

EXECUTIVE SUMMARY

CONTRACT NO. AA550-CT6-61

ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM
WESTERN GULF OF ALASKA PETROLEUM DEVELOPMENT SCENARIOS:
ECONOMIC AND DEMOGRAPHIC IMPACTS

PREPARED FOR
BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE
NATIONAL TECHNICAL INFORMATION SERVICE
5285 PORT ROYAL ROAD
SPRINGFIELD, VIRGINIA 22161

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of the Interior, Bureau of Land Management, Alaska Outer Continental Shelf Office, in the interest of information exchange. The United States Government assumes no liability for its content or use thereof.

ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM
WESTERN GULF OF ALASKA PETROLEUM DEVELOPMENT
SCENARIOS: ECONOMIC AND DEMOGRAPHIC IMPACTS

Prepared by
Lee Huskey and William Nebesky
Institute of Social and Economic Research
University of Alaska

August 1979

WESTERN GULF OF ALASKA
PETROLEUM DEVELOPMENT SCENARIOS:
ECONOMIC AND DEMOGRAPHIC IMPACTS

EXECUTIVE SUMMARY

This study examines the impact of potential Outer Continental Shelf petroleum development in the Western Gulf of Alaska. Development of these resources is assumed to begin with a lease sale held in 1980. The study focuses on the economic and demographic effects of OCS development on the State of Alaska and its Gulf of Alaska region.

The impact of OCS development is defined as the change resulting from this development. In examining Western Gulf impacts, a process of economic impact assessment was developed. While rapid growth associated with OCS development will affect most economic variables, a much smaller number of variables is important. Information on these dimensions of impact will describe the effect of rapid growth on the state and regional economies.

OCS development may affect the magnitude and the process of growth. This study emphasizes the effect on 1) the aggregate indicators of economic activity--employment, population, and personal income, 2) the state's fiscal position measured by its effect on fund balances, 3) individuals' earnings as measured by real per capita income, and 4) the average level of state services as measured by real per capita state expenditures.

The study examines the effect of OCS development on the process of growth by examining its effect on 1) the components of population growth, 2) the

proportion of the population which is working (the dependency ratio), 3) the structure of employment, and 4) the regional distribution of growth.

The economic and demographic change is examined against two points of comparison. First, the effect on OCS development is compared to growth in the historical period. Examining growth in the historical period provides an understanding of how the economy works. Secondly, the growth with Western Gulf OCS development is compared to the projected growth of the economy without Western Gulf OCS development.

The Alaska Economy, 1965-1976

The period between 1965 and 1976 was one in which the Alaska economy experienced tremendous growth. Three significant economic events occurred during this period: the major Upper Cook Inlet oil development in the late 1960s, the Prudhoe Bay lease sale in 1969, and the construction of the trans-Alaska oil pipeline beginning in 1974.

Economic growth is a multidimensional process for which there is no single summary measure; however, the general trend of the economy can be described by examining three aggregate indicators of economic activity: population, employment, and personal income. Over the historical period, each of these indicators grew rapidly. Growth was not uniform throughout the period; growth was more rapid after 1970. Employment grew at an annual average rate of 8.4 percent over the period, reaching 171,714 by 1976; the growth rate after 1970 averages 10.9 percent per year. Population

was 413,289 in 1976; it grew at an annual average rate of 4.1 percent between 1965 and 1976 and 5.4 percent between 1970 and 1976. The growth in personal income reflects both the growth of the economy and the increase in prices. Personal income increased at a rate of 15.4 percent per year between 1965 and 1976; the rate of growth after 1970 was slightly higher, averaging 19.6 percent per year.

The major cause of growth during this period was the expansion of the basic sector. The industry primarily responsible for this growth was petroleum. The traditionally important Alaskan basic industries of federal government and fisheries did not expand during this period. While employment in the total basic sector expanded at an average annual rate of about 3 percent, mining employment expanded at an average rate equal to 13 percent per year. Construction employment expanded at a rate equal to 15 percent per year; the growth of this industry was importantly affected by the construction of the trans-Alaska oil pipeline.

