals, as well as a major component of headquarters employment in Anchorage. Market forces and governmental policies are assumed to be such that this component of mining remains constant.

Agriculture-Forestry-Fisheries

This industry is, in reality, three distinct subindustries which represent Alaska's renewable resource industries. Of the three, the fishing industry is currently the largest in terms of both employment and value of product. Agriculture is currently only a marginal industry employing few people statewide (Scott, 1979). Current state efforts to develop agriculture may lead to its increased importance in the future. Forestry consists of only a small component; the future of forestry is most appropriately discussed with the future of lumber and wood products manufacturing.

The future of agricultural development in the state depends importantly on governmental policies and actions. State and federal land policies, infrastructure development and loan programs, and marketing programs will determine the future of this industry. Agriculture is assumed to rise only slightly from its current levels of employment. This assumes that agriculture receives low priorities from government.

Fisheries also hold promise for the future. The major determinant of future increases in fisheries employment will be the expansion of the Alaska bottomfish industry. The creation of the 200-mile limit may support increased Alaska bottomfish activity.

The fishing industry is assumed to undergo a rapid expansion in this scenario. Total resident employment in fisheries grows at 8.0 percent per year over the projection period, while employment in processing expands at 13.3 percent. This growth results primarily from the development of the bottomfish industry. The domestic fishery is assumed to completely replace the foreign fishery operating within the 200-mile limit by 2000 and expand to catch the allowable biological catch (Sea Grant, 1980; Earl Combs, Inc. memo to BLM/AK OCS Office, and BLM/AK OCS Office). We would state again that we feel that the bottomfish projections are substantially over optimistic and we are using them at the instruction of the BLM/AK OCS Office.

Not all fishery-related employment is assumed to have full economic impact on the state and regional economy. Boats and crews may be from outside and only fish Alaska waters; these crews have limited impact on the economy. Processing employees are also often brought in from outside the state and live in enclaves having little effect. For this reason, the resident share rather than total employment has been used. Table 29 provides estimates for 1980, 1990, and 2000.

TABLE 29 RESIDENT EMPLOYMENT IN FISHERIES

Harvesting

Year	Aleutians	Rest of the Southwest	Northwest	Southeast	Southcentral	Anchorage	Total
1980	388	642	57	1259	1164	0	3510
1990	1141	642	57	1301	1303	0	4444
2000	4905	642	57	1376	2658	0	9638

Processing

Year	Aleutians	Rest of the Southwest	Northwest	Southeast	Southcentral	Anchorage	Total
1980	175	32	21	225	359	39	851[a]
1990	1394	65	21	420	503	53	2456
2000	7208	98	17	538	2405	154	10420

SOURCE: See text.

[a]The 851 resident employees represent between 12 and 14 percent of total statewide processing employment in 1980. Although this resident share seems small, the data that is available suggest that in some areas the share of resident processing employment is considerably smaller. For example, in the Aleutian Islands Census Division, Tuck (1981) estimates that only 10 percent of the processing jobs were helds by residents. (See Technical Report No. 57, St. George Basin Petroleum Development Scenarios Economic and Demographic Analysis, Alaska Outer Continental Shelf Office, 1981, pp. 48-50.)

In their discussion of processng activity, Terry, Scoles, and Larson (1980) indicate that ". . . imported labor from other areas of Alaska and Seattle is essential for the operation of many (processing) facilities. . ." in western Alaska. (See Technical Report No. 51, Western Alaska and Bering-Norton Petroleum Development Scenarios Commercial Fishing Industry Analysis, Alaska Outer Continental Shelf Office, 1980, p. 322.)

In southcentral Alaska we assume that the resident share increases from 40-to-60 percent over the projection period. This estimate is based on the existing distribution of resident employment in southcentral; Kodiak: 50 percent, Seward: 25 percent, and Cordova: 40 percent (Technical Report 51).

For the Aleutians and part of Southcentral (Kodiak) the figures were supplied by OCS, for bottomfishing. The remainder of traditional and bottomfishing total employment projections, by region, were obtained from Sea Grant (1980). Residency adjustments were developed utilizing residency factors in Rogers (1980) and are based upon residence of fishermen, by type of gear, and fishing in each of the regions. Projections for processing were similarly developed.

Federal Government

Federal government employment has always been an important component of Alaska's economy. In recent years, federal government employment has been growing very little; increases in civilian employment have been offset by decreases in military employment. Low rates of growth in federal government employment are assumed to occur. Civilian employment grows at about 1 percent per year, while military employment declines at 0.05 percent per year.

Manufacturing

The manufacturing industry in Alaska has four important components: seafood processing, lumber-wood products-pulp, petrochemicals, and manufacturing for the local economy. Production of seafood processing is expected to continue to dominate the food processing industry in Alaska; growth of this industry was based on projections provided by Sea Grant to SESP (Sea Grant, 1980 and OCS, as explained above).

The growth of the lumber-wood-paper-pulp sector of manufacturing in the state is determined primarily by two factors. These are the Forest Service allowable annual cut and the Japanese market conditions. Growth in lumber-wood-paper-pulp reflect an increase in annual-allowed cut by half the 1970 level over the period.

The petrochemical industry in Alaska currently consists of the developments in Kenai. The petrochemical industry expands with the construction of the Pacific LNG facility as currently planned and the development of a petrochemical facility which uses the state's royalty oil and gas. The petrochemical complex is assumed to use the state's royalty gas, to produce ethylene or fuel-grade methanol, as well as include a fuels refinery as defined by ALPETCO. Although no major proposal like this is currently proposed, interest in such a project has currently been expressed by major international firms.

The final component of the manufacturing industry consists of those industries producing for local consumption and other diverse specialized production. It was assumed that this sector would grow because of increased market size, allowing scale economies which make local production viable. This sector was assumed to grow at 4 percent per year.

Transportation

The exogenous portion of the transportation industry is that which serves special projects. This industry includes the operations employment for TAPS and the Northwest gasline.

Construction

The final exogenous industry for which scenarios are required is that portion of the construction industry where the level is determined outside the economy. This sector includes construction employment associated with the special projects described above. This sector does not include capital improvement projects of any level of government or construction activity which supports the local economy; the remainder of construction activity is determined endogenously in the MAP model. The major development of special projects occurs in the early part of the projection period. The most important project during this period is the construction of the Northwest gasline which is assumed to begin in 1982. The construction of the petrochemical facility is assumed to begin in 1984. An additional major construction project is the construction of the Susitna Hydro Project which begins in 1984. Construction of the bottomfish processing facilities projected also increase employment. It is assumed that it will require 40-man years to build a processing plant (conversation with industry sources).

PETROLEUM REVENUE ASSUMPTIONS

Petroleum revenues to the state consist of royalties, production taxes, property taxes, the corporate income tax, and miscellaneous revenues.

Royalties and Production Taxes

Royalties and production taxes arise from three sources--those associated with production of oil and gas from Upper Cook Inlet, those associated with existing and planned production at Prudhoe Bay and

vicinity, and the revenues expected from state-owned properties in the Beaufort Sea. Royalties are calculated as 12.5 percent of wellhead value (net of field costs for oil), while production taxes are levied as a fraction of nonroyalty value, with the rate dependent upon the productivity of the average well in the field.

Upper Cook Inlet. Because assumptions as to future development around Upper Cook Inlet do not vary in any of the cases to be examined and because such revenues are small relative to other sources, revenue estimates for Upper Cook Inlet are taken directly from Alaska Department of Revenue forecasts, as shown in Tables 30 and 31.

Prudhoe Bay Revenues. Because of its size and its relevance to other assumptions made in both the base case and possibly the OCS scenarios, Prudhoe Bay revenues are estimated directly rather than taken from Alaska Department of Revenue computations. To arrive at such estimates, estimates of production and wellhead value are needed. Production estimates are those derived by simulations of reservoir behavior by the Alaska Division of Oil and Gas Conservation for the Department of Revenue. Wellhead value of oil is derived explicitly from the following assumptions:

- West coast market price is $25.10 per barrel in FY 1980. Real market price is assumed to remain constant throughout the forecast period.
- Tanker costs from Valdez to the West Coast are $1/bbl in FY 1980. These costs remain constant in real terms through 2000.

- Field processing and gathering costs are 75¢/bbl in FY 1980, also remaining constant in real terms through 2000.

- TAPS pipeline tariff is assumed to be $5.25 in FY 1980. The nominal tariff is assumed to remain constant through 1990 when increased operating costs are assumed to dominate decreasing capital costs. After 1990, the tariff remains constant in real terms.

Wellhead value of gas is derived by the following assumptions:

- Under the interim rules of the Natural Gas Policy Act of 1978, the ceiling price of Prudhoe gas as of December 1, 1978, is $1.63 per MMBTU, or $1.78 per MCF. Since recent sales by Exxon (OGJ, 4/2/79) reflect this ceiling, the ceiling price, kept constant in real terms, is assumed throughout the period.

- Prudhoe Bay gas must be treated in a conditioning plant, at a cost of 80$/MCF which, according to recent rulings by FERC, will be deducted from the ceiling price received by producers for the gas. This cost remains constant in real terms.

Production taxes are computed as follows. The production tax is a fraction of nonroyalty value, with the fraction dependent on the productivity of the average well in the field. The tax rate on oil is assumed to equal 12 percent through 1989, after which the rate falls to 11 percent. For gas, the 12 percent rate is assumed throughout the period. Production tax estimates are shown in Table 30.

Royalties for oil are computed as 12.5 percent of the value of production net of field costs; while for gas, royalties are 12.5 percent of wellhead value received by the producer. Royalty estimates are shown in Table 31.

TABLE 30. STATE PRODUCTION TAX REVENUES
(Millions of Current Dollars)

Year	Upper Cook Inlet[1]		Prudhoe Bay[2]		Beaufort Sea[2]		Total
	Oil	Gas	Oil	Gas	Oil	Gas	
1980	12.1	10.3	1087.23	0.0	0.0	0.0	1109.63
1981	16.1	11.4	1261.06	0.0	0.0	0.0	1288.56
1982	25.4	11.9	1430.76	0.0	0.0	0,0	1468.06
1983	28.8	12.2	1575.85	0.0	0.0	0.0	1616.85
1984	32.2	13.0	1739.00	0.0	0.0	0.0	1784.20
1985	24.8	18.3	1915.69	113.68	0.0	0.0	1978.79
1986	19.9	19.6	2108.43	123.502	0.0	0.0	2271.43
1987	15.0	19.6	2318.86	134.172	0.0	0.0	2487.63
1988	10.4	19.7	2547.13	145.765	0.0	0.0	2723.00
1989	6.0	20.1	2768.96	158.359	37.847	1.193	2992.46
1990	2.3	21.1	2644.98	172.04	110.775	3.535	2954.73
1991	0.0	21.5	2663.14	186.905	162.657	5.249	3039.45
1992	0.0	22.3	2526.4	200.053	180.191	5.702	2939.65
1993	0.0	21.5	2413.44	220.597	195.984	6.195	2857.72
1994	0.0	22.4	2243.77	239.656	213.158	6.73	2725.71
1995	0.0	22.8	2084.84	260.362	227.619	7.312	2602.93
1996	0.0	22.8	1942.14	282.857	242.975	7.749	2498.52
1997	0.0	22.8	1802.06	307.295	259.271	8.209	2399.64
1998	0.0	22.8	1669.55	333.845	260.287	8.232	2294.71
1999	0.0	22.8	1539.30	362.689	253.591	7.949	2186.43
2000	0.0	22.8	1416.57	394.025	243.724	7.827	2084.95

[1]From Alaska Department of Revenue, Petroleum Production Revenue Forecast, September 1979.

[2]1979-81 from Alaska Department of Revenue, op. cit.; thereafter, calculated as explained in text.

TABLE 31. STATE ROYALTY REVENUES
(Millions of Current Dollars)

Year	Upper Cook Inlet[1]		Prudhoe Bay[2]		Beaufort Sea[2]		Total
	Oil	Gas	Oil	Gas	Oil	Gas	
1980	29.9	6.4	1240.34	0.0	0.0	0.0	1276.64
1981	36.4	7.4	1440.2	0.0	0.0	0.0	1484.00
1982	81.3	8.0	1635.54	0.0	0.0	0.0	1724.84
1983	96.1	9.5	1802.89	0.0	0.0	0.0	1908.49
1984	116.9	10.8	1991.01	0.0	0.0	0.0	2118.71
1985	114.8	16.3	2194.73	135.334	0.0	0.0	2461.164
1986	113.2	17.1	2416.95	147.026	0.0	0.0	2694.276
1987	111.7	17.6	2659.55	159.729	0.0	0.0	2948.579
1988	107.8	18.5	2922.72	173.529	0.0	0.0	3222.549
1989	104.4	19.2	3178.59	188.522	43.446	1.42	3535.578
1990	99.7	20.1	3313.53	204.81	127.209	4.208	3769.557
1991	96.0	20.7	3336.43	222.506	186.797	6.248	3868.681
1992	91.4	21.5	3167.77	241.73	206.942	6.788	3736.130
1993	87.3	22.1	3023.86	262.615	225.089	7.375	3628.339
1994	83.5	23.0	2811.4	285.305	244.824	8.012	3456.041
1995	87.8	23.6	2612.36	309.955	261.444	8.704	3303.863
1996	92.8	23.6	2433.65	336.734	279.092	9.226	3175.102
1997	92.8	23.6	2258.21	365.828	297.823	9.772	3048.033
1998	92.8	23.6	2092.24	397.435	299.001	9.8	2914.876
1999	92.8	23.6	1929.09	431.773	291.321	9.464	2778.048
2000	92.8	23.6	1775.36	469.078	279.997	9.317	2650.152

[1]From Alaska Department of Revenue, Petroleum Production Revenue Forecast, September 1979.

[2]1979-81 from Alaska Department of Revenue, op. cit.; thereafter, calculated as explained in text.

Beaufort Sea Revenues. Beaufort Sea revenues are calculated as in the Prudhoe case, with one exception--namely that an additional 60¢ per barrel for oil and 15¢ per MCF for gas are subtracted from wellhead value, representing additional transport costs from offshore areas. Furthermore, it is assumed that only 50 percent of such production falls under state ownership. Royalty and production tax estimates are shown in Tables 30 and 31.

Property Tax Revenues. The state levies a 20 mill property tax on certain categories of oil and gas property within the state such as seismic equipment, drilling rigs, wells, platforms, pipelines, pump stations, and terminal facilities. Estimates of theses revenues are shown by development in Table 32.

Corporate Income Tax Revenues. In 1978, the state passed new legislation levying a 9.4 percent tax on net income from oil and gas production and transportation in the state. While no detailed modeling of this tax has yet been done by the Department of Revenue, currently available estimates through FY 1981 project such revenues to be about 10 percent of the level of estimated production taxes and royalties. It is assumed that this relationship continues to hold throughout the forecast period (see Table 33).

STATE FISCAL POLICY ASSUMPTIONS

Past studies of the Alaskan economy conducted within the Man-in-the-Arctic Program, the OCS Studies Program, and other miscellaneous programs have indicated repeatedly the key role of state government

TABLE 32. STATE PETROLEUM PROPERTY TAX REVENUES
(Millions of Current Dollars)

Year	TAPS	ALCAN	Lower Cook Inlet OCS I	Beaufort Sea I	Northern Gulf OCS	Bering-Norton	Lower Cook Inlet OCS II	St. George	Total
1980	187.929	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.929
1981	193.714	0.0	0.0	0.3	0.0	0.0	0.0	0.0	194.014
1982	199.299	0.0	0.0	0.4	0.0	0.0	0.558	0.0	200.257
1983	204.622	0.0	0.0	0.7	0.0	0.128	0.576	0.0	206.026
1984	209.611	0.0	19.7	0.7	0.0	0.135	0.594	0.0	230.740
1985	214.184	0.0	19.7	0.8	0.0	0.141	2.381	0.0	237.206
1986	218.251	133.168	19.6	3.0	0.1	0.148	25.199	0.0	399.466
1987	221.709	137.506	19.4	6.2	2.0	14.73	26.737	8.309	436.591
1988	224.442	141.739	19.2	11.0	2.4	36.581	27.562	26.68	489.604
1989	226.322	145.826	18.9	16.2	7.8	49.781	28.358	76.327	569.514
1990	227.203	149.721	18.6	18.5	7.8	58.392	29.116	101.089	610.421
1991	226.923	153.371	18.1	20.7	7.8	61.177	29.825	106.009	623.905
1992	225.303	166.717	17.5	22.1	7.8	64.009	30.474	111.025	634.928
1993	222.141	159.693	16.8	24.2	7.8	66.873	31.049	116.116	644.672
1994	217.214	162.223	15.9	26.4	7.7	69.753	31.536	121.258	651.984
1995	210.271	164.223	14.9	27.6	7.7	72.633	31.917	126.422	655.666
1996	201.038	165.598	14.0	28.0	7.5	75.489	32.175	131.573	655.370
1997	189.207	166.243	13.0	28.0	7.4	78.297	32.287	136.67	651.104
1998	174.438	166.039	12.0	27.8	7.2	81.026	32.23	141.666	642.399
1999	156.354	164.853	11.0	27.5	7.0	83.642	31.978	146.505	628.832
2000	134.539	162.54	10.0	27.1	6.7	86.106	31.501	151.122	609.608

Table 32 Notes

The TAPS and ALCAN property tax base for each period was calculated by deducting depreciation in the current period from last period's depreciated cost. Petroleum property tax revenues for the remaining OCS projects were calculated in a similar fashion from data provided by the Alaska OCS Office.

TABLE 33. CORPORATE INCOME TAX REVENUES
(Millions of Current Dollars)

Year	Upper Cook Inlet OCS I	Prudhoe Bay	Beaufort Sea I	Total
1980	5.87	232.757	0.0	238.627
1981	7.3	270.126	0.0	277.256
1982	12.66	306.63	0.0	319.290
1983	14.66	337.875	0.0	352.535
1984	17.29	373.001	0.0	390.291
1985	17.42	438.094	0.0	455.514
1986	16.98	481.927	0.0	498.907
1987	16.39	529.771	0.0	546.161
1988	15.64	581.673	0.0	591.313
1989	14.97	632.439	8.413	655.822
1990	14.32	636.792	24.64	675.752
1991	13.82	644.434	36.194	694.448
1992	13.52	617.999	40.07	671.589
1993	13.09	596.226	43.581	652.897
1994	12.89	562.548	47.4	622.838
1995	13.42	531.679	50.646	595.745
1996	13.92	504.891	54.051	572.862
1997	13.92	479.155	57.663	550.738
1998	13.92	455.625	57.888	527.433
1999	13.92	433.149	56.383	503.452
2000	13.92	412.96	54.235	481.115

SOURCE: See text.

fiscal policy as a major determinant of both historical and future state economic growth.

Over the period of study state government will receive revenues from oil development which far exceed current levels of expenditure. The rate at which the government chooses to spend these revenues (or to offset existing revenue sources with them) will serve to determine not only direct employment in the government sector but, through the multiplier effects of such expenditures or tax reductions, will have impacts on all endogenous sectors, affecting the growth of employment, income, prices, and migration into the state.

Two factors affect the current framework in which state fiscal policy will be determined. First, revenues have already overtaken expenditures as a consequence of the onset of production from Prudhoe Bay and will continue to increase as a consequence of both increased production and price increases. Second, the establishment of the Permanent Fund, as a constitutional amendment in 1976, places constraints on the use of certain petroleum revenues. It requires that a minimum of 25 percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments, and bonuses received by the state be put in the fund.

These changes in the structure of state spending limit the usefulness of past fiscal policies in determining the fiscal policy rules to be used. The rate of state expenditures, because it is a matter of policy

choice within this new framework, cannot be modeled simply from past experience. Past experience can, however, provide qualitative guidance in formulating hypothetical fiscal policy options for use in simulation. First, we can expect that, as in the past, increasing levels of economic activity generate new demands for government services. As prices and population rise, increased expenditure is required to simply maintain services at a constant level. In fact, however, this level will be expected to rise over time if historical trends continue.

Secondly, historical data gives at least some indication of state fiscal policy response to surplus petroleum revenues. The revenues generated by the Prudhoe Bay lease sale in FY 1970 led to a rapid jump in both the level and growth of nominal and per capita expenditures, with nominal expenditures jumping from an average growth of 8.9 percent annually prior to the sale to an average 19.7 percent after the sale; and real per capita expenditures jumped from 2.3 percent prior to the sale to 7.7 percent after the sale.

If these qualitative features carry over into future fiscal responses to surplus petroleum revenues, future real per capita expenditures can be expected to rise within the bounds set by revenue quantities and statutory constraints. At a minimum, the state might choose simply to maintain real per capita expenditures at their current levels. At a maximum, it could choose to spend all but 25 percent of restricted petroleum revenues as they are incurred. Unfortunately, the range of

possibilities within these brackets is very large. While it is foolish to try to anticipate the actual fiscal policy choices of the state, it is possible to simulate each of the extremes. As a compromise, for purposes of simulation, a middle-range policy can then be selected. This is the strategy followed here.

The mid-range forecast used in the base case was developed as follows. First, exogenous petroleum revenues were estimated. The petroleum revenues used in this forecast were based on the most recent Petroleum Production Revenues Forecast which is prepared quarterly by the Alaska Department of Revenue. Next, two forecasts were made, one in which real per capita state government expenditures are maintained at existing levels and a second in which only the legislated minimum is saved. These cases provide the extremes. A path of growth in state expenditures which is midway between these extremes was chosen to use in the base case. The result was a growth rate of 14 percent in nominal state government expenditures.

OCS Activity in the Base Case

Base case employment in construction, transportation, and mining increases through the cumulative effect of several OCS lease sales that have taken place and are scheduled to occur prior to sale 71. These include:

Existing

- Lower Cook
- Beaufort Sea (Joint state/federal)

Scheduled

- Northern Gulf (Sale 55)
- Lower Cook Inlet (Sale 60)
- Bering-Norton (Sale 57)
- St. George (Sale 70)

The timing, amount, and residency location of employment for each of the above lease sales are shown in Table 34. In general, the bulk of OCS employment in the base case occurs in the mid-to-late 1980s and early 1990s. Over half of OCS employment is assumed to reside in Anchorage. The remainder is distributed in diminishing amounts between southcentral Alaska and Fairbanks, with a small proportion residing in the immediate vicinity of the leased tracks for each case.

As shown in Figure 5 OCS base case employment represents about one-third of total exogenous employment in the mining, transportation, and construction industries combined.

