THE IMPACT OF COLLAPSE OF THE WORLD OIL MARKET
ON THE ALASKA ECONOMY

by

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Summary

- Absent any changes in fiscal policy, petroleum revenue projections published in December 1985 by the Alaska Department of Revenue imply state general fund revenues falling to half their FY 1986 level by 1992. This results in a flat projection of state economic activity over the next decade.

- Reimposing the income tax and using the Permanent Fund to augment general fund revenues, while helping to offset this decline, would neither eliminate the need to cut expenditures nor materially affect the level of state economic activity.

- In a worst-case oil price scenario, the impact on public services and the economy would be devastating. If the world oil price drops and stays at $13, revenues from petroleum would be one-third the current level in 1990 and one-fifth the current level in 1995. Without mitigating measures, the economy would lose 50 thousand jobs, about one in five.

- In the worst-case scenario, tapping the Permanent Fund and reimposing the income tax would add about $500 million (1984$) of sustainable revenues to the general fund. This would fill less than one-third of the revenue gap created by the loss of petroleum revenues and recoup 10 percent of the lost employment.

- In the worst-case scenario, changing the mix of government spending and adopting cost-cutting measures could further reduce but not eliminate the loss of jobs to the economy.
The world oil price and petroleum revenues projected by the Alaska Department of Revenue in December 1985 (DOR DEC 1985) will serve as the base against which the impact of a collapse of the world oil market will be measured in this paper. The DOR DEC 1985 projection anticipated a gradual downward trend in the real price of oil over a period of several years, going from $21 in FY 1987 to $18 in the early 1990s before beginning a slow climb. This projection is shown in Figure 1 along with a constant $13 price which will serve as the price representing collapse of the world oil market.

In the DOR projection, the falling oil price combined with depletion of the giant Prudhoe Bay oil field produces a projection of general fund petroleum revenues declining over time. In six years—1992—petroleum revenues are only 50 percent of the 1986 level in real 1984 dollars.\(^1\) By 2000, they are at 25 percent of the 1986 level. The pattern of decline is shown in Figure 2 as a percentage of the 1986 level, along with the lower petroleum revenue levels projected using the $13 oil price assumption.

Using the DOR revenue projections and assumptions about state and local fiscal policies which can be characterized as "business as usual," state general fund appropriations would need to contract,

\(^1\)All figures are inflation corrected and presented in terms of purchasing power in 1984.
FIG 1. Oil Price Projections

FIG 2. General Fund Petroleum Revenue
Percent of 1985 Level
relative to 1986, rapidly and continuously over the period of the next twenty-five years (Figure 3). By 1997, appropriations are one-half the present size, and they are one-fourth the present size by 2004. "Business as usual" means appropriating money available from current revenues, including a portion of available general fund balances, but not augmenting revenues through new taxes or the use of the Permanent Fund.²

Under these circumstances, economic activity in Alaska dependent upon state spending will contract, impacting not only state and local government employment and the construction industry but virtually all segments of the economy through the "multiplier." The loss in personal income and employment will be offset by growth in the private economy, but this restructuring will result in a "flat" economy, as measured by total employment, for a number of years. Figure 4 shows that under these assumptions, there is no net employment gain until the mid-1990s, at which time growth in the petroleum, mining, and tourism industries more than offsets further government-induced decline.

"Business as usual" is not a realistic case because as general fund revenues decline, new sources of revenue will be sought to try to maintain the current appropriation level. An income tax, the Permanent Fund, and petroleum tax revisions are the most likely

²All simulations reported in this paper were made using the ISSR MAP model. The assumptions for this simulation as well as the others discussed in the paper are outlined in the appendix.
FIG 3. General Fund Appropriations:
DOR Dec 1985, Business As Usual

FIG 4. Alaska Employment
DOR Dec 1985, Business As Usual
candidates for augmenting revenues. If the Permanent Fund dividend were eliminated in 1989 with one-half the earnings of the Permanent Fund transferred to the general fund starting in that year and if the personal income tax were reimposed in 1991, a higher appropriation level could be funded. The effect of this alternative on appropriations and employment is shown in Figures 3 and 4 as "Level 1 revenue augmentation." A considerably higher appropriation level is possible, but there is little employment impact because higher public spending is partially offset by lower private spending.