Overall growth in the economy was greater than in the basic sector. Two factors were responsible for this. First, state government acted as a growth-initiating sector. The rapid growth in state government in the early 1970s was funded by revenues which were exogenous to the Alaskan economy. An important source of these revenues was the Prudhoe Bay lease sale held in 1969. The second factor was the changing relationship between the basic and support sectors of the economy. As the economy grew, more goods and services were provided locally. The growth of employment in the basic sectors stimulated a greater-than-proportional response in the

remainder of the economy. The ratio of total employment to basic sector employment increased from 2.3 in 1965 to 3.0 prior to pipeline construction in 1973. This changing ratio illustrates the qualitative change which occurred in the economy during the historical period.

The level of population is influenced by the level of economic activity; like employment, population also experienced rapid growth during the historical period. Migration was the most important component of population change throughout the period. Between 1970 and 1976, migration accounted for almost 70 percent of the total change in population. Population did not grow so rapidly as employment; this resulted in a declining dependency ratio throughout the period. This ratio fell from 3.8 in 1965 to 2.4 in 1976. Much of the direct Trans-Alaska Pipeline Service (TAPS) employment was located in remote camps, which meant that workers often did not bring their families, thus lowering the dependency ratio of in-migrants. This trend emerged even prior to TAPS construction; by 1973, the dependency ratio had fallen by 22 percent. This falling dependency ratio resulted from an increase in the proportion of the population of working age and an increase in the labor force participation of this group.

Rapid growth had a mixed effect on two measures of individual welfare: the unemployment rate and real per capita income. The unemployment rate measures the probability that an average resident is unemployed. Rapid growth did not reduce the unemployment rate. The rate fell only in 1974 and 1975 and was above 10 percent in every year except 1975. The seasonal pattern of unemployment did change over the historical period. The

seasonality of employment, which measures the peak summer employment, decreased. One reason for this reduction was the increased importance of the less seasonal support sector. A second measure of individual welfare is real per capita income, which measures the command of the average resident over goods and services. The Alaskan real per capita income increased by 78 percent between 1965 and 1976. In all but one year after 1970, real per capita income in Alaska increased faster than in the United States. Real per capita income is importantly affected by prices. Alaskan price level increased slower than U.S. prices for most of the period. This reflected the growth in the scale of the economy. The rapid growth connected with TAPS construction reversed this trend.

The Alaska Economy Base Case Growth, 1978-2000

Petroleum development in the Western Gulf of Alaska may affect both the structure and the size of the Alaskan economy. The impact of this OCS development can only be described as changes from a certain pattern of economic growth which would have occurred without OCS development. The base case describes the projected growth of the economy without OCS development in the Western Gulf. This study develops three base cases which differ in their assumed level of OCS activity in the Lower Cook Inlet, the Beaufort Sea, and the Northern Gulf of Alaska.

The non-OCS assumptions are consistent across all base cases. Assumptions about industry growth, state revenues, and state expenditures determine the projected growth of the economy. In this case, non-OCS growth was assumed to include:

- Prudhoe Bay petroleum activity with expansion to the Lisburne and Kuparak formations.
- Shutdown of Upper Cook Inlet oil fields in 1990.
- Construction of the ALCAN gasline between 1981 and 1984 and Pacific LNG plant between 1980 and 1983.
- Constant federal government employment.
- Agriculture-forestry-fisheries employment increasing by 3 percent per year.
- Manufacturing output increasing at 4 percent per year.
- State exogenous petroleum revenues consisting of royalties, production taxes, property taxes, and corporate income taxes determined by existing state laws and assumed oil and gas production.
- Growth in real per capita state expenditures equal to one-half the rate of growth in real per capita income.

The base cases differ in their assumptions about OCS development in the Lower Cook Inlet, the Beaufort Sea, and the Northern Gulf of Alaska. The three alternative scenarios describe low, moderate, and high levels of activity in each area. Developing these alternative scenarios allows the assessment of the effects of the level of previous OCS activity on the impacts of the Western Gulf lease sale. The general pattern of projected future economic growth can be ascertained by examining the moderate base case growth since these cases differ only by magnitude.