The figures in Table 34 and Appendix A have been adjusted to net out nonresident OCS employees that live in enclaves for the duration of their work task. Nonresident (enclave) OCS employment refers generally to offshore, temporary, and specialized work such as offshore drilling crews for exploration and construction crews during field development. Further, we assume that offshore and specialized labor is

TABLE 34. OCS LEASE SALES IN BASE CASE SCENARIO

OCS Lease Sale	Year of Sale	Employment Schedule	Residency Location (Approximate)
Cook Inlet	1977	Operations: 1978-2000+ Median: 958 Peak: 1392 in 1987	14 percent Anchorage 86 percent Southcentral
		Construction: 1982-1986 Peak: 351 in 1985	100 percent Southcentral
		Transportation: 1978-2000+ Median: 165	100 percent Southcentral
Beaufort Sea (Joint Federal/State)	1980	Operations: 1981-2000+ Median: 213 Peak: 281 in 1990	66 percent Anchorage 16 percent Southcentral 18 percent Fairbanks
		Construction: 1981-1996 Peak: 124 in 1982-83	60 percent Anchorage 18 percent Southcentral 22 percent Fairbanks

TABLE 34

OCS Lease Sale	Year of Sale	Employment Schedule	Residency Location (Approximate)
Northern Gulf (Sale 55)	1980	Operations: 1981-2000+ Median: 310 Peak: 343 in 1991	10 percent Anchorage 90 percent Southcentral
		Construction: 1984-1988 Peak: 98 in 1987	100 percent Southcentral
		Transportation: 1981-2000+ Peak: 107 in 1990-91	100 percent Southcentral
Lower Cook (Sale 60)	1981	Operations: 1982-2000+ Median: 430 Peak: 430 in 1991	12 percent Anchorage 88 percent Southcentral
		Construction: 1982-1987 Peak: 299 in 1986	100 percent Southcentral
		Transportation: 1982-2000+ Peak: 443 in 1991	100 percent Southcentral

TABLE 34

OCS Lease Sale	Year of Sale	Employment Schedule	Residency Location (Approximate)
Bering-Norton (Sale 57)	1982	Operations: 1983-2000+ Median: 684 Peak: 776 in 1989	78 percent Anchorage 18 percent Southcentral 4 percent Nome-Kobuk
		Construction: 1983-1990 Peak: 654 in 1988	48 percent Anchorage 14 percent Southcentral 38 percent Nome-Kobuk
		Transportation: 1983-2000+ Peak: 290 in 1990-91	59 percent Anchorage 16 percent Southcentral 25 percent Nome-Kobuk
St. George (Sale 70)	1982	Operations: 1983-2000+ Median: 871 Peak: 951 in 1993	80 percent Anchorage 17 percent Southcentral 3 percent Southwestern
		Construction: 1983-1990 Peak: 1165 in 1987	76 percent Anchorage 21 percent Southcentral 3 percent Southwestern
		Transportation: 1983-2000+ Peak: 880 in 1989	28 percent Anchorage 8 percent Southcentral 64 percent Southwestern

NOTE: See Appendix A for detailed employment series by industry (mining, construction, and transportation) for each lease sale.

SOURCE: Alaska OCS Studies Office.

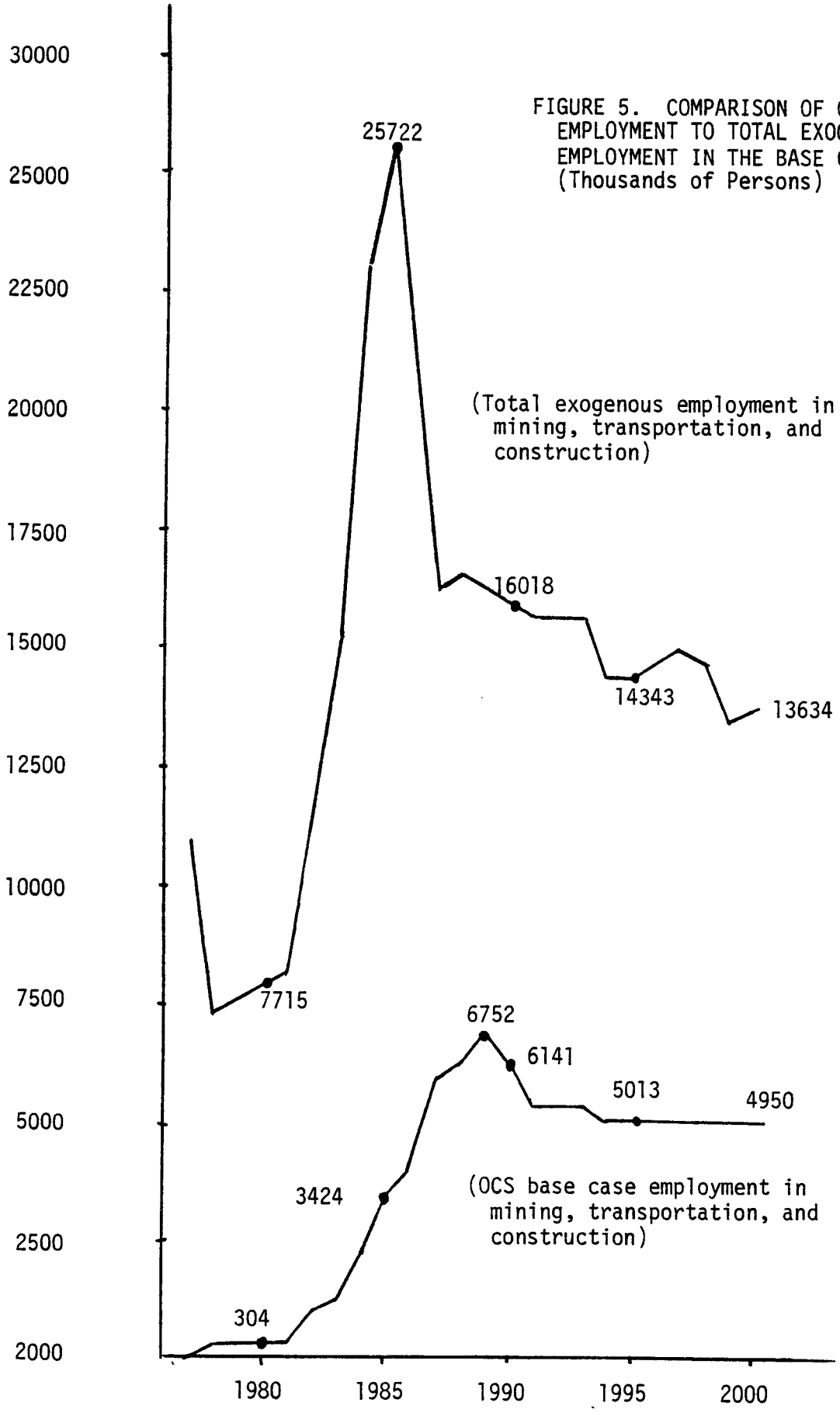


FIGURE 5. COMPARISON OF OCS EMPLOYMENT TO TOTAL EXOGENOUS EMPLOYMENT IN THE BASE CASE (Thousands of Persons)

less likely to permanently reside in Alaska during the earlier phases of offshore field development. The importance of distinguishing between enclave and resident employment is related to the different expansionary effect that each group would be likely to have on the local and statewide economy. We assume that "enclave" employees do not spend their earnings in Alaska and, therefore, have no direct or indirect effect on the economy. On the other hand, we assume that certain onshore construction jobs and most ongoing production employment, both on- and offshore, is more prone to reside and spend income in Alaska during rotation leave.

In summary, the OCS employment outlined in Table 34 and shown explicitly in Appendix A includes only the share of OCS employees that reside in Alaska (SEAR). The employment figures, therefore, do not reflect total direct OCS employment because they exclude the nonresident (enclave) component. A more detailed discussion of the methods and assumptions used to determine the share of OCS employees that are Alaska residents is found in Appendix B.

The ommission of encalve workers from resident-project employment possibly understates the true impact on Alaska's economy of OCS petroleum activity. This understated impact is most evident in the support and government sectors. The support sector includes several parts: trade, service, finance, construction, transportation, communications, and public utilities. The expansionary effect of resident OCS project employment on these sectors is transmitted through changes in two variables: income (spending) and population. The income effect directly

increases the earnings of the commercial sector while the population effect increases the "load" on public services, thereby indirectly stimulating government action. These same avenues of effect are also present for nonresident OCS employees, although to a reduced and possibly negligible degree.

To the extent that enclave OCS workers do impact the economy, their effect will probably not be felt in the region of lease sale activity. These enclave workers are more likely to leave a more noticeable trail in the Anchorage region which links them directly to the outside world. Furthermore, the support sectors affected by enclave OCS workers are most likely confined to transportation, communications, and government. The enclave OCS worker's expansionary effect in these specific sectors of the economy will depend on the economy's present capacity (and that induced by the resident OCS population--many of whom also travel regularly to the Anchorage region where they reside permanently) to absorb their direct and indirect demands.

The overall effect of enclave OCS workers may, therefore, be negligible since it is confined primarily to the Anchorage region which may have the capacity to absorb their relatively marginal effects (including transportation) without any appreciable change to the level of support sector and government services.

ISER economists are presently not able to test this or other hypotheses regarding the secondary economic effects of enclave employment

with the MAP model. We, therefore, assume that enclave OCS employees have no effect whatsoever, acknowledging that this assumption understates the true impact. Until the MAP econometric model can be further developed to handle these important and complex relationships, the only other option would be to weight enclave OCS workers by a factor that approximates their induced effect on Alaska's support and government sectors, and include this weighted component in resident-project employment that is fed into the base case scenario to estimate OCS impacts. This option, however, runs the risk of overstating the true impacts of enclave employment, a possibly less desirable alternative than our assumption that enclave workers do not impact the economy. In either case more research is needed to improve our understanding of these important relationships on economic growth.

North Slope Resident Adjustment

An important phenomenon that confronts an economic-impact analysis of petroleum development in remote regions of Alaska is that many employees of a given development project do not reside in the workplace location. Exploration and development crews are often isolated from the immediate physical and cultural environment in offshore and shore-based facilities where they are housed and fed during their work shift. As a result, these "enclave" employees do not directly affect the regional economy in which the development project is situated. Enclave employees that are residents of Alaska typically spend income

in the location of permanent residence during rotation leave. Historically, the pattern of residency of TAPS and Prudhoe employment suggests that enclave employees reside in the Anchorage, Southcentral, and Fairbanks regions, depending on the location and type of work task.

In past MAP work related to the North Slope region, we have dealt with the distinction between residency and workplace by incorporating MAP model specifications designed to redistribute some of the secondary impacts of basic sector activity in the North Slope to other MAP model regions. Briefly, total wage and salaries earnings used to determine output in several secondary industries (e.g., transportation, public utilities, trade, etc.) were divided into enclave and resident categories in the North Slope region. This dichotomy tends to reduce the contribution of basic sector earnings to support sector output, and therefore, employment in the North Slope region. It does not detract from total statewide basic sector earnings, but shifts some of the secondary effects of North Slope petroleum development to other regions of the state. Thus, exogenous North Slope employment assoicated with several projects was entered into the North Slope region in the MAP model, even though it was evident that most of these employees officially resided in other areas of the state.

Despite the conventions built into the MAP model to redistribute the secondary impacts of North Slope basic sector activity to other MAP model regions, it became increasingly evident from forecast results that the MAP regional model was permitting an unreasonably large share of secondary activity to occur in the North Slope region; suggesting structural change in the North Slope economy that MAP economists considered unlikely in the foreseeable future.

To correct the disproportionate secondary effects of employment in the North Slope, local residency assumptions similar to those applied to direct OCS employment have now been applied to direct employment associated with several North Slope development projects. These projects include:

- Beaufort Sea Joint State/Federal OCS Lease Sale (Beaufort I)
- Northwest Gasline (ALCAN)
- Trans-Alaska Pipeline System (TAPS)
- National Petroleum Reserve of Alaska (NPRA)
- Prudhoe Bay Mining
- Other (nonpetroleum) Mining

In general, we assumed that even though work is performed in the North Slope, most direct employment would not reside in the North Slope region. Mining, construction, and transportation employment was reallocated to North Slope, Fairbanks, Anchorage, and Southcentral regions according primarily to population proportions in those regions. This change in resident status does not affect the level of overall statewide employment, but does dramatically reduce residence in the North Slope. In 1984 over 7000 North Slope residents were shifted from

their North Slope workplace location to other more probable areas of instate residence. The number of North Slope residents transferred to other regions stabilizes at about 4000 persons during the latter 1980s and 1990s.

In previous MAP/OCS work, neither the local residency adjustment nor the SEAR adjustment (Appendix B) were used on direct OCS employment in the Beaufort Sea Joint State/Federal OCS lease sale. Thus, in addition to the adjustment in North Slope resident status described above, the SEAR adjustment to direct OCS employment was also applied to Beaufort I employment. The use of both employment adjustments reduces both the level of statewide employment (SEAR adjustment) and the level of employment in the North Slope (residency-status adjustment).

Again, the adjustment in North Slope resident status is not intended to undermine the importance of North Slope employment, but to more accurately reflect the resident distribution of North Slope employment.

Base Case Forecasts

The base case employment, revenue, and expenditure assumptions outlined above were used in conjunction with the MAP statewide and regional econometric models to forecast economic activity in Alaska through the year 2000. The section presents these base case forecasts which will be used as a benchmark from which to measure the impacts of proposed federal OCS development in the Beaufort Sea.

STATEWIDE

Population

Table 35 presents the forecasts of statewide population growth, natural increase and net migration. The post-Prudhoe Bay decline that ends in 1981 is rapidly overtaken by a mid-1980s "boom" period, fed principally by construction of the ALCAN gasline, as well as other large scale, special projects (see Table 28). Between 1981 and 1986, population is forecasted to grow at an average annual rate of 5.3 percent, roughly twice the overall rate of growth for the entire projection period. By the end of the boom period in 1986, population reaches 510,800 over 28 percent higher than its 1980 level. Sharply rising net inmigration into Alaska, which peaks at over 33,000 in 1985, is further evidence of a mid-1980s boom period. The post-construction decline after 1986, like the decline following the TAPS construction effort, causes slower growth in statewide population but does not result in a population decline. Between 1986 and 2000 population growth stabilizes at an average annual rate of 2.2 percent. Net outmigration occurs from 1987 to 1989 but reverses and gradually increases through the late 1990s. By 1996 net inmigration overtakes population growth from natural increase. By the year 2000 statewide population reaches 690,000, a level over two-thirds higher than 1980 population. As shown in Table 36, continued turnover of population keeps the age structure virtually unchanged throughout the forecast period.

TABLE 35. PROJECTED POPULATION AND COMPONENTS OF CHANGE: ALASKA, 1980-2000
(Thousands of persons)

	POPTST	NINCTOT	MIGNET
1980	397.976	6.556	-14.93
1981	395.49	5.855	-8.071
1982	402.451	5.456	1.434
1983	417.09[illegible]	5.466	9.172
1984	448.713	5.78	25.848
1985	488.759	6.759	33.32
1986	510.3	7.99	14.029
1987	516.114	8.39	-3.062
1988	519.502	8.113	-4.738
1989	525.482	7.807	-1.844
1990	534.1	7.637	0.969
1991	544.443	7.598	2.746
1992	556.238	7.618	4.172
1993	570.21	7.71	6.258
1994	583.372	7.892	5.27
1995	596.829	8.032	5.422
1996	613.972	8.183	8.957
1997	633.259	8.48	10.809
1998	652.729	8.842	10.603
1999	670.029	9.167	8.117
2000	690.057	9.422	10.605

POPTST = Population (10^3 persons)
NINCTOT = Civilian non-Native plus Native natural increase (10^3 persons)
MIGNET = Net migration (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 36. PROJECTED AGE STRUCTURE OF ALASKA POPULATION 1980-2000
(Proportion of Total Population)

	KID.POP	AD.POP	GER.POP
1980	0.291	0.668	0.041
1981	0.292	0.664	0.044
1982	0.291	0.663	0.045
1983	0.29	0.664	0.046
1984	0.287	0.667	0.045
1985	0.285	0.671	0.044
1986	0.285	0.671	0.044
1987	0.286	0.669	0.045
1988	0.287	0.666	0.047
1989	0.287	0.664	0.048
1990	0.287	0.663	0.049
1991	0.287	0.663	0.05
1992	0.286	0.663	0.051
1993	0.285	0.663	0.052
1994	0.284	0.663	0.053
1995	0.283	0.664	0.053
1996	0.282	0.664	0.054
1997	0.281	0.665	0.054
1998	0.28	0.666	0.055
1999	0.279	0.666	0.055
2000	0.278	0.666	0.056

KID.POP = Children (age: 1-14) as percentage of population (percent)
AD.POP = Adults (age: over 14 and under 65) as percentage of population (percent)
GER.POP = Aged (over 65) as percentage of population (percent)

SOURCE: MAP Model Projections.

Employment

As shown in Table 37, Alaska employment would begin to recover from the TAPS construction decline by 1982. By 1985, basic sector employment (i.e., construction, mining, manufacturing, and agriculture) would peak at over 53,000 workers. This rise, due largely to the construction of the gas pipeline, triggers a boom-bust cycle in total employment similar qualitatively to that accompanying the TAPS construction cycle, although of lessor severity. Total employment at the peak of construction in 1985 is 35 percent above its 1980 level. The downside of the gasline cycle witnesses a 1 percent drop in total employment from its peak level by 1986, despite a much more significant decline (over 17 percent) in basic sector employment. Basic sector employment does not regain its 1985 levels until 1993, after which growth tends to stabilize. As in the case of the post-TAPS decline, the resiliency of the economy can be traced to resiliency in the support sector (i.e., transportation, communication, public utility, trade, finance, and service employment) which by 1988 declines less than 3 percent from the 1986 peak. After the gasline cycle, support sector employment growth resumes at more or less stabile rates resembling historical growth. In the early 1980s a significant long-run change takes place in the structure of the state economy, as the support sector rapidly overtakes government as the primary source of Alaskan employment. By 2000, total employment reaches nearly 381,000, 100 percent higher than its 1980 level, for an average annual growth of 3.5 percent. The support-sector share of employment rises from 34 percent in 1980 to over 461 percent in 2000. This, combined with

TABLE 37. PROJECTED EMPLOYMENT: ALASKA, 1980-2000
(Thousands of Persons)

	EM99ST	EM98ST	EMB1ST	EMS1ST	EMG9ST
1980	190.415	175.672	27.574	63.907	84.191
1981	190.115	175.383	28.277	62.636	84.47
1982	197.133	182.127	32.564	64.788	84.775
1983	208.902	193.449	37.624	71.042	84.783
1984	232.079	215.779	48.026	85.055	82.698
1985	237.254	240.083	53.223	104.35	82.51
1986	266.12	248.654	49.232	113.136	86.286
1987	264.536	247.122	45.507	111.803	89.812
1988	264.706	247.256	46.263	109.735	91.238
1989	267.842	250.318	46.948	110.645	92.725
1990	273.578	255.866	48.54	112.965	94.362
1991	280.785	262.839	50.487	116.366	95.967
1992	289.12	270.907	52.797	120.494	97.617
1993	298.959	280.437	55.257	125.612	99.568
1994	308.109	289.303	56.766	130.528	102.01
1995	317.605	298.51	59.065	135.304	104.051
1996	329.766	310.306	62.918	141.656	105.732
1997	343.159	323.305	66.467	149.103	107.735
1998	356.365	336.132	69.388	156.549	110.195
1999	367.823	347.265	71.335	162.935	112.996
2000	381.407	360.471	75.694	169.536	115.242

EM99ST = Total employment
EM98ST = Wage and salary employment
EMB1ST = Employment in the basic sector (construction, mining, manufacturing and agriculture)
EMS1ST = Employment in the support sector (transportation, communications, public utilities, trade, finance, and services)
EMG9ST = Employment in the government sector (federal, state, and local)

SOURCE: MAP Model Projections.

the growth in basic industries, causes the government's share of total employment to fall substantially, from nearly 44 percent in 1980 to 30 percent in 2000, as shown in Table 38.

Personal Income, Wages, and Prices

The mid-1980s boom-bust cycle associated with gas pipeline and other special projects is more evident in patterns of projected personal income growth than in population and employment growth. As shown in Table 39, the gas pipeline boom sends real per capita incomes (PIRPCST) rapidly to a new peak in 1985, averaging 10.7 percent real growth since 1980. Total statewide real personal income (PIRST) grows at a more astounding rate of 15.3 percent over the same period. By the peak in 1985, real income would be twice its 1980 level, and real per capita income is two-thirds higher than its 1980 level. Real income drops nearly 10 percent; and real per capita income, 17 percent by 1988, following the decline of gas pipeline construction activity. After 1988, a period of steady income growth brings real personal income to 13.4 billion dollars in 2000, over 200 percent higher than its 1980 level, for an average annual growth of 5.9 percent. Real per capita income, on the other hand, grows by about 80 percent by the end of the period, reflecting an average annual rate of growth of 3.0 percent. The decline in total and per capita real personal income after 1985 and the generally lower rate of income growth in the second decade of the forecast period reflects both the sudden reduction of high paying construction jobs with the completion of several major construction projects and a long-term shift toward lower-wage jobs in support sector and fisheries industries.

TABLE 38. PROJECTED COMPOSITION OF ALASKAN EMPLOYMENT, 1980-2000
(Proportion of Total Employment)

	EMNS.EM	EMSP.EM	EMG9.EM
1980	0.222	0.336	0.442
1981	0.226	0.329	0.444
1982	0.241	0.329	0.43
1983	0.254	0.34	0.406
1984	0.277	0.366	0.356
1985	0.274	0.406	0.321
1986	0.251	0.425	0.324
1987	0.238	0.423	0.34
1988	0.241	0.415	0.345
1989	0.241	0.413	0.346
1990	0.242	0.413	0.345
1991	0.244	0.415	0.342
1992	0.246	0.417	0.338
1993	0.247	0.42	0.333
1994	0.245	0.424	0.331
1995	0.246	0.426	0.328
1996	0.25	0.43	0.321
1997	0.252	0.435	0.314
1998	0.251	0.439	0.309
1999	0.25	0.443	0.307
2000	0.253	0.445	0.302

EMNS.EM = Basic sector employment as percentage of total employment (percent)
EMSP.EM = Support sector employment as percentage of total employment (percent)

EMG9.EM = Government employment as percentage of total employment (percent)

SOURCE: MAP Model Projections.

TABLE 39. PROJECTED PERSONAL INCOME:
ALASKA, 1980-2000
(Millions of 1980 Dollars
and 1980 Dollars, Respectively)

	PIRST	PIRPCST
1980	4274.	10739.3
1981	4361.3	11027.6
1982	4720.2	11728.6
1983	5377.93	12893.8
1984	7020.61	15646.1
1985	8725.83	17848.9
1986	8673.73	16980.7
1987	8007.	15514.
1988	7943.06	15289.8
1989	8065.78	15349.3
1990	8324.97	15586.9
1991	8581.71	15909.3
1992	9080.83	16325.5
1993	9529.02	16711.4
1994	9872.16	16922.6
1995	10327.7	17304.4
1996	10969.7	17868.8
1997	11652.6	18401.
1998	12261.	18784.2
1999	12724.9	18991.6
2000	13399.1	19417.4

PIRST = Personal income (millions of 1980 dollars)
PIRPCST = Real per capita personal income (1980 dollars)

SOURCE: MAP Model Projections.

Projection of real wages and salaries by major sector are shown in Table 40. In general, growth in total wages and salaries would parallel the pattern of growth in real personal income; characterized by rapid growth during the period of concentrated, high-wage pipeline construction from 1980 to 1985, followed by retraction and eventual stabilization toward historic trends during the second decade of the forecast period. Wages in the support sector (WSS1RST) peak in 1985, following a 5-year period of average growth exceeding 16 percent per year. From 1985 to 2000, real wages grow moderately at an average annual rate of 2.5 percent, reflecting the effects of a post-boom decline in the late 1980s. Basic sector wages (WSB1RST) are projected to experience dramatic growth of nearly 30 percent per year from 1980 to 1985, and would peak at over two and one-half times their 1980 level, only to drop 50 percent by 1989. The sharp reduction in high-wage, basic-sector construction activity after 1985 tends to dampen long-run growth at 2.1 percent per year between 1985 and 2000.

Overall growth in government wages (WSG9RST) between 1980 and 2000 would be slower than either the support or basic sectors but would be far more stabile during the post-boom decline in the late 1980s. Unlike government wages which experience a only modest reduction in average annual growth after 1985, real basic and support sector wages would not regain their 1985 levels before 1998.