$13 Oil: A Worst-case Scenario

For the purpose of illustrating the general nature of the impact of lower world oil prices on the Alaska economy, we assume the price falls to $13 in FY 1987 and remains constant at that level in real dollars in succeeding years. This is not a prediction because the market is currently too unstable to anticipate what the likely price range will be in coming years. There is considerable likelihood of the market stabilizing at a price above $13 through some form of international cooperation to restrict supply. Oil at $13 is a plausible lower bound for at least two reasons. First, it is a price at which oil begins to compete with alternative fuels—coal and natural gas—for base load electricity generation, and thus demand at $13 would increase rapidly, absorbing any excess supply. Second, oil at $13 would, in the long run, significantly contract domestic supply, making the U.S. economy again more vulnerable to foreign sources. Thus, at that price, there would be considerable domestic political pressure to support the industry.
Oil at $13 is within the range at which existing Alaska production would continue, but exploration and development would come to a halt, particularly if the industry felt that the $13 price were here to stay. The assumptions underlying the $13 oil case reflect this industry response. Therefore, petroleum revenues are low, both because of the lower oil price and lower production rates. In effect, the industry gradually shuts down in Alaska, an extremely pessimistic scenario, but one which demonstrates the potential range of downside economic risk associated with lower oil prices.

In the absence of specific measures to augment revenues, the fundable level of general fund appropriations falls dramatically if the oil price remains at $13 for any length of time. Figure 5 shows that appropriations must be cut in half by 1990 and by two-thirds by 1994. The fall is much more rapid than the DOR case, also shown in the figure.

Such a dramatic reduction in the level of government spending combined with a declining petroleum industry presence in the state would result in a significant economic contraction. As measured by the level of employment, there would be a loss of 50 thousand jobs over the next decade, close to 20 percent of the current level (Figure 6). The subsequent recovery would be long and slow.
FIG 5. General Fund Approp.: $13 Oil
Business As Usual compared to DOR 12/85

FIG 6. Employment: $13 Oil
Business As Usual compared to DOR 12/85
The pattern of economic impact measured by population (Figure 7) and real personal income (Figure 8) is similar. Population would decline 14 percent from its current level, and real personal income would fall 12 percent. These declines represent an economy experiencing a decade of painful restructuring.

The size of the potential economic decline calculated here may seem underestimated, particularly compared to the decline in petroleum revenues. But other basic industries would remain and continue to grow and stimulate the development of the economy. In addition, the industry would leave behind a legacy of infrastructure in the state which would prevent contraction to a pre-petroleum level.  

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3A recent analysis estimated that about 40 percent of employment in Alaska is attributable to petroleum revenues and the petroleum industry. The present analysis assumes the industry declines gradually and the legacy of the Permanent Fund remains as well as a more highly developed infrastructure and broader range of support activities than prior to the petroleum era. See Gunnar Knapp, "The Alaska Economy: Where We Are and How We Got There," ISER Working Paper 85.8, October 1985.
FIG 7. Population: $13 Oil
Business As Usual compared to DOR 12/85

FIG 8. Real Personal Income: $13 Oil
Business As Usual compared to DOR 12/85
Mitigation Measures

A number of fiscal policies are available to state government to minimize the aggregate impacts on public expenditures, employment, population, and personal income of lower oil prices. These measures could reduce but not eliminate the declines depicted in the previous figures. For the purpose of illustrating the relative effects which certain mitigation measures might have in "filling the gap" in the economy left by a collapse of oil prices, we present five cases. Each case is a collection of policies including the measures in the previous case. The cases are as follows:

1. **Level 1 Revenue Augmentation.** Elimination of the Permanent Fund Dividend in FY 1987 and redirection of one-half of the earnings of the Permanent Fund to the general fund at that time. Reinstitution of the personal income tax in FY 1989 at the previous rates.

2. **Level 2 Revenue Augmentation.** Level 1, except redirection of all the nominal earnings of the Permanent Fund to the general fund (slow "eating away" of the principal of the Permanent Fund).

3. **Level 3 Revenue Augmentation.** Level 2, except redirection of twice the annual earnings of the Permanent Fund to the general fund (rapid "eating away" of the principal of the Permanent Fund).

4. **Constant Real Wage in State Government.** Level 3, plus establishment of a ceiling on real average annual wage in state government employment at the current level.