Overall, substantial growth is projected, although it will not be so rapid as that experienced between 1965 and 1976. Population is projected to grow to approximately 805,700 by 2000, which is 3.2 percent average annual rate of growth. Employment grows at an average annual rate of 3.4 percent. Since wages and salaries are the major component of personal income in Alaska, the growth of personal income is related to employment growth. Personal income grows at an annual average rate of 10.8 percent. The growth over the projection period is not uniform throughout the projection period. The most rapid period of growth is prior to 1983. The major cause of this projected rapid growth is the construction of the ALCAN gas pipeline which reaches peak employment in 1983.

Three major structural changes were projected to occur in the base case; these changes support trends found in the historical period. The sectors of the Alaska economy do not grow at equal rates. Employment in the support sector grows more rapidly than in the remainder of the economy; the share of employment in the support sector is projected to increase from 37 percent in 1978 to 53 percent in 2000. Another historical trend projected to continue in the future is the increased participation of the population in the economy. This participation is measured by the dependency ratio (population/employment) which decreases from 2.24 in 1980 to 2.17 in 2000. The major reasons for this change are the aging of the population and the increased labor force participation of the adult population. The final structural change concerns the regional distribution of population. The population is projected to continue concentrating in Anchorage; by 2000, over 50 percent of the state's population is projected to be in Anchorage.

Over the projection period, the State of Alaska will receive revenues which exceed current levels of expenditure. The state's decision on the expenditure of these revenues will influence the growth of the Alaskan economy. The overall fiscal position of the state is affected by the interaction of both revenues and expenditures. Total yearly revenues are projected to grow by over \$7.0 billion during the projection period. The fastest period of growth occurs prior to 1985, when revenues from Prudhoe Bay oil and gas production peak. Total petroleum revenues from Upper Cook Inlet, Prudhoe Bay, and the Beaufort Sea are projected to fall by almost 8 percent by 2000 from the 1989 peak.

State government expenditures increase in response to growth in the economy and in response to the accumulation of unspent revenues. Expenditures grow at an average annual rate of 9.9 percent over the projection period, slowing slightly after 1989 when the increase in revenues slows. The level of real per capita expenditures also increases. The level of real per capita expenditures is a proxy for the level of services provided by the state.

The increase in revenues which are projected to result from the production of oil and gas places the State of Alaska in a unique position by allowing the state to build a fund balance. Excess revenues accumulate in two funds, the Permanent and General Funds. For most of the projection period, the General Fund is larger than the Permanent Fund. The amount in the General Fund increases until 1996. After 1996, the fund balances must be drawn down to meet increasing state expenditures. The cyclical nature of petroleum revenues and their importance as a part of state revenues mean

that when expenditure policies are tied to increases in revenues, they will eventually lead to expenditures in excess of revenues. Once petroleum revenues decline, service levels cannot be supported out of current revenues, and the fund balance must be drawn on.

The Impact of OCS Development in the Western Gulf of Alaska on the Alaska Economy

To capture the important dimensions of uncertainty surrounding oil and gas development in the Western Gulf of Alaska, this report examines the development pattern implied by three alternative resource discovery scenarios. The scenarios which were examined include the level of development which would occur if the mean, 95 percent, and 5 percent probability resource levels were discovered in the Western Gulf. The general nature of the impacts can be ascertained by examining the impact of the mean resource find on moderate base case growth.

The impact of direct OCS employment depends on the extent to which the incomes earned in OCS development are spent in Alaska. Two factors will limit the impact. First, the probable enclave nature of the development will limit the extent of interaction with the Alaska economy when workers are on the job. Secondly, the international character of OCS firms means that they have regular experienced crews dispatched around the world, which may limit their residence in Alaska. The first step in estimating the overall impact of Western Gulf OCS development is to estimate the share of direct employment which will reside in Alaska and interact with the economy. Adjustments were made to direct field employment to reflect the share of direct employment residing in Alaska. These adjustments were

determined by the characteristics of each task and considerations of labor supply and demand. These adjusted employment estimates were used in the scenarios provided to the MAP model to generate impacts.