Projection of annual wage rates in 1980 dollars in the basic (WRB1RST), service (WRS1RST), and government (WRG9RST) sectors are

TABLE 40. PROJECTED WAGES AND SALARIES
BY SECTOR: ALASKA, 1980-2000
(Millions of 1980 Dollars)

	WS99RST	WSB1RST	WSS1RST	WSG9RST
1980	3490.77	774.791	1158.03	1557.95
1981	3554.51	811.618	1146.52	1606.37
1982	3864.35	984.509	1210.87	1668.97
1983	4434.59	1275.96	1397.74	1760.89
1984	5865.07	2120.86	1878.14	1866.07
1985	7347.24	2819.12	2510.73	2017.4
1986	7218.37	2404.4	2638.18	2175.8
1987	6591.08	1877.34	2402.87	2280.87
1988	6525.13	1836.38	2334.91	2353.85
1989	6618.12	1831.77	2337.27	2446.08
1990	6834.23	1898.24	2385.47	2550.52
1991	7119.23	1986.63	2468.	2664.6
1992	7485.73	2108.25	2571.56	2785.93
1993	7823.33	2219.55	2690.55	2913.23
1994	8103.86	2257.17	2786.98	3059.72
1995	8402.34	2378.08	2804.33	3201.
1996	9020.15	2591.7	3077.53	3350.93
1997	9584.07	2794.72	3273.91	3515.44
1998	10079.8	2938.69	3450.41	3689.72
1999	10453.3	3000.14	3583.42	3869.77
2000	11012.7	3215.16	3749.53	4048.05

WS99RST = Total wages and salaries, statewide (millions of 1980 dollars)
WSB1RST = Basic sector wages and salaries (millions of 1980 dollars)
WSS1RST = Support sector wages and salaries (millions of 1980 dollars)
WSG9RST = Government sector wages and salaries (millions of 1980 dollars)

SOURCE: MAP Model Projections.

presented in Table 41. Real wage rates in the basic and support sectors would achieve positive growth up to their peak year in 1985, afterwhich wage rates decline sharply and would be unable to recover their 1985 levels by the end of the forecast period. In contrast to this, wage rates in federal, state, and local government would continue to grow steadily after 1985. Over the entire projection period real government wage rates grow 50 percent faster than basic sector wage rates and over 200 percent faster than support sector wage rates. Employees in all sectors would still receive a higher inflation adjusted annual wage rate in 2000 compared with real wage rates in 1980.

In recognition of the high rates of projected Alaska and U.S. inflation in Table 42, it is evident that nominal wages and incomes must increase dramatically in order to achieve the gains shown in Tables 39 - 41.

With the exception of the interval between 1980 and 1984, when Alaska's economy would undergo considerable expansion, U.S. inflation remains higher than inflation in Alaska. As a result, a gradual tendency toward equalization of Alaskan and U.S. price levels continues throughout the post-1984 forecast period.

Government Revenues and Expenditures

State government revenue projections by source are shown in Table 43. The variables include: total state government revenues (REVGFR), petroleum revenues (RP9SR), revenues from the federal government

TABLE 41. PROJECTED REAL WAGE RATES: ALASKA, 1980-2000
(1980 Dollars)

	WRB1RST	WRS1RST	WRG9RST
1980	28098.7	18120.5	18505.
1981	29702.5	18304.5	19017.1
1982	30232.7	18689.8	19687.
1983	33913.3	19674.9	20769.5
1984	44180.6	22081.4	22564.9
1985	52968.1	24060.6	24450.2
1986	48638.3	23318.6	25216.2
1987	41258.5	21758.5	25396.1
1988	39694.3	21277.6	25784.8
1989	39051.1	21124.1	26379.8
1990	39106.9	21116.9	27029.2
1991	39349.7	21205.3	27765.9
1992	39331.6	21341.9	28539.3
1993	40167.9	21419.5	29309.
1994	39762.9	21351.6	29994.3
1995	40243.2	21451.3	30763.7
1996	41191.5	21725.3	31698.7
1997	42046.4	21957.4	32630.4
1998	42351.4	22040.4	33483.6
1999	42057.2	21993.	34247.
2000	42475.9	22116.4	35126.5

WRB1RST = Wage rates in the basic sector (millions of 1980 dollars)
WRS1RST = Wage rates in the support sector (millions of 1980 dollars)
WRG9RST = Wage rates in the government sector (millions of 1980 dollars)

SOURCE: MAP Model Projections.

TABLE 42. PROJECTED ALASKA AND U.S. INFLATION 1980-2000
(Percent Change from Previous Year)

	ANINF	USINF
1980	0.133	0.129
1981	0.102	0.099
1982	0.091	0.094
1983	0.081	0.086
1984	0.086	0.079
1985	0.079	0.079
1986	0.068	0.084
1987	0.08	0.085
1988	0.083	0.083
1989	0.08	0.082
1990	0.079	0.083
1991	0.077	0.083
1992	0.077	0.083
1993	0.077	0.083
1994	0.076	0.083
1995	0.077	0.083
1996	0.077	0.083
1997	0.077	0.083
1998	0.077	0.083
1999	0.077	0.083
2000	0.078	0.083

ANINF = Increase in Alaska relative price index over previous year (percent)
USINF = Increase in U.S. consumer price index over previous year (percent)

SOURCE: MAP Model Projections.

TABEL 43. PROJECTED STATE GOVERNMENT REVENUES:
ALASKA, 1980-2000
(Millions of 1980 Dollars)

	REVGFR	RP9SR	RFDSR	RNDSR
1980	2288.14	1830.68	226.392	230.57
1981	3053.97	2663.31	205.067	182.59
1982	3385.38	2828.54	190.048	366.8
1983	3743.37	3005.42	180.043	557.904
1984	4052.59	3066.6	174.109	811.877
1985	4497.46	3284.03	171.103	1042.32
1986	4923.62	3450.46	165.228	1307.94
1987	5181.14	3496.88	154.092	1530.18
1988	5409.54	3539.08	143.005	1727.46
1989	5677.27	3614.43	133.545	1929.3
1990	5730.64	3462.05	125.247	2143.35
1991	5767.65	3299.92	117.847	2349.89
1992	5628.79	2973.19	111.123	2545.48
1993	5507.18	2692.43	105.062	2709.68
1994	5352.52	2396.41	99.245	2856.86
1995	5200.77	2136.26	93.709	2970.78
1996	5060.49	1911.75	88.806	3059.94
1997	4937.84	1710.07	84.366	3143.4
1998	4813.84	1523.4	80.132	3210.32
1999	4680.04	1351.75	75.981	3252.41
2000	4554.99	1197.97	71.964	3285.05

REVGFR = Total general fund revenue (millions of 1980 dollars)
RP9SR = Total petroleum revenues (millions of 1980 dollars)
RFDSR = Revenues from the federal government (millions of 1980 dollars)
RNDSR = Other (nonfederal, nonpetroleum) revenues (millions of 1980 dollars)

SOURCE: MAP Model Projections.

(RFDSR), and other revenues (RNDSR). Total revenue grows steadily from 1980 (2.3 billion dollars) to a peak of 5.8 billion dollars in 1991 and declines steadily thereafter to 4.6 billion dollars in 2000. The bulk of these revenues are accounted for by petroleum revenues. Petroleum revenues peak in 1989 at 3.6 billion dollars and decline through the year 2000 to a level of 1.2 billion dollars.

Receipts from the federal government decline throughout the period, from 0.2 billion in 1980 to 0.07 billion dollars in 2000. Other revenues increase steadily and substantially from a level of 0.2 billion dollars in 1980 to over 3.3 billion dollars in 2000. These revenues include such items as: corporate income taxes, personal income taxes, earnings on fund balances, and miscellaneous tax receipts.

Expenditure data are presented in Table 44 and include total state government real expenditures (E99SR) and real per capita expenditures (E99SRPC).

Total expenditures grow at 5.6 percent over the entire period. In contrast to this,growth in per capita state expenditures average 2.7 percent per year. The difference between total and real per capita state expenditure growth reflects the effect of increasing population which lowers the per capita share of state expenditures.

The differences between total revenues and expenditures are accumulated in the state's fund balances (expressed in 1980 dollars) which

TABLE 44. PROJECTED TOTAL AND PER CAPITA STATE GOVERNMENT EXPENDITURES: ALASKA, 1980-2000
(Millions of 1980 Dollars)

	E99SR	E99SRPC
1980	1495.46	1112.41
1981	1547.09	1158.04
1982	1616.14	1188.8
1983	1705.11	1210.22
1984	1790.47	1181.26
1985	1892.08	1146.02
1986	2019.82	1170.6
1987	2131.85	1222.8
1988	2245.06	1279.34
1989	2370.62	1335.63
1990	2505.7	1388.84
1991	2651.23	1441.59
1992	2806.46	1496.64
1993	2971.19	1542.56
1994	3146.98	1596.96
1995	3331.43	1652.45
1996	3524.89	1699.59
1997	3730.68	1744.12
1998	3949.32	1791.16
1999	4180.21	1846.93
2000	4419.67	1896.05

E99SR = Total state expenditures (millions of 1980 dollars)
E99SRPC = Real per capita state expenditures

SOURCE: MAP Model Projections.

peak in the mid-1990s and decline slowly thereafter, as shown in Table 45.

REGIONAL

In this section we review the base case projections for the North Slope (R1), Anchorage (R5), Fairbanks (R7), and Southcentral (R4). The geographic distribution of these and other MAP regions are shown in Figure 2.

North Slope

Population. The growth of North Slope population during the forecast period is shown in Figure 16. Population growth of 6.6 percent per year would be strongest in the early 1980s, until it would peak in 1986. After a modest decline from 1987 to 1989 in response to a decline in regional employment over the same period, positive growth resumes at about half the average annual rate of the early 1980s. By the year 2000, total regional population reaches 8,182, nearly twice its 1980 level, representing an average growth of about 3.5 percent annually.

Employment. Table 47 presents the base case forecast of North Slope employment. A considerable portion of total employment growth is concentrated in the early 1980s, followed by several years of employment decline before employment regains upward momentum from 1990 thereafter. Total employment growth between 1980 and 1986 would be two to three times the overall growth rate of 3.2 percent per year over the

TABLE 45. PROJECTED TOTAL AND PER CAPITA FUND BALANCES: ALASKA, 1980-2000
(Millions of 1980 Dollars)

	FUNDR	FUNDRPC
1980	1931.51	1436.77
1981	3534.99	2646.04
1982	5295.65	3995.4
1983	7244.46	5141.84
1984	9257.03	6107.29
1985	11527.8	6932.23
1986	14063.4	8150.53
1987	16457.	9439.53
1988	18776.6	10699.8
1989	21133.9	11906.1
1990	23279.	12902.9
1991	25211.1	13708.4
1992	26751.8	14237.6
1993	27932.	14501.5
1994	28744.	14586.4
1995	29183.6	14475.5
1996	29280.6	14118.1
1997	29090.9	13599.5
1998	28616.1	12978.5
1999	27854.2	12306.7
2000	26800.5	11497.5

FUNDR = Total fund balance (millions of 1980 dollars)
FUNDRPC = Real per capita fund balance (millions of 1980 dollars)

SOURCE: MAP Model Projections.

TABLE 46. PROJECTED POPULATION:
NORTH SLOPE, 1980-2000
(Thousands of Persons)

	POPTR1
1980	4.134
1981	4.225
1982	4.473
1983	4.773
1984	5.083
1985	5.664
1986	6.051
1987	5.995
1988	5.936
1989	5.857
1990	5.965
1991	6.19
1992	6.391
1993	6.584
1994	6.785
1995	7.009
1996	7.228
1997	7.481
1998	7.723
1999	7.962
2000	8.182

POPTR1 = Total population in the North Slope (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 47. PROJECTED EMPLOYMENT: NORTH SLOPE, 1980-2000
(Thousands of Persons)

	EM99R1	EM98R1	EMB1R1	EMS1R1	EMG9R1
1980	2.318	2.127	0.509	0.457	1.161
1981	2.383	2.179	0.526	0.445	1.208
1982	2.579	2.408	0.598	0.459	1.352
1983	2.764	2.605	0.691	0.488	1.426
1984	3.023	2.874	0.902	0.571	1.401
1985	3.412	3.267	1.184	0.718	1.366
1986	3.485	3.338	1.138	0.753	1.447
1987	3.317	3.169	0.965	0.691	1.513
1988	3.251	3.105	0.912	0.649	1.544
1989	3.141	2.997	0.814	0.613	1.57
1990	3.165	2.992	0.777	0.6	1.615
1991	3.298	3.126	0.845	0.615	1.667
1992	3.402	3.233	0.892	0.628	1.713
1993	3.5	3.332	0.932	0.643	1.758
1994	3.59	3.423	0.958	0.655	1.811
1995	3.707	3.542	1.005	0.672	1.865
1996	3.842	3.679	1.07	0.695	1.914
1997	3.985	3.825	1.137	0.723	1.964
1998	4.118	3.959	1.192	0.746	2.021
1999	4.236	4.079	1.232	0.763	2.083
2000	4.373	4.218	1.296	0.783	2.139

EM99R1 = Total employment in the North Slope (10^3 persons)
EM98R1 = Wages and salary employment in the North Slope (10^3 persons)
EMB1R1 = Basic sector employment in the North Slope (10^3 persons)
EMS1R1 = Support sector employment in the North Slope (10^3 persons)
EMG9R1 = Total government sector employment (10^3 persons)

SOURCE: MAP Model Projections.

entire forecast period. Virtually all growth would be due to increased basic-and-government-sector employment. By the year 2000 basic sector employment, fueled mainly by construction activity increase by one and one-half times its 1980 level. Government employment nearly doubles over the forecast period, while support sector employment in 2000 overtakes its 1980 level by only 70 percent.

Personal Income. Projected regional personal income expressed in millions of 1980 dollars and real per capita personal income expressed in 1980 dollars are shown in Table 48. Between 1980 and 1985 personal income in the North Slope is projected to grow at a remarkable average rate of 23 percent per year before experiencing a 30 percent overall decline between 1985 and 1990. High wage endogenous construction employment combined with strong growth in government employment account for the bulk of personal income growth during the early 1980s. The North Slope Borough property tax receipts from Prudhoe Bay and TAPS facilities represent a major source of regional personal income, as nearly 75 percent of property taxes are channeled directly into wages and salaries earnings, primarily for local construction projects. During the second decade of the forecast period, real personal income growth would stabilize at 5.3 percent per year. By the year 2000, real personal income reaches 213 million dollars, more than three times its 1980 level. Expressed in real per capita terms, personal income would only regain 80 percent of its peak, 1985 level of $32,000 by the end of the forecast period.

TABLE 48. PROJECTED TOTAL AND PER CAPITA REAL PERSONAL INCOME: NORTH SLOPE, 1980-2000 (Millions of 1980 Dollars and in 1980 Dollars, Respectively)

	PIRR1	PIRPCR1
1980	64.456	15692.4
1981	66.869	15825.2
1982	76.50[illegible]	17103.6
1983	91.466	19162.9
1984	128.947	25385.9
1985	183.	32311.3
1986	178.921	29570.3
1987	148.236	24725.
1988	138.151	23274.2
1989	126.708	21976.1
1990	127.651	21393.4
1991	136.638	22072.2
1992	144.061	22540.
1993	150.827	22906.8
1994	155.057	22851.3
1995	160.94	23219.5
1996	174.362	24122.2
1997	186.5[illegible]	24930.2
1998	195.901	25365.8
1999	202.647	25453.
2000	213.234	26051.

PIRR1 = Real personal income in the North Slope (millions of 1980 dollars)
PIRPCR1 = Real per capita personal income in the North Slope (millions of 1980 dollars)

SOURCE: MAP Model Projections.

Anchorage

Population. As shown in Table 49, Anchorage population is forecasted to grow steadily betwen 1980 and 2000. Although population growth levels off in 1987 after increasing at an annual average rate of 4.8 percent over the previous 6 years, it resumes a steady pace at about half of the earlier rate from 1987 to the end of the forecast period. As a proportion of statewide population, Anchorage maintains a steady 46 percent throughout the forecast period. By the year 2000, Anchorage population at 318,000 is 75 percent higher than its 1980 level, representing an overall average annual rate of growth of 2.8 percent.

Employment. The pattern of Anchorage employment growth, as shown in Table 50, follows closely the pattern of statewide growth. Anchorage employment grows from 87,500 to 178,000, reflecting a 3.6 percent annual average rate of growth from 1980 to 2000. As with statewide employment, Anchorage employment grows more rapidly in the early 1980s, averaging 6.5 percent per year until it peaks at 127,479 in 1986. After a subsequent period of moderate decline, employment growth resumes at an average rate of 2.3 percent per year from 1988 to 2000. The share of Anchorage employment belonging to the support sector (transportation, communication, public utility, trade, finance, and services) increases somewhat dramatically from 42.8 in 1980 to 57.6 in 2000. Similarly, basic sector employment increases--although modestly--from 13.5 to 14.7 percent over the same forecast period. The concentration of support sector activity reflects the role played

TABLE 49. PROJECTED POPULATION: ANCHORAGE, 1980-2000
(Thousands of Persons)

	POPTR5
1980	181.965
1981	179.823
1982	183.452
1983	192.062
1984	208.975
1985	231.487
1986	241.412
1987	241.536
1988	242.209
1989	244.445
1990	247.662
1991	251.726
1992	257.356
1993	263.364
1994	268.715
1995	275.424
1996	283.485
1997	292.793
1998	301.854
1999	309.548
2000	318.366

POPTR5 = Total population in Anchorage (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 50. PROJECTED EMPLOYMENT AND EMPLOYMENT COMPONENTS: ANCHORAGE, 1980-2000
(Thousands of Persons)

	EM99R5	EM98R5	EMB1R5	EMS1R5	EMG9R5
1980	87.506	31.025	10.96	34.712	35.352
1981	87.329	80.802	11.175	34.184	35.442
1982	90.976	84.201	12.971	35.71	35.52
1983	97.251	90.122	14.736	39.856	35.531
1984	107.934	100.205	17.013	48.267	34.925
1985	122.073	113.639	19.003	59.731	34.905
1986	127.479	118.918	18.209	64.518	36.191
1987	126.81	118.329	17.898	63.024	37.406
1988	126.162	117.671	18.099	61.651	37.921
1989	127.244	118.669	18.197	62.06	38.412
1990	129.444	120.754	18.388	63.398	38.968
1991	132.344	123.49	18.525	65.451	39.515
1992	136.228	127.166	19.175	67.91	40.08
1993	140.544	131.258	19.644	70.867	40.747
1994	144.512	135.02	19.839	73.605	41.576
1995	149.004	139.296	20.565	76.457	42.273
1996	154.541	144.551	21.579	80.118	42.853
1997	160.799	150.517	22.51	84.469	43.538
1998	166.834	156.274	23.189	88.73	44.375
1999	171.944	161.156	23.583	92.3	45.323
2000	177.664	166.613	24.482	96.038	46.093

EM99R5 = Total employment in Anchorage (10^3 persons)
EM98BR5 = Wages and salary employment in Anchorage (10^3 persons)
EMB1R5 = Basic sector employment in Anchorage (10^3 persons)
EMS1R5 = Support sector employment in Anchorage (10^3 persons)
EMG9R5 = Total government sector employment in Anchorage (10^3 persons)

SOURCE: MAP Model Projections.

by Anchorage as a regional distribution center for the state. Further, the Anchorage region absorbs a large portion of special-project employment (except for the gas pipeline) that permanently reside in Alaska, and act as an additional stimulant to endogenous construction, a major portion of basic sector growth in Anchorage. The concentration of support and basic sector employment occurs at the expense of government employment which, as a proportion of statewide government employment, declines from 43.6 percent in 1980 and 27.7 percent in 2000.

Personal Income

Table 51 presents projected real and real per capita personal income in the Anchorage region. Over the entire projection period real personal income grows at an average annual rate of 5.7 percent, slightly less than statewide real personal income growth of 5.9 percent per year. Anchorage income growth accelerates in the early 1980s, although less rapidly than North Slope income growth. By the year 2000, Anchorage personal income is over three times larger than it was in 1980. In real per capita terms, personal inocme expands over 70 percent, averaging 2.8 percent annual growth.

Fairbanks

Population. In general, Fairbanks' population growth is similar to other regions of Alaska. A period of accelerated growth occurs from 1980 to 1985, followed by absolute population decline with a gradual resumption of growth thereafter. What distinguishes Fairbanks' population growth from other regions is its magnitude in the early years.

TABLE 51. PROJECTED TOTAL AND PER CAPITA REAL PERSONAL INCOME: ANCHORAGE, 1980-2000
(Millions of 1980 Dollars
& 1980 Dollars Respectively)

	PIRR5	PIRPCR5
1980	2011.17	11052.5
1981	2051.98	11411.1
1982	2215.79	12078.3
1983	2500.15	13017.4
1984	3094.79	14809.3
1985	3328.15	16537.2
1986	3920.69	16240.6
1987	3743.26	15487.7
1988	3717.05	15346.5
1989	3777.61	15453.8
1990	3878.76	15581.5
1991	4013.26	15942.3
1992	4196.59	16306.5
1993	4390.34	16570.2
1994	4538.23	16888.6
1995	4745.42	17223.5
1996	5019.69	17706.9
1997	5320.07	18170.1
1998	5579.31	18483.4
1999	5790.23	18705.4
2000	6067.71	19058.9

PIRR5 = Real personal income in Anchorage (millions of 1980 dollars)
PIRPCR5 = Real per capita personal income in Anchorage (1980 dollars)

SOURCE: MAP Model Projections.

From 1980 to 1985 population grows at a remarkable average rate of 9.3 percent annually. as shown in Table 52. This compares to an average annual rate of 4.2 percent statewide and 4.9 percent in the Anchorage bowl. Further, the period of accelerated population growth in Fairbanks is more concentrated into fewer years than elsewhere in Alaska. Again, increases in gas pipeline construction employment, which are expected to concentrate in the Fairbanks area, represent the major contribution to the dramatic population expansion in the early 1980s. In contrast to statewide and to Anchorage population growth which continue to increase after a period of accelerated growth, Fairbanks' population falls by 6 percent to 82,144 in 1987, following its 1985 peak of 87,415. From 1987 (when population growth resumes) to 2000, Fairbanks' population grows at a moderate 2.1 percent per year. By the year 2000, Fairbanks' population was projected to increase to nearly 108,000 persons, about 92 percent higher than its 1980 level. As a proportion of statewide population, Fairbanks population increases from 14.1 in 1980 to 15.6 in 2000.