The mean scenario assumes a level of development consistent with the development of .16 billion barrels of oil. In this scenario, oil and gas discoveries are located in two basins although only one field is economic. Exploration activity begins in 1981 and lasts for three years. Field development begins in 1984, and production starts in 1987. Direct OCS employment is divided into mining, construction, and transportation. Construction employment peaks in 1984 with platform installation. As construction employment falls, mining employment rises to a peak of 275 in 1986; the permanent mining employment is only 64 after 1992. Production ends in 1999.

The changing task composition of industry employment results in the non-proportional relation between resident Alaska employment and direct OCS employment. Alaska resident construction employment peaks at 260, the same year as the peak occurs in total construction employment. By 1989, all mining employment is assumed to reside in Alaska.

Unlike production from state lands and waters, OCS development in the Western Gulf has no direct effect on state revenues. The state is assumed to receive only property tax revenues from this production, and there are no oil terminals and onshore pipelines connected with this scenario.

OCS development will lead to changes in those factors which have been isolated as important to economic growth: exogenous employment, personal income, and state expenditures. Changes in these factors may result in changes in population, the structure of employment, the state's fiscal position, and the regional distribution of growth. These changes are the economic impact of OCS development.

The Western Gulf mean scenario differs significantly from previous development scenarios we have examined (ISER, 1979). The most important difference for the results discussed in this report is the small size of production employment associated with the lease area. Long-term production employment in both mining employment and transportation averages only 88. Mining also drops significantly after development; Alaskan resident employment in mining falls from a peak of 118 in 1986 to 39 by 1990. The final major difference is that production ends in 1999, one year prior to the end of our normal projection period in 2000.

The differences, particularly the small size of long-term OCS employment, necessitate some caution in interpreting the model results. The small size of the direct employment associated with the project increases the relative importance of the state expenditure response to the overall impact. Western Gulf development according to the mean scenario is projected to have a negative impact on state expenditures. This projected reduction of state expenditures reduces state employment and dampens the impact of the direct OCS employment on the economy. We are not assuming that the reduction of state expenditures with increased population would be the state's response.

The negative expenditure impact is a result of the expenditure rule assumed in the model. This rule determines the growth in real per capita expenditures as a function of the growth in real per capita income. Expenditures are reduced in the OCS case because real per capita income grows slower after its peak than in the base case. This, combined with the small size of the direct employment, produces a decline in expenditures. In all cases, the level of expenditures in the OCS case cannot be considered significantly different from the level in the base case.

OCS development increases the level of employment in the Alaska economy both directly and indirectly because of the increased demand for local goods and services. By 1999, OCS development in the Western Gulf is projected to increase employment by approximately 15. The peak employment impact is projected to occur in 1984 when Alaska resident OCS employment is projected to peak. The increased importance of the support sector is supported by OCS development.

Population is another aggregate indicator of economic activity. OCS development is projected to increase population in the year 1999 by 376. The peak impact on population occurs in 1984 when population is 1,984. This is the same year that total employment peaks. As in the base case, population is not projected to increase so rapidly as employment, which results in a declining dependency ratio. OCS development does not significantly change the importance of migration as a component of population change. When OCS activity is building to its peak between 1981 and 1984, migration accounts for over 50 percent of the change.

The growth of personal income reflects the ability of the economy to generate increased returns to factors. The impact on personal income follows the pattern of the other indicators. By 1999, personal income is projected to be \$1 million. Like employment, the personal income peak impact occurs in 1984. Personal income growth reflects both increases in employment and prices, so it is not the best measure of welfare. One measure of welfare is real per capita income which measures the command of the average individual over goods and services. OCS development has two differential periods of impact. OCS activity has a positive impact on real per capita incomes prior to 1986 and a small negative impact after that year. These differences are not significant.

OCS development affects both state revenues and expenditures. The changes affect both the fund balance and level of services provided by the state. The major cause of state revenue increases are increases in endogenous revenues such as personal and corporate income taxes and earnings on the fund balance. Total general fund revenues are \$13 million greater in 1999 because of OCS development. State expenditures decrease because of OCS development. By 1999, expenditures are projected to be \$22 million less than in the base case. The pattern of expenditure impact results from the assumed state expenditure rule. Sensitivity analysis showed that the impacts of OCS development were highly sensitive to the rule chosen to describe the growth of expenditures.