Employment. As with population growth, the pattern and composition of projected employment in Fairbanks is similar to, but more pronounced than, that of Anchorage and of statewide employment. As shown in Table 53 the gas pipeline boom would create a 300 percent increase in 1980 basic sector employment (i.e., construction, mining, manufacturing, and agriculture) from 3,500 to 13,000 in 1985. The 30 percent annual average rate of growth over the first five projection years is matched by a decline equally as abrupt to levels well below half the

TABLE 52. PROJECTED POPULATION: FAIRBANKS, 1980-2000
(Thousands of Persons)

	POPTR7
1980	56.137
1981	57.137
1982	60.00[illegible]
1983	65.061
1984	77.389
1985	87.415
1986	85.911
1987	82.144
1988	82.285
1989	83.032
1990	84.635
1991	86.384
1992	88.397
1993	90.473
1994	92.33
1995	94.621
1996	97.049
1997	99.9
1998	102.618
1999	105.089
2000	107.553

POPTR7 = Total population in Fairbanks (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 53. PROJECTED EMPLOYMENT AND EMPLOYMENT COMPONENTS: FAIRBANKS, 1980-2000
(Thousands of Persons)

	EM99R7	EM98R7	EMB1R7	EMS1R7	EMG9R7
1980	32.029	30.088	3.52	9.3	17.267
1981	32.26	30.312	3.786	9.272	17.255
1982	33.975	31.972	4.71	10.026	17.236
1983	37.404	35.291	6.447	11.663	17.181
1984	46.265	43.876	11.316	15.76	16.8
1985	52.588	50.05	12.967	20.347	16.736
1986	50.152	47.717	9.495	20.872	17.351
1987	45.801	43.514	5.868	19.707	17.939
1988	45.256	42.988	5.612	19.199	18.177
1989	45.504	43.233	5.616	19.214	18.404
1990	46.416	44.126	5.804	19.661	18.662
1991	47.563	45.246	6.07	20.259	18.916
1992	48.856	46.511	6.279	21.05	19.181
1993	50.259	47.883	6.411	21.974	19.498
1994	51.56	49.153	6.473	22.783	19.897
1995	53.09	50.653	6.731	23.692	20.23
1996	54.607	52.137	7.071	24.76	20.506
1997	56.769	54.263	7.346	26.083	20.835
1998	58.627	56.068	7.52	27.327	21.24
1999	60.293	57.722	7.631	28.389	21.703
2000	61.992	59.397	7.927	29.394	22.076

EM99R7 = Total employment in Fairbanks (10^3 persons)
EM98R7 = Wages and salary employment in Fairbanks (10^3 persons)
EMB1R7 = Basic sector employment in Fairbanks (10^3 persons)
EMS1R7 = Support sector employment in Fairbanks (10^3 persons)
EMG9R7 = Total government sector employment (10^3 persons)

SOURCE: MAP Model Projections.

peak by 1988. Basic sector employment resumes in 1989 and increases gradually thereafter. By the end of the forecast period basic sector employment would achieve less than two-thirds of its 1985 peak. Although less erratic than basic sector employment, support sector employment (i.e., transportation, communication, public utility, trade, finance, and services) more than doubles between 1980 and 1985 and peaks at 21,000 in 1986. By 1985 support sector employment overtakes and permanently exceeds government employment, signaling a more general structural change that occurs both statewide and in Anchorage (although not in the North Slope region) in the early 1980s. Support-sector resilience to economic cycles is reflected in the moderate 8 percent employment decline that signaled the termination of gasline construction by 1988. Despite the mild downturn in the mid- to late-1980s, support sector employment maintains a strong, 5.9 percent average annual rate of growth over the 20-year projection period; exceeding employment growth in both the basic sector (4.1 percent) and government sector (1.2 percent). By 2000 support sector employment would reach 29,294, over three times its 1980 level of 9300 persons. In contrast to basic and support sector employment, government employment in Fairbanks (federal, state, and local) declines steadily between 1980 and 1985 before resuming modest growth for the duration of the forecast. Overall the entire projection period, government employment as a proportion of total wage and salary employment decreases from 57.4 to 37.2 percent. The statewide share of support sector employment increases from 11.7 to 13.3 percent while the support sector increases from 30.9 to 49.5 percent of statewide employment.

Personal Income. Projection of growth in real and real per capita personal income is presented in Table 54. Expressed in millions of 1980 dollars, real personal income grows from $807 in 1980 to a maximum of $2245 millions in 1985, representing a 22.7 average annual rate of growth over the first five forecast years. Preceded by a 3-year period of post-boom decline, positive growth resumes by 1989, averaging 4.4 percent per year. The effects of a shift away from high wage construction jobs after 1985 is largely responsible for the sharp 30 percent reduction in real personal income between 1985 and 1988.

By the end of the forecast period income would recover and grow to over 300 percent of its 1980 level. However, because Fairbanks' population also was projected to almost double over the same period, real personal income expressed in per capita terms would increase only 59 percent from $14,400 in 1980 to $22,800 in 2000. Although this overall increase reflects an improvement in individual real per capita purchasing power, real per capita personal income in 2000 is still only 89 percent of the peak level achieved largely from high wage construction employment in 1985.

Southcentral

Population. At an average annual rate of 2.4 percent from 1980 to 2000, projected population growth in Southcentral Alaska would be less rapid than statewide population growth (2.8 percent) and regional population in the North Slope (3.5 percent), Anchorage (2.8 percent), and Fairbanks (3.3 percent). In general, the Anchorage and Fairbanks regions absorb a greater share of exogenous construction, mining,

TABLE 54. PROJECTED REAL AND REAL PER CAPITA PERSONAL INCOME: FAIRBANKS, 1980-2000 (Millions of 1980 Dollars and 1980 Dollars Respectively)

	PIRR7	PIRPCR7
1980	806.503	14366.6
1981	832.243	14565.7
1982	916.331	15272.
1983	1105.46	16991.2
1984	1714.11	22149.2
1985	2244.69	25678.5
1986	1966.88	22894.4
1987	1557.83	18364.7
1988	1517.55	18442.5
1989	1531.77	18447.8
1990	1579.35	18660.7
1991	1644.09	19032.4
1992	1718.77	19443.8
1993	1794.05	19829.5
1994	1850.26	20039.7
1995	1906.07	20467.6
1996	2048.72	21110.3
1997	2168.51	21706.8
1998	2266.69	22088.7
1999	2348.22	22345.1
2000	2456.12	22336.4

PIRR7 = Real personal income in Fairbanks (millions of 1980 dollars)
PIRPCR7 = Real per capita personal income in Fairbanks (1980 dollars)

SOURCE: MAP Model Projections.

transportation, and manufacturing employment than the share we assume would reside in Southcentral. As shown in Table 55, however, population growth in Southcentral would be smoother than other regions during the cycles of economic expansion and decline in the 1980s. The downswing that follows the completion of gasline construction is not evident in Southcentral population projections which displays strong growth from 1985 to 1987. From 1987 to 1988, Southcentral population would decline by less than 1 percent compared to a 6 percent decline in Fairbanks. By 2000 Southcentral population is about 60 higher than its 1980 level. As a proportion of statewide population the Southcentral region would diminish from 12.5 percent in 1980 to 11.6 percent in 2000.

Employment. As shown in Table 56, total employment in Southcentral grows steadily throughout the post-boom decline of the mid- to late-1980s. In contrast to the other regions, which generally experience an employment peak by the mid-1980s, Southcentral employment reaches a peak in 1993 primarily in response to construction of the Susitna Hydroelectric project. By the year 2000, total employment has more than doubled at 43,475, representing an average growth rate of 3.7 percent annually. This long-run growth rate exceeds that of other regions. Further, the employment participation rate (i.e., the ratio of employment to population) rises from 42.4 in 1980 to 54.4 in 2000. The bulk of employment growth occurred in the basic sector which by the end of the forecast period exhibited a 200 percent increase from 1980 levels. Over the 20-year forecast period basic sector employment would grow

TABLE 55. PROJECTED POPULATION: SOUTHCENTRAL, 1980-2000
(Thousands of Persons)

	POPTR4
1980	49.681
1981	49.077
1982	50.524
1983	52.239
1984	56.554
1985	60.144
1986	64.338
1987	67.096
1988	66.936
1989	67.191
1990	67.432
1991	68.025
1992	68.529
1993	69.398
1994	69.089
1995	70.012
1996	71.644
1997	73.605
1998	75.257
1999	76.212
2000	79.893

POPTR4 = Total population in Southcentral (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 56. PROJECTED EMPLOYMENT AND EMPLOYMENT COMPONENTS: SOUTHCENTRAL, 1980-2000
(Thousands of Persons)

	EM99R4	EM98R4	EMB1R4	EMS1R4	EMG9R4
1980	21.079	13.107	4.574	6.495	7.038
1981	21.049	18.097	4.716	6.308	7.073
1982	22.443	19.44	5.942	6.406	7.093
1983	24.09	21.04	7.038	6.925	7.075
1984	27.635	24.488	9.767	7.957	6.783
1985	29.777	26.606	10.405	9.466	6.735
1986	31.629	28.351	10.206	10.931	7.215
1987	32.496	29.147	9.937	11.554	7.656
1988	32.55	29.211	10.118	11.254	7.839
1989	32.857	29.523	10.15	11.35	8.024
1990	33.387	30.055	10.376	11.448	8.231
1991	34.068	30.728	10.68	11.618	8.43
1992	34.733	31.392	10.978	11.779	8.635
1993	35.586	32.233	11.218	12.134	8.881
1994	35.562	32.228	10.649	12.386	9.192
1995	36.414	33.073	10.800	12.720	9.447
1996	37.766	34.404	11.533	13.218	9.653
1997	39.277	35.889	12.148	13.838	9.903
1998	40.48	37.075	12.432	14.429	10.214
1999	41.042	37.638	12.091	14.977	10.57
2000	43.475	40.016	13.439	15.728	10.849

EM99R4 = Total employment in Southcentral (10^3 persons)
EM98R4 = Wages and salary employment in Southcentral (10^3 persons)
EMB1R4 = Basic sector employment in Southcentral (10^3 persons)
EMS1R4 = Support sector employment in Southcentral (10^3 persons)
EMG9R4 = Total government sector employment (10^3 persons)

SOURCE: MAP Model Projections.

from one-quarter to one-third of total wage and salary employment. The share of support sector employment also increased moderately from 36 percent to 39 percent of total wage and salary employment. At an average rate of 2.2 percent per year, government employment would experience the lowest overall rate of growth compared to basic sector (5.5 percent) and support sector (4.5 percent) growth, and as with other regions, would decline as a percent of total employment; in this case from 39 percent in 1980 to 27 percent in 2000.

Personal Income. The pattern of real and real per capita personal income growth shown in Table 57 is similar to other regions. As in the case of employment, personal income in real and real per capita terms exhibits stronger long-run growth at 6.3 and 3.8 percent respectively, than the other regions under consideration in this analysis. At 1,488 millions of 1980 dollars in the year 2000 real personal income is nearly two and one-half times its 1980 level. Because population increases by 60 percent over this period, real per capita income in the year 2000 would be roughly double its 1980 level, which exhibits a greater overall increase per capita purchasing power to Southcentral residents than to residents in Fairbanks, Anchorage, and the North Slope.

Summary

In summary, the following general features characterize economic growth in the base case. First, a period of dramatic economic expansion would occur during the early 1980s which culminates to a maximum

TABLE 57. PROJECTED REAL AND REAL PER CAPITA PERSONAL INCOME: SOUTHCENTRAL, 1980-2000 (Millions of 1980 Dollars and 1980 Dollars Respectively)

	PIRR4	PIRPCR4
1980	441.658	8389.87
1981	451.362	9137.1
1982	518.028	10253.1
1983	619.509	11859.1
1984	913.494	16152.7
1985	1128.02	19758.5
1986	1136.84	17870.
1987	1044.74	15570.8
1988	1026.17	15330.6
1989	1028.76	15310.9
1990	1053.36	15621.
1991	1067.06	15990.1
1992	1126.01	16431.1
1993	1166.72	16812.1
1994	1147.95	16615.4
1995	1188.58	16976.7
1996	1262.44	17621.1
1997	1343.57	18253.7
1998	1393.43	18515.7
1999	1395.23	18307.2
2000	1487.56	18619.5

PIRR4 = Real personal income in Southcentral (millions of 1980 dollars)
PIRPCR4 = Real per capita personal income in Southcentral (1980 dollars)

SOURCE: MAP Model Projections.

in 1985-86, as exhibited by several aggregate statewide and regional economic indicators. The boom is strongly exacerbated by Northwest gasline construction employment, which alone exceeds 10,500 workers in 1985 and contributes to almost half of statewide exogenous employment in the construction, mining, and transportation industries combined. Most gasline employment is concentrated in the Fairbanks region which would experience the benefits and hardships of short-lived, accelerated growth more acutely than the North Slope, Anchorage, and South-central regions.

Structural change would occur in the form of a diminishing share of government employment from a once dominant proportion of total statewide employment in all four regions under consideration. Despite this shift, government employment in the North Slope still exceeds 50 percent of total wage and salary employment by the year 2000. The relative decline in government employment is confined to state and local levels and reflects our assumption that ongoing state expenditures neither exhaust fund balances nor diminish to radically conservative levels but grow in real terms at a mid-range rate of about 3 percent annually.

IV. PROJECTED IMPACTS OF THE PROPOSED BEAUFORT SALE

Introduction

Four scenarios of OCS development in Harrison Bay of the Beaufort Sea are included in the following discussion of projected impacts. Estimates of economically recoverable reserves for each development scenario are shown in Table 58. In general, the exploration, construction, and development phases would occur over the same intervals for each scenario. Shore-based facilities are constructed in 1984 and exploration would extend from 1985 to 1988, followed by a 2-year lapse until platform and pipeline construction would begin in 1990. Oil and gas production would begin in 1993 for all scenarios and continue beyond the forecast interval which terminates in 2000. Estimates of direct SEAR adjusted, OCS resident employment for the low, mean, high, and Simpson deletion scenarios are shown in Table 59. Direct OCS employment adjusted for Alaska residency constitutes the primary source of impact of OCS development on the Alaska economy. The remaining OCS impact would occur from state property taxes revenues that accrue from three miles of additional pipeline (valued at $30 million for each scenario) within state boundaries. These extra property tax revenues (including the portion going to the North Slope Borough) are shown in Table 60.

Projections of sale impacts are developed by adjusting the non-OCS base case to include direct impacts (primarily employment) of the low, mean, high, and Simpson deletion development scenarios and re-running

TABLE 58. ECONOMICALLY RECOVERABLE RESERVES IN THE BEAUFORT SEA LEASE SALE 71

Scenario	Oil[1]	Gas[2]
Low	.5	.37
Mean	2.38	1.78
High	4.73	3.55
Simpson Deletion	1.63	1.23

[1]Billions of barrels.

[2]Trillions of cubic feet.

SOURCE: Alaska OCS Office.

TABLE 59. PROJECTED DIRECT OCS EMPLOYEES THAT WILL RESIDE IN ALASKA

Year	Scenarios			
	Low	Mean	High	Simpson Deletion
1983	0	0	0	0
1984	37	37	37	37
1985	39	39	39	39
1986	46	69	85	66
1987	46	71	88	66
1988	23	69	85	66
1989	0	0	0	0
1990	64	76	76	72
1991	461	1282	2319	152
1992	470	1479	2524	1075
1993	492	1641	2732	1336
1994	457	1757	2978	1426
1995	393	1771	3069	1297
1996	401	1541	3180	1062
1997	401	1333	2940	1067
1998	398	1333	2772	1069
1999	396	1348	2628	1069
2000	401	1359	2499	1062

SOURCE: Alaska OCS Office; SEAR adjustment performed at ISER (see Appendix C).

TABLE 60. PROJECTED STATE PROPERTY TAX REVENUES FOR ALL SCENARIOS
(Millions of Current Dollars)

Year	State Property Tax Revenues
1983	0.0
1984	0.0
1985	0.0
1986	0.0
1987	0.0
1988	0.0
1989	0.0
1990	0.687
1991	1.468
1992	1.541
1993	1.615
1994	1.691
1995	1.768
1996	1.845
1997	1.923
1998	2.000
1999	2.076
2000	2.151

SOURCE: ALASKA OCS OFFICE.

the statewide and regional MAP model. A comparison of each modified OCS development case run is then made with the non-OCS base case projections of the previous section. The difference in the values of the respective variables of each development case and the non-OCS base case provides a measure of the impact of the OCS development scenarios. Projections are developed for the 1980-2000 period.

The Mean-find Scenario

STATEWIDE IMPACTS

Population

Over the projection period there is a net increase of about 11,000 people above what would have occurred in the absence of the mean case (700.9 thousand versus 690.1 thousand). This is equivalent to 1.6 percent of the base case projected population. The bulk of this increase would not occur until after production begins in 1990, as shown in Tables 61 and 62.

Net in-migration contributes most to year-by-year population increase through the early part of the production phase. After 1995, natural increase contributes a greater share to annual population increments. Net out-migration would occur from 1996 to 1998 in response to an absolute decline in direct OCS employment from a peak of 1771 employees in 1995. (See Table 61.) Over the entire projection period net migration adds about 8400 persons to the total state population. By comparison, natural increase expands total population by 2400 persons

TABLE 61. PROJECTED STATEWIDE POPULATION IMPACTS, ABSOLUTE VALUES: MEAN CASE (Thousands of Persons)

	POPTST	MIGNET	NATINC
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.121	0.121	0.
1985	0.263	0.137	0.005
1986	0.362	0.09	0.01
1987	0.403	0.027	0.013
1988	0.428	0.012	0.014
1989	0.281	-0.16	0.014
1990	0.425	0.137	0.007
1991	3.718	3.281	0.012
1992	6.475	2.617	0.145
1993	8.208	1.496	0.241
1994	9.429	0.934	0.289
1995	10.308	0.566	0.314
1996	10.443	-0.188	0.324
1997	10.118	-0.629	0.303
1998	10.132	-0.254	0.266
1999	10.441	0.063	0.247
2000	10.847	0.164	0.241

POPTST = State population (10^3 persons)
MIGNET = Net migration (10^3 persons)
NATINC = Civilian non-native natural increase (10^3 persons)

SOURCE: MAP Model Projections.

TABLE 62. PROJECTED STATEWIDE POPULATION IMPACTS
PERCENTAGE DIFFERENCES: MEAN CASES
(Percent)

	POPTST	MIGNET	NATINC
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.027	0.468	0.
1985	0.054	0.41	0.096
1986	0.071	0.637	0.16
1987	0.078	-0.893	0.197
1988	0.082	-0.247	0.213
1989	0.054	8.686	0.224
1990	0.08	14.113	0.111
1991	0.683	119.488	0.207
1992	1.164	62.734	2.486
1993	1.439	23.908	4.085
1994	1.616	17.717	4.772
1995	1.727	10.447	5.088
1996	1.701	-2.093	5.14
1997	1.598	-5.819	4.609
1998	1.552	-2.388	3.85
1999	1.558	0.77	3.411
2000	1.572	1.547	3.235

POPTST = State population
MIGNET = Net migration
NATINC = Civilian non-native natural increase

SOURCE: MAP Model Projections.

or about 23 percent of the cumulative population increase of 10,800 persons generated from mean OCS development in the Beaufort Sea.

Employment

The pattern of net employment differences in total state employment between the base and mean case generally follows that of direct OCS employment in Table 61. As shown in Tables 63 and 64, net employment impacts remain modest at about 200 persons through the exploration and construction phases but increase rapidly after 1990, reflecting the heavy employment requirements of the development phase. The peak employment impact would be reached in 1995 at 2.0 percent above the base case or 6400 statewide employees. Differences in base and mean case employment would decline to about 1.5 percent above the base case (5500 employees) after 1995.

The same general pattern holds for components of total employment. Between 80 and 90 percent of basic sector employment (EMB1ST) expansion would consist primarily of OCS direct employment; the remaining 10 to 20 percent is generated through multiplier effects in the construction sector. Support sector employment (EMS1ST) expansion would be similar but would peak three years later than basic sector employment, reflecting lagged multiplier effects (i.e., the delayed employment impacts of discretionary spending distributed over several periods after income was earned). The same pattern is also present in government employment (EMG9ST) although the amplitude is considerably less.

TABLE 63. PROJECTED STATEWIDE EMPLOYMENT IMPACTS
ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	EM99ST	EM98ST	EMB1ST	EMS1ST	EMG9ST
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.089	0.085	0.048	0.042	-0.004
1985	0.159	0.154	0.046	0.09	0.018
1986	0.209	0.202	0.068	0.099	0.035
1987	0.22	0.212	0.07	0.105	0.038
1988	0.226	0.218	0.07	0.109	0.04
1989	0.116	0.112	0.009	0.072	0.032
1990	0.216	0.209	0.099	0.102	0.008
1991	2.63	2.546	1.535	0.784	0.227
1992	4.44	4.299	1.771	1.891	0.638
1993	5.424	5.255	1.849	2.545	0.861
1994	6.016	5.832	1.9	2.939	0.993
1995	6.354	6.163	1.951	3.133	1.078
1996	6.155	5.973	1.707	3.162	1.104
1997	5.676	5.511	1.464	2.993	1.055
1998	5.492	5.336	1.462	2.856	1.019
1999	5.541	5.386	1.491	2.86	1.035
2000	5.68	5.524	1.525	2.931	1.068

EM99ST = Total employment (10^3 persons)
EM98ST = Wage and salary employment (10^3 persons)
EMB1ST = Proportion of employment in the basic sector (10^3 persons)
EMS1ST = Proportion of employment in the support sector
EMG9ST = Proportion of employment in the government sector

SOURCE: MAP Model Projections.

TABLE 64. PROJECTED STATEWIDE EMPLOYMENT IMPACTS
PERCENTAGE DIFFERENCES: MEAN CASE
(Percent)

	EM99ST	EM98ST	EMB1ST	EMS1ST	EMG9ST
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.038	0.04	0.099	0.049	-0.005
1985	0.062	0.064	0.086	0.086	0.022
1986	0.078	0.081	0.137	0.087	0.041
1987	0.083	0.086	0.154	0.094	0.042
1988	0.085	0.088	0.151	0.099	0.043
1989	0.043	0.045	0.019	0.065	0.034
1990	0.079	0.082	0.204	0.09	0.008
1991	0.937	0.969	3.04	0.673	0.237
1992	1.536	1.587	3.354	1.569	0.653
1993	1.814	1.874	3.347	2.026	0.864
1994	1.953	2.016	3.347	2.252	0.973
1995	2.001	2.065	3.303	2.314	1.036
1996	1.866	1.925	2.713	2.232	1.044
1997	1.654	1.705	2.202	2.007	0.979
1998	1.541	1.588	2.106	1.824	0.925
1999	1.507	1.551	2.09	1.755	0.916
2000	1.489	1.532	2.015	1.729	0.927

EM99ST = Total employment
EM98ST = Wage and salary employment
EMB1ST = Proportion of employment in the basic sector
EMS1ST = Proportion of employment in the support sector
EMG9ST = Proportion of employment in the government sector

SOURCE: MAP Model Projections.

Income, Wages, and Prices

Total personal income in 1980 dollars (PIRST) rises about $8 million above base case levels during mean case exploration and construction. This income impact is not significant when expressed as a percent of total base case personal income or in absolute real per capita terms (Table 65). Not until the development phase commences in 1990 does the impact of OCS development on real personal income increase notably, rising to a peak impact of $236 million (or 2.3 percent) in 1995. As a percent of base case real per capita personal income, the impact of mean case OCS development does not exceeds 1 percent over the projection period (see Table 66).

The real wage and salary payments shown in Tables 67 and 68 follow the same general pattern as personal income. The smallest differences are seen in the government wage bill (WSG9RST), where the difference grows from about 9.2 million dollars in 1984 to 31.5 million dollars in 1996 (a 0.9 percent increase above the base case). After this peak, the differences drop slightly before increasing gradually to about $33.8 million by the year 2000. The average percentage difference over the period remains less than 1 percent.

The difference in total support sector real wages (WSS1RST) grows from $1.6 million in 1984 to $68 million in 1996 (a 2.2 percent increase above the base case). Thereafter, the percentage difference averages less than 2.0 percent. Basic sector wage bills (WSB1RST) closely approximate those of the support sector, although the average wage and

TABLE 65. PROJECTED STATEWIDE REAL AND REAL PER CAPITA PERSONAL INCOME IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Millions of 1980 Dollars and 1980 Dollars, Respectively)

	PIRST	PIRPCST
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	7.023	11.43
1985	7.527	5.805
1986	7.297	2.242
1987	7.641	2.695
1988	7.516	1.871
1989	2.844	-2.805
1990	14.258	14.281
1991	120.926	112.707
1992	174.035	121.418
1993	201.57	111.344
1994	220.934	103.543
1995	235.758	94.52
1996	227.047	64.801
1997	209.742	36.613
1998	209.117	28.367
1999	215.605	25.441
2000	224.484	19.793

PIRST = Personal income (millions of 1980 dollars)
PIRPCST = Real per capita personal income (1980 dollars)

SOURCE: MAP Model Projections.

TABLE 66. PROJECTED STATEWIDE REAL AND REAL PER CAPITA PERSONAL INCOME IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE
(Percent)

	PIRST	PIRPCST
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.1	0.073
1985	0.086	0.033
1986	0.084	0.013
1987	0.095	0.017
1988	0.095	0.012
1989	0.035	-0.018
1990	0.171	0.092
1991	1.396	0.708
1992	1.917	0.744
1993	2.115	0.666
1994	2.238	0.612
1995	2.283	0.546
1996	2.07	0.363
1997	1.8	0.199
1998	1.706	0.151
1999	1.694	0.134
2000	1.675	0.102

PIRST = Personal income
PIRPCST = Real per capita personal income

SOURCE: MAP Model Projections.

TABLE 67. PROJECTED STATEWIDE REAL WAGE AND SALARY IMPACTS, ABSOLUTE DIFFERENCES, MEAN CASE
(Millions of 1980 Dollars)

	WSB1RST	WSS1RST	WSG9RST
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	4.121	1.607	0.185
1985	2.802	2.431	0.737
1986	2.865	1.964	0.874
1987	3.015	2.083	0.929
1988	3.033	2.199	1.009
1989	0.328	1.423	0.852
1990	6.924	3.753	0.889
1991	75.504	17.368	7.183
1992	86.571	39.663	17.521
1993	90.208	53.117	23.109
1994	93.598	61.968	26.957
1995	98.124	66.555	30.01
1996	88.051	68.053	31.456
1997	77.401	65.273	30.799
1998	79.248	62.861	30.583
1999	82.438	63.401	31.927
2000	86.127	65.505	33.808

WRB1RST = Basic sector wages and salaries
WRS1RST = Support sector wages and salaries
WRG9RST = government sector wages and salaries

SOURCE: MAP Model Projections.

TABLE 68. PROJECTED STATEWIDE REAL WAGE AND SALARY IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE
(Percent)

	WSB1RST	WSS1RST	WSG9RST
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.194	0.086	0.01
1985	0.099	0.097	0.037
1986	0.119	0.074	0.04
1987	0.161	0.086	0.041
1988	0.165	0.094	0.043
1989	0.018	0.061	0.035
1990	0.365	0.157	0.035
1991	3.801	0.704	0.27
1992	4.106	1.542	0.629
1993	4.064	1.974	0.792
1994	4.147	2.223	0.881
1995	4.128	2.292	0.938
1996	3.397	2.211	0.939
1997	2.77	1.994	0.876
1998	2.697	1.822	0.829
1999	2.748	1.769	0.825
2000	2.679	1.747	0.835

WSB1RST = Basic sector wages and salaries
WSS1RST = Support sector wages and salaries
WSG9RST = Government sector wages and salaries

SOURCE: MAP Model Projections.

TABLE 69. PROJECTED STATEWIDE REAL WAGE RATE IMPACTS, ABSOLUTE VALUES: MEAN CASE (1980 Dollars)

	WRB1RST	WRS1RST	WRG9RST
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	41.879	8.066	3.348
1985	7.047	2.594	3.488
1986	-8.844	-2.992	-0.246
1987	2.937	-1.711	-0.387
1988	5.59	-1.059	-0.168
1989	-0.305	-0.824	0.168
1990	62.773	14.133	7.18
1991	290.578	6.398	9.016
1992	290.812	-5.668	-6.977
1993	278.84	-10.922	-21.086
1994	307.852	-5.934	-27.395
1995	321.285	-4.773	-30.027
1996	274.57	-4.484	-33.031
1997	233.402	-2.871	-33.383
1998	244.891	-0.477	-31.852
1999	270.891	2.988	-30.902
2000	276.539	3.988	-31.965

WRB1RST = Wage rates in the basic sector
WRS1RST = Wage rates in the support sector
WRG9RST = Wage rates in the government sector

SOURCE: MAP Model projections.

salaries are higher and the peak occurs one year earlier. Basic sector total wages in the OCS case are about 4.1 percent above the base case in the peak year (1995), but the percentage difference drops steadily until the end of the projection period, at which time the difference is 2.7 percent.

Real annual wage rate impacts shown in Tables 69 and 70 are greatest in the basic sector (WRB1RST). From a difference of 42 dollars in 1984, the wage rate impact grows to 321 dollars in 1995, a 0.8 percent difference over the base case. After a 2-year period of decline, wage rates impacts gradually increase to about 277 dollars by the end of the projection period. Differences in the wage rates for the support sector (WRS1RST) and government sector (WRG9RST) are generally negative over most of the projection period.

Direct OCS and indirect high-wage employment increases in the basic sector create additional low wage jobs in the support and government sectors.

Changes in the Alaska Relative Price Index (RPI) are minimal. A negligible increase over the base case of approximately 0.01 percent occurs in the early part of the project, but before the project peaks the differential becomes negative. Statistically, the differences are probably not significant and for all intents and purposes there is no real effect on the index. Data on the index are included in Table 71.

TABLE 70. PROJECTED STATEWIDE REAL WAGE RATE IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	WRB1RST	WRS1RST	WRG9RST
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.095	0.037	0.015
1985	0.013	0.011	0.014
1986	-0.018	-0.013	-0.001
1987	0.007	-0.008	-0.002
1988	0.014	-0.005	-0.001
1989	-0.001	-0.004	0.001
1990	0.161	0.067	0.027
1991	0.738	0.03	0.032
1992	0.728	-0.027	-0.024
1993	0.694	-0.051	-0.072
1994	0.774	-0.028	-0.091
1995	0.798	-0.022	-0.098
1996	0.667	-0.021	-0.104
1997	0.555	-0.013	-0.102
1998	0.578	-0.002	-0.095
1999	0.644	0.014	-0.09
2000	0.651	0.018	-0.091

WRB1RST = Wage rates in the basic sector
WRS1RST = Wage rates in the support sector
WRG9RST = Wage rates in the government sector

SOURCE: MAP Model projections.

TABLE 71. PROJECTED STATEWIDE RELATIVE PRICE INDEX IMPACTS, ABSOLUTE AND PERCENTAGE DIFFERENCES: MEAN CASE

	RPI	RPI
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.082	0.016
1985	0.119	0.022
1986	0.116	0.02
1987	0.111	0.018
1988	0.115	0.017
1989	0.144	0.02
1990	0.189	0.024
1991	0.34	0.04
1992	-0.313	-0.035
1993	-0.791	-0.081
1994	-1.031	-0.098
1995	-1.15	-0.102
1996	-1.267	-0.104
1997	-1.236	-0.094
1998	-0.983	-0.069
1999	-0.755	-0.05
2000	-0.604	-0.037

RPI = Alaska Relative Price Index

SOURCE: MAP Model projections.

TABLE 72. PROJECTED STATEWIDE REVENUE IMPACTS, ABSOLUTE VALUE: MEAN CASE (Millions of 1980 Dollars)

	REVGFR	RP9SR	RFDSR	RNDSR
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	-0.597	-0.505	0.003	-0.094
1985	-0.719	-0.729	0.026	-0.018
1986	-0.609	-0.7	0.049	0.039
1987	-0.598	-0.628	0.057	-0.025
1988	-0.672	-0.609	0.058	-0.123
1989	-1.	-0.718	0.024	-0.305
1990	-0.973	-0.54	0.041	-0.472
1991	-0.699	-0.741	0.528	-0.484
1992	6.832	1.601	0.969	4.263
1993	12.445	2.742	1.182	8.522
1994	14.352	2.896	1.268	10.186
1995	14.613	2.7	1.283	10.628
1996	14.352	2.5	1.21	10.643
1997	12.637	2.106	1.084	9.448
1998	9.195	1.537	0.99	6.666
1999	6.246	1.132	0.931	4.182
2000	4.707	0.883	0.887	2.938

REVGFR = Total general fund revenue
RP9ST = Total petroleum revenues
RFDSR = Revenues from the federal government
RNDSR = Other (nonfederal, nonpetroleum) revenues

SOURCE: MAP Model projections.

Government Revenue and Expenditure

The difference in total state government revenue (REVGFR) between the base case and the mean OCS development shown in Table 72 is negative until 1992, after oil and gas production begins. The decline is caused by the marginally higher price level brought about by OCS development. (See Table 71.) The nominal direct and indirect revenue effects of economic expansion in both the petroleum and endogenous sectors are neutral until state and borough petroleum property tax receipts accrue with the onset of production. Expressed in 1980 dollars, total state government revenue (REVGFR), petroleum taxes (RP9SR), and other (nonpetroleum) state government revenues (RNDSR) including state corporate income taxes and earnings on the general and permanent fund balances decline modestly in real terms through 1991 at less than 0.02 percent below base case revenues (Table 73). Further, although real property tax receipts grow steadily after 1990 (Table 60) the present value of their real impact in future years expressed in 1980 dollars, diminishes as the forecast period progresses. By the second half of the projection period all state government revenue impacts shown in Table 72 remain positive. The absolute value of other state government revenues (RNDSR) are more strongly impacted by OCS activity than are federal government revenues (RFDSR) or petroleum revenues. Note, however, that as a percent of base case revenue, federal government revenue (RFDSR) would be the only revenue category having a greater-than-1 percent increase over base case levels. By 1996 the difference in total state government revenue approaches $11 million or 0.3 percent of base case state government revenue.

TABLE 73. PROJECTED STATEWIDE REVENUE IMPACTS, PERCENTAGE DIFFERENCE: MEAN CASE

	REVGFR	RP9SR	RFDSR	RNDSR
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	-0.015	-0.016	0.002	-0.012
1985	-0.016	-0.022	0.015	-0.002
1986	-0.012	-0.02	0.029	0.003
1987	-0.012	-0.018	0.037	-0.002
1988	-0.012	-0.017	0.041	-0.007
1989	-0.018	-0.02	0.018	-0.016
1990	-0.017	-0.016	0.032	-0.022
1991	-0.012	-0.022	0.448	-0.021
1992	0.121	0.054	0.872	0.167
1993	0.226	0.102	1.125	0.315
1994	0.268	0.121	1.277	0.357
1995	0.281	0.126	1.37	0.358
1996	0.284	0.131	1.362	0.348
1997	0.256	0.123	1.285	0.301
1998	0.191	0.101	1.235	0.208
1999	0.133	0.084	1.227	0.129
2000	0.103	0.074	1.233	0.089

REVGFR = Total general fund revenue
RP9ST = Total petroleum revenues
RFDSR = Revenues from the federal government
RNDSR = Other (nonfederal, nonpetroleum) revenues

SOURCE: MAP Model projections.

TABLE 74. PROJECTED STATEWIDE REAL AND REAL PER CAPITA GOVERNMENT EXPENDITURE IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Millions of 1980 Dollars and 1980 Dollars, Respectively)

	E99SR	E99SRPC
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.504	0.013
1985	0.993	-0.015
1986	1.403	-0.016
1987	1.623	-0.022
1988	1.811	-0.022
1989	1.303	0.02
1990	1.951	-0.022
1991	18.119	0.01
1992	32.706	0.019
1993	42.734	-0.019
1994	50.897	0.017
1995	57.475	-0.031
1996	59.994	0.018
1997	59.646	0.015
1998	61.338	0.016
1999	65.07	-0.03
2000	69.516	0.019

E99SR = Total state expenditures
E99SRPC = Real per capita state expenditures

SOURCE: MAP Model projections.

Total state government expenditures (E99SR) expressed in 1980 dollars increased modestly during exploration and construction (see Tables 74 and 75). The difference between base and mean case state expenditures increases abruptly after 1990 as a result of expanded population resulting directly and indirectly from mean OCS development. From 1991 to the end of the forecast period the rate of state expenditures growth averaged 16 percent per year. As a percent of base case levels state expenditure under mean OCS development peaked at 1.7 percent in 1995, declining gradually thereafter. By assumption, real per capita state expenditures remain constant at base case levels.

The difference between base case and mean case general fund balances is shown in current dollars (FUND) and in 1980 dollars (FUNDR) in Table 76 (percentage differences shown in Table 77). The impact of mean OCS development on general fund balances would steadily decline in both current and 1980 dollars. By the year 2000 general fund balances fall by $252 million (of 1980 dollars), reflecting a 35 percent average annual rate of decline between 1984 and 2000. Although large in absolute terms, this negative impact approaches but does not exceed 1 percent of base case general fund levels over the duration of the forecast.

The drain in the general fund balance is caused mainly by accelerated state government expenditures to meet OCS-induced population and price

TABLE 75. PROJECTED STATEWIDE REAL AND REAL PER CAPITA GOVERNMENT EXPENDITURE IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	E99SR	E99SRPC
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.028	0.001
1985	0.052	-0.001
1986	0.069	-0.001
1987	0.076	-0.002
1988	0.081	-0.002
1989	0.055	0.001
1990	0.078	-0.002
1991	0.683	0.001
1992	1.165	0.001
1993	1.438	-0.001
1994	1.617	0.001
1995	1.725	-0.002
1996	1.702	0.001
1997	1.599	0.001
1998	1.553	0.001
1999	1.557	-0.002
2000	1.573	0.001

E99SR = Total state expenditures
E99SRPC = Real per capita state expenditures

SOURCE: MAP Model projections.

TABLE 76. PROJECTED STATEWIDE GENERAL AND PERMANENT FUND BALANCE IMPACTS, ABSOLUTE DIFFERENCE: MEAN CASE
(Millions of Current and 1980 Dollars, Respectively)

	FUND	FUNDR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	-0.797	-2.062
1985	-2.086	-3.871
1986	-3.832	-5.105
1987	-6.105	-6.281
1988	-9.031	-7.773
1989	-11.805	-9.703
1990	-15.547	-12.34
1991	-48.293	-29.535
1992	-100.937	-28.367
1993	-168.687	-35.75
1994	-256.875	-54.43
1995	-368.312	-80.352
1996	-496.687	-107.266
1997	-640.	-137.34
1998	-812.312	-174.219
1999	-1022.87	-213.082
2000	-1273.81	-252.18

FUND = Total fund balance (millions of current dollars)
FUNDR = Total fund balance (millions of 1980 dollars)

SOURCE: MAP Model projections.

TABLE 77. PROJECTED PERCENTAGE DIFFERENCES IN CURRENT- AND 1980- DOLLAR FUND BALANCES: MEAN CASE

	FUND	FUNDR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	-0.006	-0.022
1985	-0.011	-0.034
1986	-0.016	-0.036
1987	-0.02	-0.038
1988	-0.024	-0.041
1989	-0.026	-0.046
1990	-0.029	-0.053
1991	-0.077	-0.117
1992	-0.141	-0.106
1993	-0.209	-0.128
1994	-0.287	-0.189
1995	-0.377	-0.275
1996	-0.47	-0.366
1997	-0.566	-0.472
1998	-0.678	-0.609
1999	-0.814	-0.765
2000	-0.977	-0.941

FUND = Total fund balance (millions of current dollars)
FUNDR = Total fund balance (millions of 1980 dollars)

SOURCE: MAP Model projections.

TABLE 78. PROJECTED REGIONAL POPULATION IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	POPTR1	POPTR4	POPTR5	POPTR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.001	0.014	0.082	0.033
1985	0.001	0.03	0.151	0.062
1986	0.001	0.045	0.208	0.082
1987	0.002	0.05	0.232	0.088
1988	0.002	0.053	0.244	0.09
1989	0.004	0.032	0.135	0.043
1990	0.003	0.052	0.261	0.071
1991	-0.01	0.033	3.744	0.176
1992	0.026	0.36	5.103	0.684
1993	0.043	0.566	6.013	1.011
1994	0.052	0.703	6.676	1.235
1995	0.06	0.788	7.14	1.371
1996	0.069	0.797	7.078	1.303
1997	0.069	0.758	6.815	1.172
1998	0.063	0.754	6.843	1.172
1999	0.063	0.784	7.003	1.229
2000	0.066	0.835	7.197	1.296

POPTR1 = Total population in the North Slope region
POPTR4 = Total population in the Southcentral region
POPTR5 = Total population in the Anchorage region
POPTR7 = Total population in the Fairbanks region

SOURCE: MAP Model projections.

level expansion in the absence of a compensating rise in state government revenues. For example, in 1995 when the difference in general fund revenues peaked at $14.5 million (1980), the difference in (i.e., impact) on) state expenditures was $57.5 million (1980), nearly four times the size of general fund revenue impacts. In general, direct and indirect state government revenue increases from OCS development do not match the rise in state government expenditures needed to accommodate OCS-induced economic expansion.

REGIONAL IMPACTS

Introduction

We have assumed that OCS development in the Beaufort 71 lease sale will not have any direct employment impact on the North Slope region. All Beaufort employment will permanently reside in the Fairbanks, Anchorage, and Southcentral regions during rotation leave. Consequently, the population, employment, and personal income impacts that are projected in the North Slope would result from the dispursement of North Slope Borough property tax receipts through local government wages and salaries and local capital improvement projects.

Regional Population Impacts

Absolute and percentage differences between the base and mean case population projections for the North Slope (R1), Southcentral (R4), Anchorage (R5), and Fairbanks (R7) regions are shown in Tables 78 and 79. Anchorage undergoes the greatest population expansion with the difference between the mean and base cases growing from 82 persons in

TABLE 79. PROJECTED REGIONAL POPULATION IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	POPTR1	POPTR4	POPTR5	POPTR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.011	0.024	0.039	0.042
1985	0.024	0.049	0.065	0.071
1986	0.018	0.069	0.086	0.096
1987	0.031	0.075	0.096	0.107
1988	0.04	0.078	0.101	0.109
1989	0.063	0.047	0.055	0.051
1990	0.047	0.077	0.105	0.084
1991	-0.155	0.049	1.487	0.204
1992	0.41	0.526	1.983	0.774
1993	0.646	0.815	2.283	1.117
1994	0.765	1.017	2.485	1.338
1995	0.853	1.125	2.592	1.449
1996	0.949	1.113	2.497	1.343
1997	0.916	1.03	2.328	1.173
1998	0.818	1.002	2.267	1.142
1999	0.797	1.028	2.262	1.17
2000	0.807	1.046	2.26	1.205

POPTR1 = Total population in the North Slope region
POPTR4 = Total population in the Southcentral region
POPTR5 = Total population in the Anchorage region
POPTR7 = Total population in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 80. PROJECTED REGIONAL TOTAL EMPLOYMENT IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	EM99R1	EM99R4	EM99R5	EM99R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.001	0.01	0.055	0.023
1985	0.001	0.016	0.093	0.037
1986	0.001	0.023	0.121	0.048
1987	0.001	0.026	0.127	0.049
1988	0.001	0.026	0.129	0.049
1989	0.002	0.013	0.056	0.02
1990	0.002	0.028	0.134	0.039
1991	0.007	0.089	2.297	0.196
1992	0.025	0.291	3.239	0.535
1993	0.034	0.404	3.76	0.728
1994	0.04	0.469	4.079	0.845
1995	0.044	0.501	4.259	0.903
1996	0.047	0.478	4.098	0.827
1997	0.046	0.425	3.808	0.708
1998	0.044	0.402	3.725	0.673
1999	0.045	0.403	3.762	0.681
2000	0.047	0.419	3.838	0.701

EM99R1 = Total employment in the North Slope region
EM99R4 = Total employment in the Southcentral region
EM99R5 = Total employment in the Anchorage region
EM99R7 = Total employment in the Fairbanks region

SOURCE: MAP Model projections.

1984 to 7200 persons in 2000. Expressed in terms of percent difference, the Anchorage population impact would be greatest in 1995 at 26 percent higher than base case levels. The population impacts on Southcentral and Fairbanks are similar to those on Anchorage in that the percentage difference would also be greatest in 1995. The Fairbanks region generally absorbs about 50 percent more additional population that Southcentral. The North Slope population impact is less in absolute and percentage in absolute and percentage differences than the other regions. Not until after 1990 does the difference in mean and base case population in the North Slope exceed more than a few persons. The North Slope population impact is greatest in 1996 and 1997 with 69 additional persons. Again, we emphasize that this impact is not a result of direct employment, but is attributed to local government wage and salary and capital improvements expenditures from higher petroleum property tax receipts. As a proportion of the total statewide population impact in the year 2000 (9394 persons), Anchorage absorbs 76 percent, Fairbanks receives 14 percent, Southcentral receives 9 percent, leaving 1 percent to the North Slope region.

Regional Employment Impacts

The impact of the mean case expressed in absolute and percentage differences is projected for each of the four regions and for several categories of employment including total employment (EM99), support sector employment (EMS1), basic sector employment (EMB1), and government sector employment (EMG9). (See Tables 80 through 87.) As shown in Table 80, the difference between total employment in the mean and

TABLE 81. PROJECTED REGIONAL TOTAL EMPLOYMENT IMPACTS, PERCENTAGE DIFFERENCE: MEAN CASE

	EM99R1	EM99R4	EM99R5	EM99R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.032	0.038	0.051	0.049
1985	0.037	0.053	0.076	0.071
1986	0.021	0.074	0.095	0.096
1987	0.033	0.079	0.1	0.108
1988	0.042	0.081	0.102	0.109
1989	0.05	0.04	0.044	0.043
1990	0.073	0.084	0.103	0.085
1991	0.22	0.26	1.735	0.412
1992	0.741	0.837	2.378	1.094
1993	0.977	1.134	2.676	1.448
1994	1.114	1.32	2.823	1.64
1995	1.198	1.377	2.859	1.701
1996	1.23	1.266	2.652	1.509
1997	1.157	1.082	2.368	1.246
1998	1.073	0.993	2.233	1.147
1999	1.065	0.982	2.188	1.13
2000	1.076	0.965	2.16	1.131

EM99R1 = Total employment in the North Slope region
EM99R4 = Total employment in the Southcentral region
EM99R5 = Total employment in the Anchorage region
EM99R7 = Total employment in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 82. PROJECTED REGIONAL BASIC SECTOR EMPLOYMENT IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	EMB1R1	EMB1R4	EMB1R5	EMB1R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.001	0.009	0.027	0.01
1985	0.001	0.007	0.028	0.01
1986	-0.	0.01	0.042	0.015
1987	0.	0.011	0.043	0.014
1988	0.	0.011	0.043	0.014
1989	0.	0.001	0.004	0.001
1990	0.001	0.018	0.058	0.019
1991	0.003	0.071	1.367	0.094
1992	0.006	0.105	1.499	0.136
1993	0.008	0.114	1.541	0.149
1994	0.009	0.117	1.569	0.158
1995	0.01	0.123	1.599	0.165
1996	0.011	0.084	1.438	0.11
1997	0.011	0.047	1.284	0.057
1998	0.011	0.045	1.287	0.056
1999	0.012	0.047	1.308	0.061
2000	0.013	0.051	1.327	0.066

EMB1R1 = Basic sector employment in the North Slope region
EMB1R4 = Basic sector employment in the Southcentral region
EMB1R5 = Basic sector employment in the Anchorage region
EMB1R7 = Basic sector employment in the Fairbanks region

SOURCE: MAP Model projections.

base cases for Southcentral (R4), Anchorage (R5), and Fairbanks (R7) strongly resembles the pattern of direct OCS employment shown in Table 59, as well as the regional population impacts just discussed; employment impacts gradually increase to peak levels in 1995, followed by modest cyclical changes thereafter. Again, the Anchorage region accepts the bulk of the statewide employment impact (77 percent in 2000) followed by Fairbanks (1+ percent), Southcentral (8 percent), and the North Slope (1 percent). As with regional population, the largest regional employment impacts occur outside the North Slope region where OCS development takes place. This reflects two important assumptions discussed above. First, nonresident enclave employment is not included in the development scenarios. Second, the employment data reflect place of residence rather than place of work. In the case of Anchorage (R5), part of employment expansion represents the direct (and indirect) impact of headquarters employment.