OCS development has an overall positive impact on the fund balance because expenditures decrease and revenues increase. By 1999, the fund balance is \$204 million greater than in the base case. The overall impact of Western Gulf OCS development on the state fiscal position is impossible to determine. The fiscal position is a combination of the impact on state services as measured by real per capita expenditures and the fund balance. According to these projections, Western Gulf development causes these measures to move in opposite directions.

Summary and Conclusions

In this report, we assess the major impacts that offshore oil and gas development in the Western Gulf of Alaska will have on the process of Alaska economic growth. These projected impacts were assessed in terms of both an assumed base case growth without the project and the historical economic growth.

For all of the OCS scenarios, the qualitative nature of the influence of OCS development on the growth process is similar. Development generates direct employment activity in the construction, mining, manufacturing, and transportation industries which builds to a peak during the development phase, then declines to a stable, long-term level as production dominates the activity. Since a number of fields are developed in each scenario, the various phases of development occur simultaneously. This development activity generates both new private incomes and public revenues which induce impacts. Expenditure of wages and salaries earned in OCS activity generates further income and employment in the endogenous

sector of the economy through the increased demand for the output of these sectors. The increased economic activity also increases public expenditures which affect economic activity by increasing government employment and construction expenditures.

The qualitative nature of the impacts is also similar across scenarios. Four major structural changes were observed in the base case and the historical period. First, as the scale of the economy increased, more goods and services were produced locally and the importance of the support sector increased. Secondly, the population aged and labor force participation increased over time; this led to an increase in the proportion of the population which is employed. Thirdly, the role of Anchorage as the administrative and distributive center of Alaska resulted in population growth continuing to center in Anchorage. Finally, state expenditures and revenues were projected to follow a pattern in which expenditures would increase faster than revenues after the major petroleum revenues peaked. This pattern of expenditure and revenue increase would necessitate drawing down the general fund balance. This results from the declining importance of the petroleum revenues throughout the period. All of the Western Gulf OCS development scenarios support these trends.

The qualitative impact of OCS development on individual welfare was also similar across scenarios. In all scenarios, real per capita incomes increased significantly over the base case levels during the buildup to the peak employment. After this, increases in population and prices led to no real significant increases in real per capita income. The level of

real per capita state expenditures is also reduced relative to the base case by OCS development. The reduction of real per capita state expenditures is one part of the negative fiscal impact of OCS development. The other part concerns the impact on the fund balance. In all cases, the combined effect of increased prices and expenditures from OCS development reduces the real value of the fund balance below its base case levels.

Quantitatively, the impacts across scenarios differ. The single most important determinant of impact is the size of the field. The 5 percent scenario has larger development activity and so has a larger impact. The 95 percent scenario contains only exploration and has only minimal impact on the major economic variables. Table 1 shows the relative year 2000 impacts across the five OCS scenarios.

The major dimensions of both base case growth and OCS development are uncertain. By examining the three alternate development scenarios, we get some feeling for the range of impacts possible from OCS development in the Western Gulf. Examination of the assumptions in the base case shows that the major assumptions concerning the base case, such as ALCAN, do have a significant effect on the impact of OCS development. The results are also affected importantly by the assumptions made about the expenditure policy followed by the state.

TABLE 1. SUMMARY OF THE LONG-RUN IMPACTS OF
 ALTERNATIVE DEVELOPMENT SENARIOS
 (IMPACTS IN THE YEAR 2000)

	<u>Population</u>	<u>Employment</u>	<u>State Expenditures (Millions of Nominal Dollars)</u>	<u>Fund Balance (Millions of Nominal Dollars)</u>
<u>Moderate Base Case</u>				
Mean OCS Scenario (1999)	376	15	-19	204
5% OCS Scenario	8,025	2,363	-14	458
95% OCS Scenario	101	12	1	-28
<u>High Base Case</u>				
5% OCS Scenario	9,689	3,083	46	-119
<u>Low Base Case</u>				
95% OCS Scenario	96	10	1	-26

SOURCE: MAP Model