Differences in basic sector employment (EMB1) for the peak year 1995 are: 10, 123, 1599, and 165 for regions R1, R4, R5, and R7, respectively. The comparable percentage differentials are 2 percent or less for all regions except Anchorage (R5) which experiences a peak basic sector employment impact of nearly 8 percent over base case levels (see Tables 82 and 83).

Support sector peak employment differences occur in 1996, reflecting a slight lag in support sector response to direct economic expansion. In absolute terms these impacts are: 9, 248, 2131, and 529 for R1, R4,

TABLE 83. PROJECTED REGIONAL BASIC SECTOR EMPLOYMENT IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	EMB1R1	EMB1R4	EMB1R5	EMB1R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.096	0.087	0.16	0.091
1985	0.043	0.064	0.145	0.078
1986	-0.006	0.102	0.23	0.154
1987	0.014	0.113	0.241	0.245
1988	0.027	0.112	0.236	0.253
1989	0.039	0.014	0.02	0.02
1990	0.188	0.172	0.313	0.326
1991	0.34	0.663	7.379	1.545
1992	0.689	0.956	7.816	2.169
1993	0.814	1.016	7.845	2.329
1994	0.946	1.102	7.908	2.433
1995	1.033	1.125	7.775	2.458
1996	1.053	0.731	6.665	1.556
1997	0.993	0.383	5.706	0.778
1998	0.94	0.36	5.554	0.75
1999	0.966	0.385	5.557	0.802
2000	0.987	0.383	5.421	0.83

EMB1R1 = Basic sector employment in the North Slope region
EMB1R4 = Basic sector employment in the Southcentral region
EMB1R5 = Basic sector employment in the Anchorage region
EMB1R7 = Basic sector employment in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 84. PROJECTED REGIONAL SUPPORT SECTOR EMPLOYMENT IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	EMS1R1	EMS1R4	EMS1R5	EMS1R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.	0.002	0.026	0.013
1985	0.	0.007	0.055	0.023
1986	-0.	0.008	0.062	0.027
1987	0.	0.009	0.066	0.028
1988	0.	0.009	0.067	0.028
1989	0.	0.007	0.04	0.013
1990	0.001	0.009	0.067	0.019
1991	-0.	0.	0.74	0.069
1992	0.004	0.107	1.384	0.291
1993	0.006	0.179	1.772	0.431
1994	0.007	0.222	2.009	0.516
1995	0.007	0.237	2.127	0.551
1996	0.009	0.248	2.131	0.529
1997	0.009	0.24	2.025	0.473
1998	0.008	0.224	1.956	0.445
1999	0.008	0.222	1.967	0.446
2000	0.008	0.229	2.012	0.456

EMS1R1 = Support sector employment in the North Slope region
EMS1R4 = Support sector employment in the Southcentral region
EMS1R5 = Support sector employment in the Anchorage region
EMS1R7 = Support sector employment in the Fairbanks region

SOURCE: MAP Model projections.

R5, and R7, respectively. Support sector impacts do not exceed 3 percent of base case levels for all regions (see Tables 84 and 85).

In comparison to basic and support sector expansion, government employment differences are considerably less in Anchorage than in other regions.

Whereas, Anchorage would typically absorb 75 percent of basic and support sector employment expansion, it only accounts for 50 percent of statewide government employment expansion in the peak year impact year of 1996. Fairbanks accounts for 25 percent, Southcentral has 20 percent, and the North Slope captures nearly 5 percent of statewide government employment (see Tables 86 and 87). This higher North Slope impact reflects the disbursement of about 50 percent of borough petroleum property taxes for local government wages and salaries.

Regional Personal Income Impacts

The regional distribution of real personal income expansion (expressed in 1980 dollars) follows the same patterns as employment and population. As shown in Table 88, Anchorage experiences the largest impact, $150 million or 75 percent of statewide personal income expansion in the year 2000; followed by Fairbanks, $30.4 million or 16 percent of statewide expansion; Southcentral, $16.2 million or 8 percent of statewide expansion; and the North Slope, $2.63 million at 1 percent of statewide personal income expansion. Personal income regional impacts peak in 1995 for Anchorage, Fairbanks, and Southcentral, and in

TABLE 85. PROJECTED REGIONAL SUPPORT SECTOR EMPLOYMENT IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	EMS1R1	EMS1R4	EMS1R5	EMS1R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.054	0.031	0.054	0.08
1985	0.041	0.069	0.092	0.115
1986	-0.009	0.072	0.096	0.128
1987	0.003	0.077	0.104	0.141
1988	0.02	0.083	0.109	0.143
1989	0.065	0.061	0.065	0.067
1990	0.115	0.079	0.105	0.094
1991	-0.035	0.001	1.131	0.339
1992	0.649	0.908	2.038	1.382
1993	0.884	1.474	2.501	1.96
1994	1.007	1.794	2.73	2.267
1995	1.114	1.861	2.782	2.327
1996	1.232	1.876	2.659	2.135
1997	1.18	1.732	2.397	1.812
1998	1.032	1.556	2.204	1.629
1999	0.996	1.482	2.131	1.573
2000	1.005	1.457	2.095	1.553

EMS1R1 = Support sector employment in the North Slope region
EMS1R4 = Support sector employment in the Southcentral region
EMS1R5 = Support sector employment in the Anchorage region
EMS1R7 = Support sector employment in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 86. PROJECTED REGIONAL GOVERNMENT SECTOR EMPLOYMENT IMPACTS, ABSOLUTE VALUES: MEAN CASE
(Thousands of Persons)

	EMG9R1	EMG9R4	EMG9R5	EMG9R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	-0.	-0.001	-0.001	-0.001
1985	0.	0.002	0.006	0.003
1986	0.001	0.005	0.012	0.006
1987	0.001	0.005	0.012	0.006
1988	0.001	0.005	0.013	0.006
1989	0.001	0.004	0.01	0.005
1990	0.	0.001	0.003	0.001
1991	0.006	0.03	0.076	0.037
1992	0.016	0.085	0.208	0.104
1993	0.022	0.114	0.281	0.14
1994	0.025	0.131	0.324	0.162
1995	0.028	0.143	0.352	0.176
1996	0.028	0.146	0.36	0.18
1997	0.027	0.14	0.345	0.172
1998	0.026	0.135	0.333	0.166
1999	0.026	0.137	0.338	0.169
2000	0.027	0.141	0.349	0.174

EMG9R1 = Total government sector employment in the North Slope region
EMG9R4 = Total government sector employment in the Southcentral region
EMG9R5 = Total government sector employment in the Anchorage region
EMG9R7 = Total government sector employment in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 87. PROJECTED REGIONAL GOVERNMENT SECTOR EMPLOYMENT IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	EMG9R1	EMG9R4	EMG9R5	EMG9R7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	-0.012	-0.01	-0.003	-0.004
1985	0.034	0.036	0.017	0.017
1986	0.063	0.065	0.032	0.033
1987	0.064	0.066	0.033	0.034
1988	0.066	0.067	0.034	0.035
1989	0.053	0.053	0.027	0.028
1990	0.013	0.011	0.007	0.007
1991	0.335	0.35	0.191	0.197
1992	0.933	0.983	0.518	0.54
1993	1.249	1.284	0.69	0.719
1994	1.402	1.43	0.78	0.813
1995	1.479	1.511	0.833	0.868
1996	1.478	1.515	0.84	0.876
1997	1.376	1.41	0.792	0.825
1998	1.287	1.319	0.751	0.782
1999	1.265	1.296	0.746	0.777
2000	1.27	1.304	0.757	0.788

EMG9R1 = Total government sector employment in the North Slope region
EMG9R4 = Total government sector employment in the Southcentral region
EMG9R5 = Total government sector employment in the Anchorage region
EMG9R7 = Total government sector employment in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 88. PROJECTED REGIONAL REAL PERSONAL INCOME IMPACTS, ABSOLUTE DIFFERENCES: MEAN CASE
(Millions of 1980 Dollars)

	PIRR1	PIRR4	PIRR5	PIRR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.162	1.155	3.217	2.104
1985	0.116	0.9	3.928	1.992
1986	-0.005	0.844	4.186	1.825
1987	0.033	0.954	4.269	1.87
1988	0.049	0.943	4.157	1.803
1989	0.061	0.311	1.287	0.551
1990	0.287	2.354	7.062	3.121
1991	0.692	7.42	95.484	12.319
1992	1.431	13.26	122.465	23.291
1993	1.722	16.038	137.012	29.455
1994	1.995	17.986	146.926	33.924
1995	2.261	19.408	154.941	36.608
1996	2.431	17.81	149.176	33.347
1997	2.404	15.256	139.836	28.488
1998	2.359	14.881	140.773	27.985
1999	2.475	15.317	144.793	29.084
2000	2.63	16.237	150.012	30.415

PIRR1 = Real personal income in the North Slope region
PIRR4 = Real personal income in the Southcentral region
PIRR5 = Real personal income in the Anchorage region
PIRR7 = Real personal income in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 89. PROJECTED REGIONAL REAL PERSONAL INCOME IMPACTS, PERCENTAGE DIFFERENCES: MEAN CASE

	PIRR1	PIRR4	PIRR5	PIRR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.125	0.126	0.104	0.123
1985	0.064	0.08	0.103	0.089
1986	-0.003	0.074	0.107	0.093
1987	0.022	0.091	0.114	0.12
1988	0.035	0.092	0.112	0.119
1989	0.047	0.03	0.034	0.036
1990	0.225	0.223	0.182	0.198
1991	0.507	0.683	2.379	0.749
1992	0.993	1.178	2.918	1.355
1993	1.142	1.375	3.121	1.642
1994	1.287	1.567	3.238	1.833
1995	1.387	1.633	3.265	1.89
1996	1.394	1.411	2.972	1.628
1997	1.289	1.135	2.628	1.314
1998	1.204	1.068	2.523	1.235
1999	1.221	1.098	2.501	1.239
2000	1.233	1.092	2.472	1.238

PIRR1 = Real personal income in the North Slope region
PIRR4 = Real personal income in the Southcentral region
PIRR5 = Real personal income in the Anchorage region
PIRR7 = Real personal income in the Fairbanks region

SOURCE: MAP Model projections.

1996 for the North Slope. In general the percentage differences from the base case shown by region in Table 89 indicate that personal income impacts would be relatively small, not exceeding 3.3 percent for any region in any given year.

Real per capita income impacts (see Tables 90 and 91) generally reflect those observed at the statewide level. Increases that occur at the start of the project are followed by brief periods of negative impacts before turning positive again. Real per capita personal income impacts peak in the early 1990s for all regions and except for the North Slope, and decline steadily thereafter. North Slope impacts experience cyclical changes throughout the 1990s. The Anchorage region experiences the largest absolute impact at $150 per capita in 1992. The North Slope is a close second at $146 in 1991. In general the real per capita impacts are well below 1 percent of base case real personal income in all regions.

The Low-Find Scenario: Statewide and Regional Impacts

The impacts associated with low-find OCS development, as measured against base case aggregate indicators are similar to the pattern of moderate-find OCS impacts. Between 1984 and 1989 when exploration and construction would take place, low case impacts on population, employment, prices, wage rates, income, and the state fiscal position are minor. Most aggregate indicators typically do not expand by more than

TABLE 90. PROJECTED REGIONAL REAL PER CAPITA PERSONAL INCOME IMPACTS, ABSOLUTE VALUES: MEAN CASE
(1980 Dollars)

	PIRPCR1	PIRPCR4	PIRPCR5	PIRPCR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	29.086	16.562	9.555	17.809
1985	12.762	5.703	6.141	4.672
1986	-6.246	0.855	3.355	-0.699
1987	-2.035	2.523	2.77	2.559
1988	-1.152	2.059	1.699	1.797
1989	-3.461	-2.617	-3.242	-2.832
1990	38.047	22.855	12.004	21.113
1991	146.289	101.242	140.109	103.637
1992	131.012	106.531	149.562	112.062
1993	112.824	93.242	136.531	102.898
1994	118.168	90.395	124.109	98.008
1995	123.301	85.215	112.965	89.047
1996	106.309	51.859	82.09	59.402
1997	92.172	19.039	53.418	30.184
1998	97.207	12.027	46.312	20.18
1999	107.266	12.602	43.562	15.191
2000	110.176	8.477	39.484	7.48

PIRPCR1 = Real per capita personal income in the North Slope region
PIRPCR4 = Real per capita personal income in the Southcentral region
PIRPCR5 = Real per capita personal income in the Anchorage region
PIRPCR7 = Real per capita personal income in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 91. PROJECTED REGIONAL REAL PER CAPITA PERSONAL INCOME IMPACTS PERCENTAGE DIFFERENCES MEAN CASE

	PIRPCR1	PIRPCR4	PIRPCR5	PIRPCR7
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.115	0.103	0.065	0.08
1985	0.039	0.03	0.037	0.018
1986	-0.021	0.005	0.021	-0.003
1987	-0.008	0.016	0.018	0.013
1988	-0.005	0.013	0.011	0.01
1989	-0.016	-0.017	-0.021	-0.015
1990	0.178	0.146	0.077	0.113
1991	0.663	0.634	0.879	0.545
1992	0.581	0.648	0.917	0.576
1993	0.493	0.555	0.819	0.519
1994	0.517	0.544	0.735	0.489
1995	0.53	0.502	0.656	0.435
1996	0.441	0.294	0.464	0.281
1997	0.37	0.104	0.294	0.139
1998	0.383	0.065	0.251	0.091
1999	0.421	0.069	0.233	0.068
2000	0.423	0.046	0.207	0.033

PIRPCR1 = Real per capita personal income in the North Slope region
PIRPCR4 = Real per capita personal income in the Southcentral region
PIRPCR5 = Real per capita personal income in the Anchorage region
PIRPCR7 = Real per capita personal income in the Fairbanks region

SOURCE: MAP Model projections.

TABLE 92. SUMMARY OF LOW SCENARIO IMPACTS

Variable	Peak Cyclical Impact			Impact in the Year 2000	
	Absolute Value (Persons)	Percentage Difference (Percent)	Year	Absolute Value (Persons)	Percentage Difference (Percent)
POPTST	2730	0.47	1994	3088	0.45
MIGNET	1203	43.8	1991	47	0.44
EM99ST	1681	0.56	1993	1597	0.43
EMB1ST	511	1.01	1991	305	0.51
EMS1ST	881	0.68	1994	867	0.51
EMG9ST	286	0.28	1994	301	0.26
	(Millions of 1980 Dollars)			(Millions of 1980 Dollars)	
PIRST	$58.9	0.62	1993	$61.9	0.46
REVGFR	$ 3.95	0.45	1993	$ 0.37	0.01
E99SR	$19.82	0.45	2000	$19.82	0.45
FUNDR	-$83.2	-0.31	2000	-$83.2	-0.31

POPTST = Population
MIGNET = Net migration
EM99ST = Total employment
EMB1ST = Proportion of employment in the basic sector
EMS1ST = Proportion of employment in the support sector
EMG9ST = Proportion of employment in the government sector
PIRST = Personal income
REVGFR = Total general fund revenue
E99SR = Total state expenditures
FUNDR = Total fund balance

SOURCE: MAP Model projections.

one-tenth of a percent over base case levels during this predevelopment-phase. Aggregate state expenditures and fund balances, expressed in 1980 dollars experience the greatest expansion relative to respective base case levels, yet the impact of low-find OCS development on these variables would still be less than one-half of one percent of base case levels.

Once the development phase begins, the impact of low-find OCS development becomes noticeably larger as with the mean case impacts. The absolute value and percent difference of cyclical peak impacts are shown in Table 92 for several aggregate indicators. With few exceptions these cylcical peaks do not exceed 1 percent of base case levels and are usually on the order of less than 0.5 percent. Also shown in Table 92 are the absolute values and percentage differences of impacts that occur in the year 2000 for the same variables. By the year 2000 the largest employment expansion occurs in the support sector (867 employees) followed by roughly equal amounts of increased employment in the basic and government sectors (305 and 301 employees, respectively). As in the mean-find scenario the impact of low-find development on the overall fiscal position of the state is reflected in an increasingly negative fund balance. Expressed in 1980 dollars, these negative low-find fund balance impacts for 2000 are one-third the size of those in the mean-find scenario. For reference purposes, supporting data for statewide and regional low-find impacts are included in a technical appendix of MAP model projections entitled, "Beaufort Base Case and Impact Results from the MAP Model, ISER, dated January 5, 1981; pages 119-47.

TABLE 93. REGIONAL DISTRIBUTION OF LOW-FIND IMPACTS IN THE YEAR 2000

	Population		Employment		Personal Income	
	Persons	Percent	Persons	Percent	Dollars[a]	Percent
North Slope (R1)	18	0.6	13	0.8	0.7	1.1
Southcentral (R4)	27	0.9	135	8.5	5.2	8.4
Anchorage (R5)	1,963	63.6	1033	64.7	39.3	63.5
Fairbanks (R7)	439	14.2	234	14.7	20.1	16.3
Statewide	3,088	100.0	1597	100.0	61.9	100.0

[a]Million of 1980 dollars.

Table Note: Regional percentages do not sum to 100 since other regions not included in this table are also affected by OCS development.

SOURCE: MAP Model.

The regional distribution of the absolute difference between low-find and base case statewide population, employment, and real personal income is shown in Table 93. Also shown are the regional shares expressed as a percent statewide impacts represented by each variable. As expected, the regional distribution of impacts on the aggregate indicators in Table 93 reflect the pattern of direct OCS employment adjusted for Alaska residency. The relatively modest population, employment, and real personal income impacts in the North Slope occur indirectly through the expanded petroleum property tax base in the North Slope Borough. For all variables, the Anchorage region absorbs nearly two-thirds of the total statewide impact.

The High-Find Scenario: Statewide and Regional Impacts

Table 94 summarizes the impact of high scenario development relative to the base case. The impacts in Table 94 are expressed as absolute and percentage differences from the base case for several aggregate economic indicators. Many aggregate indicators experience peak impacts prior to 2000 when the projection period ends. These peak cyclical impacts and the year they occur are presented in the first three columns of Table 94. Columns four and five display the impacts as they occur in the year 2000. The following discussion summarizes the high scenario impacts; supporting data are shown in Beaufort Base Case and Impact Results from the MAP Model, 1981, pages 61-117.

TABLE 94. SUMMARY OF HIGH SCENARIO IMPACTS

Variable	Peak Cyclical Impact			Impact in the Year 2000	
	Absolute Difference (Persons)	Percentage Difference (Percent)	Year	Absolute Difference (Persons)	Percentage Difference (Percent)
POPTST	20,642	2.99	2000	20,642	2.99
MIGNET	5,895	214.65	1991	- 375	-3.54
EM99ST	11,722	3.56	1996	10,944	2.86
EMB1ST	3,440	6.06	1994	2,893	3.82
EMS1ST	5,940	3.98	1997	5,683	3.35
EMG9ST	2,091	1.90	1998	2.069	1.80
	(Millions of 1980 Dollars)			(Millions of 1980 Dollars)	
PIRST	445.1	3.82	1997	430.3	3.2
REVGFR	24.1	0.46	1995	12.6	0.28
E99SR	132.3	2.99	2000	132.3	2.99
FUNDR	-468.2	1.75	2000	-468.2	1.75

POPTST = Population
MIGNET = Net migration
EM99ST = Total employment
EMB1ST = Proportion of employment in the basic sector
EMS1ST = Proportion of employment in the support sector
EMG9ST = Proportion of employment in the government sector
PIRST = Personal income
REVGFR = Total general fund revenue
E99SR = Total state expenditures
FUNDR = Total fund balance

SOURCE: MAP Model.

TABLE 95. REGIONAL DISTRIBUTION OF HIGH-FIND IMPACTS IN THE YEAR 2000

	Population		Employment		Personal Income	
	Persons	Percent	Persons	Percent	Dollars[a]	Percent
North Slope (R1)	132	0.6	92	0.8	5.2	1.2
Southcentral (R4)	1,551	7.5	791	7.2	30.2	7.0
Anchorage (R5)	13,761	66.7	7,413	67.7	288.8	67.1
Fairbanks (R7)	2,358	11.4	1,303	11.9	56.0	13.0
Statewide	20,642	100.0	10,944	100.0	430.3	100.0

[a]Million of 1980 dollars.

Table Note: Regional percentages do not sum to 100 since other regions not included in this table are also affected by OCS development.

SOURCE: MAP Model.

As with the mean- and low-find scenarios, the high-find scenario impacts are relatively modest until after the development phase commences in 1990. By 1991 net inmigration expands to 5895 persons which accounts for 93 percent of population increase in that year. Population impacts continue to grow steadily without experiencing an intermediate cyclical peak prior to termination of the projection period in 2000. The 20,642 extra persons in 2000 represents a 3 percent increase in base case population of 690,057. The pattern of total and sectoral employment impacts suggest that, in contrast to the more concentrated low and mean scenario impacts, the high-find impacts are more dispursed throughout the projection period. Although the total employment impact occurs in 1996 (the same year of peak direct OCS employment) basic sector employment peaks two years earlier in 1994 while support and government sector employment are lagged one and two years behind, respectively. As a percent of base case employment in each industry sector, the basic sector peak impact increases by more than 6 percent, and government sector at 1.9 percent above respective base case levels.

Further evidence of a more widely distributed impact than that of previous development scenarios is reflected in the distribution of maximum impact for real personal income (PIRST) and total state government revenue (REVGFR). A comparison between the low- and high-find peak-cyclical impacts on various aggregate indicators (excluding state expenditures and general fund balance) in Tables 92 and 93 indicate that, whereas low-find impacts occur between 1991 and 1994, high-find

impacts occur between 1991 and 2000. Note also that the base case fund balances are drawn further down as a result of high-find OCS development than either the low or mean scenarios. High scenario fund balance impacts become increasingly negative; by 2000 fund balances fall $468 million (1980 dollars) from the base case level of $268 billion; a decline of nearly 2 percent.

The regional distribution of high-find statewide population, employment, and real personal income is summarized for the year 2000 in Table 95. The regional shares of economic expansion, represented by the variables in Table 95 follow the general patterns of low-find impacts and of direct OCS employment. Again, the North Slope impacts occur indirectly since we assume that direct OCS employment in sale 71 does not reside in the North Slope. The North Slope impacts shown in Table 95 are considerably larger than those shown in Table 93 for the low-find regional impacts. The difference reflects the method that North Slope Borough property taxes are calculated. The borough property tax base is a function of the number of North Slope residents. At the present time, there is still some controversy over whether the North Slope Borough can legitimately include persons that work but do not necessary reside on the North Slope. In this analysis we have followed the borough's traditional formula and included North Slope construction, mining, and transportation employees in the borough's property tax base calculation even though these employees reside elsewhere in Alaska.

TABLE 96. SUMMARY OF SIMPSON-DELETION IMPACTS

Variable	Peak Cyclical Impact			Impact in the Year 2000	
	Absolute Difference (Persons)	Percentage Difference (Percent)	Year	Absolute Difference (Persons)	Percentage Difference (Percent)
POPTST	7710	1.3	1995	8123	1.2
MIGNET	2367	86.2	1991	86	0.8
EM99ST	4754	1.5	1995	4296	1.1
EMB1ST	1434	2.5	1994	1069	1.4
EMS1ST	2485	1.8	1995	2308	1.4
EMG9ST	819	0.8	1995	801	0.7
	(Millions of 1980 Dollars)			(Millions of 1980 Dollars)	
PIRST	172.6	1.7	1994	167.1	1.2
REVGFR	11.6	0.2	1995	3.5	0.07
E99SR	52.1	1.2	2000	52.1	1.2
FUNDR	-190.3	0.7	2000	-190.3	0.7

POPTST = Population
MIGNET = Net migration
EM99ST = Total employment
EMB1ST = Proportion of employment in the basic sector
EMS1ST = Proportion of employment in the support sector
EMG9ST = Proportion of employment in the government sector
PIRST = Personal income
REVGFR = Total general fund revenue
E99SR = Total state expenditures
FUNDR = Total fund balance

SOURCE: MAP Model.

The Simpson-Deletion Scenario: Statewide and Regional Impacts

The Simpson-deletion scenario impacts are summarized in Tables 96 and 97. As a tract-deletion variant of the mean-find scenario, the difference between the Simpson-deletion and base case scenarios parallel the mean-find impacts. In general, the peak impact on aggregate indicators of mean-find development without the Simpson tracts occurs about one year earlier with about 75 percent of the overall economic expansion that would occur under the mean-find scenario discussed above. The regional distribution of Simpson-deletion impacts is similar to that of all other cases examined. More detailed supporting data is presented on pages 177-205 of Beaufort Base Case and Impact Results from the MAP Model.

TABLE 97. REGIONAL DISTRIBUTION OF SIMPSON DELETION IMPACTS IN THE YEAR 2000

	Population		Employment		Personal Income	
	Persons	Percent	Persons	Percent	Dollars[a]	Percent
North Slope (R1)	48	0.6	35	0.8	1.9	1.2
Southcentral (R4)	659	8.1	338	7.9	12.8	7.6
Anchorage (R5)	5,238	64.5	2,856	66.5	109.6	65.6
Fairbanks (R7)	1,041	12.8	570	13.3	24.5	14.7
Statewide	8,123	100.0	4,296	100.0	167.1	100.0

[a]Million of 1980 dollars.

Table Note: Regional percentages do not sum to 100 since other regions not included in this table are also affected by OCS development.

SOURCE: MAP Model.

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APPENDIX A
OCS LEASE SALE EMPLOYMENT IN THE BASE CASE

TABLE A1. LOWER COOK INLET MINING EMPLOYMENT

	EP9CI4	EP9CI5	EMP9CI
1977	0.	0.	0.
1978	0.196	0.021	0.217
1979	0.16	0.037	0.197
1980	0.169	0.032	0.201
1981	0.166	0.037	0.203
1982	0.132	0.024	0.156
1983	0.061	0.024	0.085
1984	0.226	0.037	0.263
1985	0.898	0.077	0.975
1986	1.224	0.134	1.358
1987	1.239	0.153	1.392
1988	1.103	0.141	1.244
1989	0.963	0.135	1.098
1990	0.923	0.133	1.056
1991	0.936	0.133	1.069
1992	0.974	0.133	1.107
1993	0.974	0.133	1.107
1994	0.913	0.133	1.046
1995	0.86	0.133	0.993
1996	0.825	0.133	0.958
1997	0.825	0.133	0.958
1998	0.825	0.133	0.958
1999	0.825	0.133	0.958
2000	0.825	0.133	0.958

EP9CI4 = Mining employment in Southcentral region
EP9CI5 = Mining employment in Anchorage region
EMP9CI = Total mining employment

SOURCE: Alaska OCS Office

TABLE A2. LOWER COOK INLET TRANSPORTATION (ETX) AND CONSTRUCTION (ECX) EMPLOYMENT

	ETXCI4	ECXCI4
1977	0.	0.
1978	0.062	0.
1979	0.103	0.
1980	0.103	0.
1981	0.108	0.
1982	0.087	0.136
1983	0.128	0.072
1984	0.182	0.309
1985	0.251	0.351
1986	0.196	0.057
1987	0.144	0.
1988	0.165	0.
1989	0.165	0.
1990	0.165	0.
1991	0.165	0.
1992	0.165	0.
1993	0.165	0.
1994	0.151	0.
1995	0.137	0.
1996	0.135	0.
1997	0.135	0.
1998	0.135	0.
1999	0.135	0.
2000	0.135	0.

ETXCI4 = Transportation employment in Southcentral region
ECXCI4 = Construction employment in Southcentral region

Note: All Lower Cook transportation and construction employment resides in Southcentral region

SOURCE: Alaska OCS Office

TABLE A3. BEAUFORT SEA MINING EMPLOYMENT, STATE AND FEDERAL JOINT LEASE SALE

	EP9BF4	EP9BF5	EP9BF7	EMP9BF
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.003	0.017	0.003	0.023
1982	0.008	0.05	0.01	0.068
1983	0.008	0.05	0.01	0.068
1984	0.009	0.058	0.012	0.079
1985	0.003	0.018	0.003	0.024
1986	0.007	0.031	0.008	0.046
1987	0.02	0.074	0.024	0.118
1988	0.034	0.131	0.04	0.205
1989	0.045	0.179	0.052	0.276
1990	0.044	0.185	0.052	0.281
1991	0.041	0.168	0.047	0.256
1992	0.039	0.164	0.046	0.249
1993	0.036	0.147	0.041	0.224
1994	0.036	0.148	0.042	0.226
1995	0.036	0.149	0.042	0.227
1996	0.036	0.149	0.043	0.228
1997	0.035	0.144	0.041	0.22
1998	0.034	0.14	0.039	0.213
1999	0.034	0.14	0.039	0.213
2000	0.034	0.14	0.039	0.213

EP9BF4 = Mining employment in Southcentral region
EP9BF5 = Mining employment in Anchorage region
EP9BF7 = Mining employment in Fairbanks region
EMP9BF = Total mining employment

SOURCE: Alaska OCS Office

TABLE A4. BEAUFORT SEA CONSTRUCTION EMPLOYMENT, STATE AND FEDERAL JOINT LEASE SALE

	ECXBF4	ECXBF5	ECXBF7	ECONXBF
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.005	0.015	0.005	0.025
1982	0.018	0.059	0.022	0.099
1983	0.023	0.074	0.027	0.124
1984	0.023	0.074	0.027	0.124
1985	0.009	0.03	0.011	0.05
1986	0.018	0.058	0.022	0.098
1987	0.009	0.03	0.011	0.05
1988	0.013	0.042	0.015	0.07
1989	0.013	0.042	0.015	0.07
1990	0.004	0.014	0.005	0.023
1991	0.004	0.014	0.005	0.023
1992	0.002	0.007	0.003	0.012
1993	0.004	0.014	0.005	0.023
1994	0.004	0.014	0.005	0.023
1995	0.002	0.007	0.003	0.012
1996	0.	0.002	0.001	0.003
1997	0.	0.	0.	0.
1998	0.	0.	0.	0.
1999	0.	0.	0.	0.
2000	0.	0.	0.	0.

ECXBF4 = Construction employment in Southcentral region
ECXBF5 = Construction employment in Anchorage region
ECXBF7 = Construction employment in Fairbanks region
ECONXBF = Total construction employment

SOURCE: Alaska OCS Office

TABLE A5. NORTHERN GULF (SALE 55) MINING EMPLOYMENT

	EP9554	EP9555	EMP955
1977	0.	0.	0.
1978	0.	0.	0.
1979	0.	0.	0.
1980	0.	0.	0.
1981	0.041	0.004	0.045
1982	0.081	0.009	0.09
1983	0.081	0.009	0.09
1984	0.075	0.008	0.083
1985	0.034	0.004	0.038
1986	0.	0.	0.
1987	0.081	0.009	0.09
1988	0.161	0.018	0.179
1989	0.306	0.034	0.34
1990	0.3	0.033	0.333
1991	0.309	0.034	0.343
1992	0.263	0.029	0.292
1993	0.274	0.031	0.305
1994	0.276	0.031	0.307
1995	0.279	0.031	0.31
1996	0.279	0.031	0.31
1997	0.279	0.031	0.31
1998	0.279	0.031	0.31
1999	0.279	0.031	0.31
2000	0.279	0.031	0.31

EP9554 = Mining employment in Southcentral region
EP9555 = Mining employment in Anchorage region
EMP955 = Total mining employment

SOURCE: Alaska OCS Office

TABLE A6. NORTHERN GULF (SALE 55) TRANSPORTATION AND CONSTRUCTION EMPLOYMENT

	ETX554	ECX554
1977	0.	0.
1978	0.	0.
1979	0.	0.
1980	0.	0.
1981	0.017	0.
1982	0.035	0.
1983	0.035	0.
1984	0.026	0.038
1985	0.009	0.012
1986	0.	0.093
1987	0.086	0.098
1988	0.086	0.037
1989	0.1	0.
1990	0.107	0.
1991	0.107	0.
1992	0.042	0.
1993	0.042	0.
1994	0.042	0.
1995	0.042	0.
1996	0.042	0.
1997	0.042	0.
1998	0.042	0.
1999	0.042	0.
2000	0.042	0.

ETX554 = Transportation employment in Southcentral region
ECX554 = Construction employment in Southcentral region

Note: All transportation and construction employment resides in Southcentral region

SOURCE: Alaska OCS Office

TABLE A7. LOWER COOK INLET (SALE 60) MINING EMPLOYMENT

	EP9604	EP9605	EMP960
1977	0.	0.	0.
1978	0.	0.	0.
1979	0.	0.	0.
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.083	0.	0.083
1983	0.09	0.	0.09
1984	0.09	0.	0.09
1985	0.084	0.	0.084
1986	0.206	0.002	0.208
1987	0.354	0.004	0.358
1988	0.354	0.015	0.369
1989	0.354	0.031	0.385
1990	0.365	0.046	0.411
1991	0.379	0.053	0.432
1992	0.377	0.053	0.43
1993	0.377	0.053	0.43
1994	0.377	0.053	0.43
1995	0.377	0.053	0.43
1996	0.377	0.053	0.43
1997	0.377	0.053	0.43
1998	0.377	0.053	0.43
1999	0.377	0.053	0.43
2000	0.377	0.053	0.43

EP9604 = Mining employment in Southcentral region
EP9605 = Mining employment in Anchorage region
EMP960 = Total mining employment

SOURCE: Alaska OCS Office

TABLE A8. LOWER COOK INLET (SALE 60) TRANSPORTATION AND CONSTRUCTION EMPLOYMENT

	ETX604	ECX604
1977	0.	0.
1978	0.	0.
1979	0.	0.
1980	0.	0.
1981	0.	0.
1982	0.025	0.131
1983	0.036	0.
1984	0.036	0.
1985	0.027	0.048
1986	0.28	0.299
1987	0.425	0.133
1988	0.425	0.
1989	0.425	0.
1990	0.443	0.
1991	0.366	0.
1992	0.366	0.
1993	0.366	0.
1994	0.366	0.
1995	0.366	0.
1996	0.366	0.
1997	0.366	0.
1998	0.366	0.
1999	0.366	0.
2000	0.366	0.

ETX604 = Transportation employment in Southcentral region
ECX604 = Construction employment in Southcentral region

Note: All transportation and construction employment resides in Southcentral region

SOURCE: Alaska OCS Office

TABLE A9. BERING-NORTON (SALE 57) MINING EMPLOYMENT

	EP9574	EP9575	EP9576	EMP957M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.026	0.097	0.018	0.141
1984	0.083	0.316	0.059	0.458
1985	0.14	0.537	0.097	0.774
1986	0.098	0.36	0.066	0.524
1987	0.112	0.395	0.012	0.519
1988	0.146	0.561	0.022	0.729
1989	0.156	0.597	0.022	0.776
1990	0.138	0.538	0.022	0.698
1991	0.135	0.534	0.022	0.691
1992	0.132	0.52	0.022	0.684
1993	0.132	0.534	0.022	0.689
1994	0.13	0.541	0.022	0.694
1995	0.127	0.534	0.022	0.684
1996	0.126	0.535	0.022	0.683
1997	0.125	0.536	0.022	0.684
1998	0.126	0.54	0.022	0.688
1999	0.125	0.546	0.022	0.694
2000	0.126	0.536	0.022	0.684

EP9574 = Mining employment in Southcentral region
EP9575 = Mining employment in Anchorage region
EP9576 = Mining employment in Bering-Norton region
EMP957 = Total mining employment

SOURCE: Alaska OCS Office

TABLE A10. BERING-NORTON (SALE 57) TRANSPORTATION EMPLOYMENT

	ETX574	ETX575	ETX576	EMT9X57M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.009	0.034	0.	0.043
1984	0.029	0.111	0.	0.141
1985	0.055	0.21	0.007	0.272
1986	0.048	0.175	0.022	0.246
1987	0.027	0.097	0.037	0.162
1988	0.044	0.158	0.074	0.276
1989	0.044	0.158	0.074	0.276
1990	0.047	0.169	0.074	0.29
1991	0.046	0.17	0.074	0.29
1992	0.037	0.136	0.059	0.231
1993	0.036	0.137	0.059	0.231
1994	0.036	0.137	0.059	0.231
1995	0.035	0.138	0.059	0.231
1996	0.035	0.138	0.059	0.231
1997	0.035	0.138	0.059	0.231
1998	0.035	0.138	0.059	0.231
1999	0.034	0.138	0.059	0.231
2000	0.035	0.138	0.059	0.231

ETX574 = Transportation employment in Southcentral region
ETX575 = Transportation employment in Anchorage region
ETX576 = Transportation employment in Bering-Norton region
EMT9X57M = Total transportation employment

SOURCE: Alaska OCS Office

TABLE A11. BERING-NORTON (SALE 57) CONSTRUCTION EMPLOYMENT

	ECX574	ECX575	ECX576	ECONX57M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.016	0.061	0.077	0.155
1984	0.	0.	0.	0.
1985	0.008	0.031	0.	0.038
1986	0.016	0.061	0.	0.077
1987	0.074	0.261	0.188	0.523
1988	0.089	0.316	0.25	0.654
1989	0.03	0.107	0.125	0.262
1990	0.018	0.064	0.063	0.144
1991	0.	0.	0.	0.
1992	0.	0.	0.	0.
1993	0.	0.	0.	0.
1994	0.	0.	0.	0.
1995	0.	0.	0.	0.
1996	0.	0.	0.	0.
1997	0.	0.	0.	0.
1998	0.	0.	0.	0.
1999	0.	0.	0.	0.
2000	0.	0.	0.	0.

ECX574 = Construction employment in Southcentral region
ECX575 = Construction employment in Anchorage region
ECX576 = Construction employment in Bering-Norton region
ECONX57M = Total construction employment

SOURCE: Alaska OCS Office

TABLE A12. ST. GEORGE (SALE 70) MINING EMPLOYMENT

	EP9702	EP9704	EP9705	EMP970M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.017	0.067	0.084
1984	0.	0.024	0.094	0.118
1985	0.	0.027	0.109	0.136
1986	0.	0.026	0.096	0.122
1987	0.03	0.046	0.167	0.244
1988	0.03	0.047	0.185	0.263
1989	0.03	0.166	0.63	0.826
1990	0.03	0.157	0.672	0.859
1991	0.03	0.145	0.668	0.843
1992	0.03	0.154	0.707	0.891
1993	0.03	0.166	0.756	0.951
1994	0.03	0.154	0.727	0.911
1995	0.03	0.145	0.696	0.871
1996	0.03	0.136	0.667	0.833
1997	0.03	0.147	0.714	0.891
1998	0.03	0.158	0.763	0.951
1999	0.03	0.149	0.732	0.911
2000	0.03	0.143	0.698	0.871

EP9702 = Mining employment in St. George region
EP9704 = Mining employment in Southcentral region
EP9705 = Mining employment in Anchorage region
EMP970M = Total mining employment

SOURCE: Alaska OCS Office

TABLE A13. ST. GEORGE (SALE 70) TRANSPORTATION EMPLOYMENT

	ETX702	ETX704	ETX705	EMT9X70M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.012	0.046	0.057
1984	0.	0.018	0.072	0.091
1985	0.015	0.03	0.117	0.162
1986	0.045	0.044	0.165	0.254
1987	0.09	0.059	0.214	0.363
1988	0.332	0.062	0.222	0.616
1989	0.565	0.068	0.247	0.88
1990	0.51	0.043	0.158	0.711
1991	0.51	0.043	0.158	0.711
1992	0.51	0.042	0.159	0.711
1993	0.51	0.042	0.159	0.711
1994	0.51	0.041	0.16	0.711
1995	0.51	0.041	0.16	0.711
1996	0.51	0.041	0.16	0.711
1997	0.51	0.041	0.16	0.711
1998	0.51	0.04	0.161	0.711
1999	0.51	0.04	0.161	0.711
2000	0.51	0.041	0.16	0.711

ETX702 = Transportation employment in St. George region
ETX704 = Transportation employment in Southcentral region
ETX705 = Transportation employment in Anchorage region
EMT9X70M = Total transportation employment

SOURCE: Alaska OCS Office

TABLE A14. ST. GEORGE (SALE 70) CONSTRUCTION EMPLOYMENT

	ECX702	ECX704	ECX705	ECONX70M
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	0.	0.	0.	0.
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.001	0.004	0.014	0.018
1984	0.002	0.011	0.043	0.055
1985	0.004	0.034	0.134	0.172
1986	0.	0.04	0.15	0.19
1987	0.029	0.247	0.888	1.165
1988	0.029	0.227	0.819	1.075
1989	0.029	0.183	0.66	0.873
1990	0.021	0.129	0.47	0.619
1991	0.	0.	0.	0.
1992	0.	0.	0.	0.
1993	0.	0.	0.	0.
1994	0.	0.	0.	0.
1995	0.	0.	0.	0.
1996	0.	0.	0.	0.
1997	0.	0.	0.	0.
1998	0.	0.	0.	0.
1999	0.	0.	0.	0.
2000	0.	0.	0.	0.

ECX702 = Construction employment in St. George region
ECX704 = Construction employment in Southcentral region
ECX705 = Construction employment in Anchorage region
ECONX70M = Total construction employment

SOURCE: Alaska OCS Office

APPENDIX B
A PROCEDURE TO DETERMINE THE SHARE OF OCS EMPLOYMENT THAT RESIDE IN ALASKA (SEAR)

The direct total employment estimates made by Dames and Moore and the Alaska OCS Office Studies Program for several OCS petroleum scenarios have been refined to reflect resident/nonresident composition of this employment. Resident, in the context of these refinements, refers to an individual that resides in Alaska for the duration of employment (including offsite). Resident employees do not need to live in Alaska before the project begins. Resident employment is assumed to have full impact on the Alaska economy, while the impact of nonresident employees is assumed to be negligible. To assist in the determination of the share of employment to Alaska residents (SEAR), a cross section of information regarding the classification, structure, duration, and impact of OCS petroleum development-related employment is presented in Table B1, Characteristics of OCS Employment by Task," which accompanies this appendix.

A brief outline of the table's format and information content will precede a discussion of the assumptions used to provide consistency and accuracy in the interpretation of this information.

TABLE B1. CHARACTERISTICS OF OCS EMPLOYMENT BY TASK

1 Employment Sectors For Petroleum Operations[1]	2 Phase of Development[2]	3 Rotation Factor[3]	4 Duration[4]	5 Potential AK Resident Share from Industry[5]	6 Employment Multiplier[6]		7 Payments Allocation Coefficients Share to AK Residents[8] In Years: 1	5	10	8 Estimate Share of Employment To Alaskan Residents (SEAR) 1979-84	1985-89	1990 +
ONSHORE												
1. Service Base	Exploration	1		.15[a]						1.0	1.0	1.0
	Development	1	P	.2	1.5	1[7]		NA		1.0	1.0	1.0
	Production	1		1.0						1.0	1.0	1.0
2. Helicopter Service	Exploration	2								.5	.525	.578
	Development	1.5[a]	P	.2 (.3)[b]	1.5	1		NA		.5	.525	.578
	Production	1								1.0	1.0	1.0
3. Service Base Const.	Development	1.11	T	.5	1.5	1	.25	.25	.25	.5	.525	.578
4. Pipe Coating	Development	1.11	T	.2	1.1	.2	.25	.25	.25	.2	.21	.231
5. Onshore Pipeline Const.	Development	1.11	T	.2	1.1	.2	.25	.25	.25	.2	.21	.231
6. Oil Terminal Const.	Development	1.11	T	.5	1.1	.2	.25	.25	.25	.5	.525	.578
7. LNG Plant Const.	Development	1.11	T	NA	1.1	.2	.25	.25	.25	.5	.525	.578
8. Concrete Platform Const.[10]	Development	NA	NA	NA	NA	NA	.25	.25	.25	NA	NA	NA
9. Oil Terminal Operations	Production	1	P	1.0	1.5	1	.75	.75	.75[9]	1.0	1.0	1.0
10. LNG Plant Operations	Production	1	P	1.0	1.5	1	.75	.75	.75[9]	1.0	1.0	1.0
OFFSHORE												
11. Surveys	Exploration	1	T	.2	1.1	.2	.15	.55	.55	.2	.21	.231
12. Rigs	Exploration	2	T	.1	1.1	.2	.15	.55	.55	.2	.21	.231
13. Platforms	Development	2	P	.1 (.3)[b]	1.2[c]	.4	.75	.75	.75[9]	.1	.3	.33
	Production	1		1.0	1.4[d]	.8	.75	.75	.75[9]	1.0	1.0	1.0
14. Platform Installation	Development	2	T	.1	1.1	.2	.25	.25	.25	.1	.105	.116
15. Offshore Pipeline Const.	Development	2	T	.1	1.1	.2	.25	.25	.25	.1	.105	.116
16. Supply-Anchor-Tugboats	Exploration	1.5	T	.15	1.2[c]	.4		NA		.4	.42	.462
	Development	1.5		.15	1.4[d]	.8				.8	.88	.968
	Production	1.5		.5	1.4[d]	.8				.8	.88	.968

[a] Approximation [b] Numbers in parentheses indicate second 5-year period
[c] First three years [d] Thereafter NA = not applicable

TABLE NOTES

Characteristics of OCS Employment by Task

1. These are the employment sectors (or tasks) requested by Tom Smythe of Alaska Consultants in his November 21 correspondence with Richard Schmidt of Peat, Marwick, Mitchell and Co.

2. Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Northern Gulf of Alaska, Petroleum Development Scenarios," Draft Report, Task 9BA, October 24, 1978, Table 5-4, pages 119-122.

3. Ibid.

4. Based on discussions found in Planning for Offshore Oil Development, Gulf of Alaska OCS Handbook, Division of Community Planning, ADCRA, 1978, pages 40-41 and 223-224. Note: P = permanent; T = temporary.

5. Interview: Max Beazley, Staff Engineer at Mobil Oil Corporation, Exploration and Producing. Mr. Beazley is currently working in the Prudhoe Unit, a planning team for future development in Prudhoe Bay.

6. "Planning for Offshore Oil Development," Division of Community Planning, ADCRA, October 1977, Table 12, pages 17-18.

7. The factors to the right of the multipliers are the ratios of respective task-specific multiplier increments (multiplier - 1) to the statewide basic sector employment multiplier (1.5 - 1 = .5). (See note 6, above.)

8. "A Social and Economic Impact Study of Offshore Petroleum and Natural Gas Development in Alaska: Phase II," Mathematics Science Northwest, Inc., and Alaska Consultants, Inc., for BLM, October 1976, page 19.

9. Amendments suggested by Ed Phillips, Alaska DNR.

10. Concrete Platform Construction is not considered feasible in the Gulf of Alaska.

TABLE FORMAT

Columns one and two categorize employment by sector (or task) and by phase of development, respectively. Column three lists the rotation factor associated with each task. The rotation factors are taken from Dames and Moore (see table note 2) and are calculated as follows:[1]

$$1 + \frac{\text{Number of days off duty}}{\text{Number of days on duty}}$$

They are used to determine the on- and offsite employment for a given task. Employment duration (permanent or temporary) by task is listed in column four. The information in columns one through four characterize employment by task. They are intended to provide qualitative limits for the SEAR estimates.

Columns five through seven provide alternative implicit and explicit estimates of the SEAR. Column five includes an industry perspective on the resident potential of Alaska OCS employment. Column six provides estimates of the impact multipliers of employment in each task. The multipliers are implicit indicators of in-state residence. The factors to the right of the employment multipliers are the implicit SEARs assumed in these multipliers, given an employment multiplier of 1.5 for Alaska. The payment allocation coefficients found in column seven were developed for use in a regional input-output analysis designed

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[1]The assignment of a unitary rotation factor for offshore platforms production (task 13) suggests that an operations crew is never granted off-duty leave from the platform. Although this assumption appears to be questionable, Gordon Harrison of Dames and Moore attributes categorical data problems to its existence and notes that potential inconsistencies implied by its use are insignificant and are balanced elsewhere in employment assumptions for that task.

to capture the socioeconomic impacts of OCS petroleum development in the Yakutat area. (See table note 8.) The values associated with table note 9 are adjustments suggested to compensate for a bias toward higher payment allocation to Alaska residents that was introduced to facilitate interregional effects. An even distribution of skills across resident and nonresident groups is required in order to reinterpret the payment allocation coefficients in the context of employment and residency. This assumption is, perhaps, unrealistic during exploration and petroleum field development. Under this interpretation, the payment allocation coefficients will overstate the SEAR for tasks relevant to those phases of development.

METHODOLOGY AND ASSUMPTIONS

The task-specific information just outlined has been mapped into a final SEAR estimate (in column eight) for each task using the following methodology:

1. The SEAR estimates contained in columns five, six, and seven are used to bracket a reasonable SEAR range for each task. For example, the SEAR range for offshore platform installation (task 14) extends from .1 to .25.

2. In the interest of consistency, an additional set of general, phase-specific SEAR guidelines are developed. Here, a given employment task is examined in the context of its phase of development.

Tasks subsumed under exploration (Onshore: service base, helicopter service; Offshore: surveys, rigs, supply-anchor-tugboats) are temporary, require "extreme specialization," and usually embrace a

reparatory work crew having "international character."[2] These conditions imply a low SEAR (of approximately .1 to .2) for exploration employment. Of course, exceptions to these guidelines occur. For example, helicopter service during exploration may be contracted through Anchorage-based firms.[3]

The offshore development phase, including platform installation (14) and operation (13) offshore pipeline construction (15), and supply-anchor-tugboats (16), is assumed to retain the descriptive and structural characteristics mentioned above for the case of exploration.

Onshore development includes various types of construction employment. Although the work force is generally seasonal (not unusual in the Alaska construction industry), the potential for civil construction work by Alaska-based contractors is more likely than that of offshore development or of exploration, particularly as the overall sphere of OCS development broadens. It is assumed that a SEAR of about .4 to .5 is consistent with these conditions.

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[2]Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Northern Gulf of Alaska, Petroleum Development Scenarios," Draft Report Task 9BA, October 24, 1978, pp. 106-107.

[3]Dames and Moore, "Alaska OCS Socioeconomic Studies Program, Monitoring Petroleum Activities in the Gulf of Alaska and the Lower Cook Inlet Between April 1975 and June 1978," Technical Report #17, August 1978, p. 38.

During production, employment is generally permanent and oriented toward less specialized, more routine entry-level positions. These employment characteristics appear to be compatible with Alaska residency. Overall, we attach a SEAR of 1.0 to tasks subsumed under the production phase.

Table B2 summarizes the general SEAR guidelines outlined above.

TABLE B2. PHASE-SPECIFIC SEAR GUIDELINE

	Onshore	Offshore
Exploration	.1 - .2	.1 - .2
Development	.4 - .5	.1 - .2
Production	1.0	1.0

Additionally, there are two principal relationships which influence the trend in the share of OCS employment to Alaska residents (SEAR). First, the internal supply of labor that is qualified to perform the variety of tasks delineated in column one of Table B1 is assumed to increase in response to earlier "layers" of OCS petroleum development, as a function of other mining activity, and to more general growth in the Alaska economy. Second, for those OCS employees that initially accept nonresident status, it is likely that a certain percentage shift to Alaska residency over time. We consolidate the combined effects of these employment dynamics into an assumption calling for a one percent annual average rate of growth in the SEAR for all tasks having an initial SEAR of less than one. For simplicity, the continuous compounding of growth per period

is replaced by a five percent increase between 1985 and 1989 and a ten percent increase thereafter. This assumption corresponds to the figures in the three subcolumns under column eight.

APPENDIX C

DIRECT AND SEAR ADJUSTED EMPLOYMENT FOR THE BEAUFORT SEA SALE 71

TABLE C.1. OCS TOTAL DIRECT AND SEAR ADJUSTED EMPLOYMENT
MEAN CASE, BEAUFORT SEA SALE 71

	Mining		Construction		Transportation		HQTS	Total	
Year	Total	SEAR	Total	SEAR	Total	SEAR		Total	SEAR
1980	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0		0	0
1982	0	0	0	0	0	0		0	0
1983	0	0	0	0	0	0		0	0
1984	0	0	75	37	0	0		75	37
1985	135	32	0	0	17	7		152	40
1986	206	52	0	0	39	17		246	69
1987	207	53	0	0	43	18		251	72
1988	206	52	0	0	39	17		246	69
1989	0	0	0	0	0	0		0	0
1990	0	0	443	76	0	0	0	443	76
1991	1808	297	522	77	0	0	908	2330	1282
1992	2258	445	300	35	92	90		2651	1478
1993	2298	485	0	0	252	247		2550	1640
1994	2298	485			372	363		2670	1756
1995	2343	500						2715	1771
1996	1646	270						2017	1541
1997	1016	62						1387	1333
1998	1016	62						1387	1333
1999	1061	77						1432	1348
2000	1092	88	0	0	372	363	908	1464	1358

SOURCE: Alaska OCS Office.

TABLE C.2. OCS TOTAL DIRECT AND SEAR ADJUSTED EMPLOYMENT
LOW CASE, BEAUFORT SEA SALE 71

	Mining		Construction		Transportation		HQTS	Total	
Year	Total	SEAR	Total	SEAR	Total	SEAR		Total	SEAR
1980	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0		0	0
1982	0	0	0	0	0	0		0	0
1983	0	0	0	0	0	0		0	0
1984	0	0	75	37	0	0		75	37
1985	135	32	0	0	17	7		152	40
1986	137	35	0	0	26	11		164	46
1987	137	35	0	0	26	11		164	46
1988	69	17	0	0	13	6		82	23
1989	0	0	0	0	0	0		0	0
1990	0	0	350	64	0	0	0	350	64
1991	671	158	350	64	60	58	191	1081	471
1992	686	163	0	0	120	116		806	470
1993	531	139	0	0	166	162		697	492
1994	426	104						592	458
1995	231	40						397	393
1996	255	48						421	401
1997	255	48						422	401
1998	246	45						412	398
1999	240	43						407	396
2000	255	48	0	0	166	162	191	421	401

SOURCE: Alaska OCS Office.

TABLE C.3. OCS TOTAL DIRECT AND SEAR ADJUSTED EMPLOYMENT
HIGH CASE, BEAUFORT SEA SALE 71

	Mining		Construction		Transportation		HQTS	Total	
Year	Total	SEAR	Total	SEAR	Total	SEAR		Total	SEAR
1980	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0		0	0
1982	0	0	0	0	0	0		0	0
1983	0	0	0	0	0	0		0	0
1984	0	0	75	37	0	0		75	37
1985	135	32	0	0	17	7		152	40
1986	272	67	0	0	44	18		316	85
1987	274	68	0	0	48	20		322	89
1988	272	67	0	0	44	18		316	85
1989	0	0	0	0	0	0		0	0
1990	0	0	443	76	0	0	0	443	76
1991	3155	445	447	69	0	0	1805	3601	2319
1992	3605	594	300	35	92	90		3997	2523
1993	3605	594	300	35	305	298		4210	2732
1994	3945	733	225	26	425	414		4595	2978
1995	3945	733	0	0	545	531		4490	3068
1996	4012	755	0	0	637	620		4650	3018
1997	3285	515	0	0	637	620		3922	2940
1998	2775	347	0	0	637	620		3412	2772
1999	2340	203	0	0	637	620		2977	2628
2000	1905	75	0	0	637	620	1805	2587	2500

SOURCE: Alaska OCS Office.

TABLE C.4. OCS TOTAL DIRECT AND SEAR ADJUSTED EMPLOYMENT: SIMPSON DELETION CASE, BEAUFORT SEA SALE 71

	Mining		Construction		Transportation		HQTS	Total	
Year	Total	SEAR	Total	SEAR	Total	SEAR		Total	SEAR
1980	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0		0	0
1982	0	0	0	0	0	0		0	0
1983	0	0	0	0	0	0		0	0
1984	0	0	75	37	0	0		75	37
1985	135	32	0	0	17	7		152	40
1986	205	51	0	0	35	15		240	66
1987	205	51	0	0	35	15		240	66
1988	205	51	0	0	35	15		240	66
1989	0	0	0	0	0	0		0	0
1990	0	0	425	72	0	0	0	425	72
1991	1342	238	433	66	0	0	622	1775	925
1992	1642	337	225	26	92	90		1959	1074
1993	1802	416	0	0	305	298		2107	1336
1994	1802	416			397	388		2199	1426
1995	1412	287						1809	1297
1996	698	52						1095	1062
1997	713	57						1110	1066
1998	719	59						1116	1068
1999	719	59						1116	1068
2000	699	52	0	0	397	388	622	1097	1062

SOURCE: Alaska OCS Office.

APPENDIX D

ASSUMPTIONS FOR THE NORTH SLOPE RESIDENT ADJUSTMENT

Appendix D shows the allocation of employment before and after the North Slope resident adjustment for the six projects discussed in the text. The overall effect of the North Slope resident adjustment is summarized in Tables D.1 and D.2. Table D.1 shows the amount of North Slope employment that was transferred to regions 4, 5, and 7 to more accurately reflect the geographic residence distribution of North Slope employment. In Table D.2, the amount of project North Slope project employment that I assume will reside in the North Slope work-place location is shown by industry classification. Tables D.3 through D.18 provide detailed assumptions on the North Slope resident adjustment. Note region 1 is the North Slope.

TABLE D.1. NORTH SLOPE EMPLOYMENT TRANSFER

Year	Employment
1980	2524
1981	2727
1982	5076
1983	6414
1984	7119
1985	5934
1986	4990
1987	4049
1988	3925
1989	3463
1990	3651
1991	4133
1992	4248
1993	3952
1994	3415
1995	3652
1996	4175
1997	4301
1998	4008
1999	3469
2000	3716

TABLE D.2. NORTH SLOPE EMPLOYMENT THAT RESIDES IN THE NORTH SLOPE BY INDUSTRY CLASSIFICATION

Year	Mining	Transportation	Construction	Total
1980	27	1	0	28
1981	29		0	30
1982	52		0	53
1983	61		11	73
1984	58		34	93
1985	33		73	107
1986	30		78	109
1987	32		57	90
1988	31		38	70
1989	31		16	48
1990	31		27	59
1991	31		55	87
1992	31		59	91
1993	33		59	93
1994	32			92
1995	32			92
1996	32			92
1997	32			92
1998	34			94
1999	33			93
2000	33	1	59	93

TABLE D.3. BEAUFORT JOINT FEDERAL/STATE MINING AND CONSTRUCTION EMPLOYMENT ORIGINAL REGIONAL ALLOCATION[a]

	Mining			Construction
Year	Region 1	Region 5[b]	Total	(Total)
1980	0	0	0	0
1981	58	8	66	49
1982	173	24	197	198
1983	173	24	197	247
1984	202	28	230	247
1985	56	10	66	99
1986	102	10	112	304
1987	266	10	276	333
1988	458	21	479	466
1989	580	36	616	466
1990	553	42	595	155
1991	486	38	524	155
1992	466	37	503	77
1993	399	33	432	155
1994	402	33	435	155
1995	405	33	438	77
1996	407	33	440	22
1997	385	32	417	0
1998	361	32	393	0
1999	362	32	394	0
2000	362	32	394	0

[a]The SEAR adjustment was not applied to these figures.

[b]Headquarters employment.

SOURCE: Alaska OCS Office (November 1978).

TABLE D.4. BEAUFORT JOINT FEDERAL/STATE MINING EMPLOYMENT AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total[a]	Region 4	Region 5[b]	Region 7
1980	0	0	0	0
1981	23	3	17	3
1982	68	8	50	10
1983	68	8	50	10
1984	79	9	58	12
1985	24	3	18	3
1986	46	7	31	8
1987	118	20	74	24
1988	206	34	131	40
1989	276	45	179	52
1990	281	44	185	52
1991	256	41	168	47
1992	249	39	164	46
1993	224	36	147	41
1994	226	36	148	42
1995	227	36	149	42
1996	228	36	149	43
1997	220	35	144	41
1998	213	34	140	39
1999	213	34	140	39
2000	213	34	140	39

[a]These projections are based on the SEAR adjustment which determines statewide residency, and the North Slope resident adjustment which determines the regional resident allocation of OCS employment. The application of SEAR reduced original mining employment (Table D.1) by the following proportion by phase of development:

Phase	Resident Proportion of Total Direct Employment (Percent)
Exploration 1981-86	25
Development 1986-96	33
Operations	50

[b]Includes headquarters.

TABLE D.5. BEAUFORT JOINT FEDERAL/STATE CONSTRUCTION EMPLOYMENT AFTER NORTH SLOPE RESIDENT ADJUSTMENT[a]

Year	Total[b]	Region 4	Region 5	Region 7
1980	0	0	0	0
1981	25	5	15	5
1982	99	18	59	22
1983	124	23	74	27
1984	124	23	74	27
1985	50	9	30	11
1986	98	18	58	22
1987	50	9	30	11
1988	70	13	42	15
1989	70	13	42	15
1990	23	4	14	5
1991	23	4	14	5
1992	12	2	7	3
1993	23	4	14	5
1994	23	4	14	5
1995	12	2	7	3
1996	3	0	2	1
1997	0	0	0	0
1998	0	0	0	0
1999	0	0	0	0
2000	0	0	0	0

[a]Regional employment allocated as a proportion of 1978 population.

[b]Application of SEAR adjustment reduces original direct construction employment by the following proportions for each development phase:

Phase	Resident Proportion of Total Direct Employment (Percent)
Exploration 1981-86	50
Development 1986-96	15

TABLE D.6. PRUDHOE BAY MINING EMPLOYMENT ORIGINAL REGIONAL ALLOCATION

Year	Region 1
1980	2044
1981	2155
1982	4337
1983	5134
1984	4684
1985	2217
1986	1802
1987	
1988	
1989	
1990	
1991	
1992	
1993	
1994	
1995	
1996	
1997	
1998	
1999	
2000	1802

SOURCE: Porter, Edward, Alaska OCS Socioeconomic Studies Program Bering-Norton Petroleum Development Scenarios Economic and Demographic Analysis, Institute of Social and Economic Research, 1980, pp. 78-81.

TABLE D.7. PRUDHOE BAY MINING EMPLOYMENT REGIONAL ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 4	Region 5	Region 7
1977	1000	11	184	590	215
1978	1113	12	205	657	239
1979	1772	19	326	1045	382
1980	2044	22	376	1206	440
1981	2155	24	397	1271	463
1982	4337	47	798	2559	933
1983	5134	56	945	3029	1104
1984	4684	52	862	2763	1007
1985	2217	24	408	1308	477
1986	1802	20	332	1063	387
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000	1802	20	332	1063	387

Note: Allocation based on population proportions in each region.

TABLE D.8. NPRA CONSTRUCTION AND MINING EMPLOYMENT
ORIGINAL REGIONAL ALLOCATION

	Region 1	
Year	Construction	Mining
1982	0	0
1983	75	0
1984	75	0
1985	363	88
1986	987	176
1987	1099	230
1988	765	443
1989	314	354
1990	541	374
1991	1092	354
1992	1174	408
1993	765	533
1994	314	444
1995	541	464
1996	1092	444
1997	1174	498
1998	765	623
1999	314	534
2000	541	554

SOURCE: Office of Minerals Policy and Research Analysis, U.S. Department of the Interior, Final Report of the 105(b) Economic and Policy Analysis, 1979. Based on the mean scenario order management plan 4.

TABLE D.9. NPRA CONSTRUCTION EMPLOYMENT RESIDENT ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 4	Region 5	Region 7
1982	0	0	0	0	0
1983	75	4	11	44	16
1984	75	4	11	44	16
1985	363	18	53	214	78
1986	987	49	144	582	212
1987	1099	55	159	648	237
1988	765	38	111	451	165
1989	314	16	45	185	68
1990	541	27	79	319	116
1991	1092	55	159	644	235
1992	1174	59	170	693	252
1993	765	59	90	451	165
1994	314	59	2	185	68
1995	541	59	47	319	116
1996	1092	59	154	644	235
1997	1174	59	170	693	252
1998	765	59	90	451	165
1999	314	59	2	185	68
2000	541	59	47	319	116

Note: Employment in region 1 equals five percent of total until peak in 1992; maintains peak thereafter. Employment in other regions based on regional population proportion.

TABLE D.10. NPRA MINING EMPLOYMENT REGIONAL ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 4	Region 5	Region 7
1984	0	0	0	0	0
1985	88	1	16	52	19
1986	176	2	32	104	38
1987	230	3	42	136	49
1988	443	5	82	261	95
1989	354	4	65	209	76
1990	374	4	69	221	80
1991	354	4	65	209	76
1992	408	4	75	241	88
1993	533	6	98	314	115
1994	444	5	82	262	95
1995	464	5	85	274	100
1996	444	5	82	262	95
1997	498	5	92	294	107
1998	623	7	115	368	134
1999	534	6	98	315	115
2000	554	6	102	327	119

Note: Allocation based on proportion of population in each region.

TABLE D.11. TAPS CONSTRUCTION EMPLOYMENT ORIGINAL REGIONAL ALLOCATION

Year	Total	Region 1	Region 4	Region 5	Region 7
1980	90	7	32	0	51
1981	90	7	32		51
1982	90	7	32		51
1983	0	0	0		0
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000	0	0	0	0	0

SOURCE: Dames and Moore, Beaufort OCS Development Scenarios, 1980. Based on addition for four pump stations adding capacity of .15 million barrels per day each.

TABLE D.12. TAPS TRANSPORTATION EMPLOYMENT ORIGINAL REGIONAL ALLOCATION

Year	Total	Region 1	Region 4	Region 5	Region 7
1980	1500	50	569	529	352
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000	1500	50	569	529	352

SOURCE: Alaska Department of Labor, Alaska Economic Trends, October 1978.

TABLE D.13. TAPS CONSTRUCTION EMPLOYMENT RESIDENT ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 4	Region 5	Region 7
1980	90	0	32	0	58
1981	90		32		58
1982	90		32		58
1983	0		0		0
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000	0	0	0	0	0

Note: The seven original employees in region 1 (Table D.11) all transferred to region 7. Employment in regions 4 and 5 remain constant.

TABLE D.14. TAPS TRANSPORTATION EMPLOYMENT RESIDENT ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 4	Region 5	Region 7
1980	1500	1	577	559	363
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000	1500	1	577	559	363

Note: Of the fifty original region 1 employees (see Table D.12), one was allocated to the North Slope according to the North Slope population proportion. The forty-nine additional employees going to regions 4, 5, and 7 were distributed according to population proportions in those regions; they incremented the original levels in those regions.

TABLE D.15. ALCAN MINING, TRANSPORTATION, AND CONSTRUCTION EMPLOYMENT
ORIGINAL REGIONAL ALLOCATION

Year	Mining[a]	Transportation[b]			Construction[c]		
	Region 1	Total	Region 1	Region 7	Total	Region 1	Region 7
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	500	125	375
1983	0	0	0	0	2795	699	2096
1984	0	0	0	0	7823	1956	5867
1985	0	0	0	0	7038	1759	5278
1985	0	0	0	0	1563	391	1172
1986	400	200	50	150	0	0	0
1987							
1988							
1989							
1990							
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							
1999							
2000	400	200	50	150	0	0	0

[a] Prudhoe Bay Project: Draft EIS, Federal Energy Regulatory Commission, July 1979.

[b] Estimate by Northwest Alaska Pipeline Company, August 1979.

[c] Alaska Economic Outlook to 1985, Alaska Department of Labor, July 1978 and Prudhoe Bay Project: Draft EIS, (see note a).

TABLE D.16. ALCAN MINING TRANSPORTATION AND CONSTRUCTION EMPLOYMENT REGIONAL ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

	Mining[a]					Transportation[b]	Construction[c]				
Year	Total	Region 1	Region 4	Region 4	Region 7	Total	Total	Region 1	Region 4	Region 5	Region 7
1980	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	217	0	2	5	210
1982	0	0	0	0	0	0	563	0	7	23	533
1983	0	0	0	0	0	0	2435	7	122	392	1914
1984	0	0	0	0	0	0	7103	30	497	1592	4984
1985	160	2	29	94	35	0	10589	55	924	2962	6648
1986	200	2	37	118	43	119	5074	29	483	1549	3013
1987							468	2	33	108	325
1988							0	0	0	0	0
1989											
1990											
1991											
1992											
1993											
1994											
1995											
1996											
1997											
1998											
1999											
2000	200	2	37	118	43	119	0	0	0	0	0

TABLE NOTES FOR TABLE D.16:

[a]Mining employment allocated according to the proportion of population in each region.

[b]All transportation employment is assumed to reside in the Fairbanks region (7) where the Northwest Gasline Headquarters are based.

[c]Approximately forty percent of pipeline construction employment will be staff personnel which receive special leave rotation privileges that would encourage them to reside near project headquarters in Fairbanks. I assume the twenty-nine percent of pipeline craft construction employment will reside in Fairbanks reflecting the distribution of TAPS operation personnel in the Fairbanks district. Regional population proportions were applied to the remaining pipeline and conditioning plant construction personnel.

SOURCE: Mogford and Goldsmith, 1980 (Table 1).

TABLE D.17. OTHER MINING EMPLOYMENT ORIGINAL REGIONAL ALLOCATION[a]

Year	Total	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7
1980	2945	451	34	53	350	1618	136	303
1981								
1982								
1983								
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995								
1996								
1997								
1998								
1999								
2000	2945	451	34	53	350	1618	136	303

[a]"Other" mining refers to nonpetroleum mining employment primarily hard rock minerals.

SOURCE: Alaska Annual Planning Information, FY 1980. Assume 1980 value remains constant throughout the forecast period.

TABLE D.18. OTHER MINING EMPLOYMENT REGIONAL ALLOCATION AFTER NORTH SLOPE RESIDENT ADJUSTMENT

Year	Total	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7
1980	2945	5	34	53	433	1884	136	400
1981								
1982								
1983								
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995								
1996								
1997								
1998								
1999								
2000	2945	5	34	53	433	1884	136	400

Note: Full-time resident employment in other mining reduced from 451 to 5 employees in region 1. The remaining 446 employees were distributed to regions 4, 5, and 7 according to population proportions in those regions. Regions 2, 3, and 6 were not affected by this resident adjustment.