5. **No State Capital Expenditures.** Ceiling on real wage plus shift of money from the general fund capital budget (which has a low employment "bang per buck") into the operating budget (which has a relatively high employment "bang per buck").
One revenue-producing alternative--additional or revised taxation of the petroleum industry--was not included in this analysis because the complexities of the issues involved require a separate study. It is clear from Figure 2, however, that no combination of new revenue-generating measures directed at the petroleum industry could possibly fill the gap opened by declining production coupled with a declining price.

The revenues which are generated by reimposition of the income tax and by tapping the earnings of the Permanent Fund at three different rates are shown in Figure 9 as percentages of 1986 general fund appropriation levels. The income tax would generate about 10 percent of the revenues needed to fund a $2.7 billion budget. The pattern of revenues generated by tapping the earnings of the Permanent Fund depend upon the rate. Use of half the earnings produces a revenue stream almost equal to that of the personal income tax--about 10 percent of a $2.7 billion budget. If the draw is larger, the initial revenue flow is larger, but eventually, because principal is being spent, these policies produce less income than drawing half the earnings.

None of these policies fills the gap left by the fall in petroleum revenues. Figure 10 shows total general fund revenues for the basic $13 oil case, compared to the three revenue augmentation cases. By 1995, revenues are only about 50 percent of the current level under any of the three revenue augmentation alternatives.
The impact of these three revenue augmentation cases on the economy, as measured by employment, is shown in Figure 11. In contrast to the "business-as-usual" $13 oil case, these measures produce additional employment, particularly in the early years. A very serious employment gap, however, does remain.

In the Level 1 case, where the income tax is reinstituted and the Permanent Fund dividend is eliminated and used for appropriations, the amount of money pumped into the economy is practically unchanged, but it is used in a way that is more efficient at generating jobs. About 5 thousand jobs, or 10 percent of the loss, is recovered at the low point of the employment gap.

Use of the full earnings of the Permanent Fund (Level 2), or the full earnings plus a portion of the principal (Level 3), both represent a net addition of income flowing into the economy to replace some of the lost petroleum income. A significant number of jobs can be "bought" using the Permanent Fund, but only on a temporary basis. For example, if twice the Fund earnings is withdrawn annually (Level 3), 10 to 15 thousand jobs, or 20 to 30 percent of the employment gap, could be filled in the late 1980s. By the mid-1990s, the net contribution would be down to 5 thousand jobs and declining rapidly as the Permanent Fund itself shrinks.

The additional impact of the final two policies for employment creation, holding the real wage in state government constant at the
current level and shifting all expenditures into the operating budget is shown in Figure 12. The former has a modest but growing impact on total employment. The latter adds a much more significant increment to total employment. On top of all the other measures, this change in the "mix" of government expenditures increases employment by about 8 thousand in the early 1990s.

The combined effect of implementation of all these policies is to cut the loss in employment but neither to eliminate it nor to shorten the length of the down cycle. Additional policies not examined here would likely have similar marginal effects on the cycle.

Limitations of Analysis

It is tempting but invalid to draw conclusions from this analysis about the level of economic activity associated with any specific oil prices within the range of prices investigated here. The loss in state revenue from each $1 decline in the price of oil is roughly $150 million at the current production rate. As the production rate falls, changes in the oil price have less effect on state revenues. Thus, converting price changes into government employment estimates can be misleading. In addition, industry employment is concentrated in a small number of large projects dependent not only on current price but also prices expected several years hence. The industry response is not a smooth function of price because there are a few large-scale projects in the state rather than a large number of small projects.
APPENDIX A

SUMMARY OF MAP MODEL BASE CASE ASSUMPTIONS

CASE NAME: DOR DEC 1985 BUSINESS AS USUAL (A5.4B)

A. PETROLEUM REVENUE ASSUMPTIONS: DOR DEC 1985 (S85.B8)
B. FISCAL ASSUMPTIONS: BUSINESS AS USUAL
C. INDUSTRY ASSUMPTIONS: MODERATE GROWTH (S85.B8)
D. NATIONAL VARIABLE ASSUMPTIONS: MODERATE GROWTH

<table>
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<tr>
<th>DESCRIPTION(a)</th>
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<tbody>
<tr>
<td>A. PETROLEUM REVENUE ASSUMPTIONS</td>
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<tr>
<td>1. Severance Taxes</td>
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<tr>
<td>2. Royalties</td>
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<tr>
<td>3. Bonuses</td>
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<td>4. Property Taxes</td>
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<tr>
<td>5. Petroleum Corporate Income Tax</td>
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<tr>
<td>6. Rents</td>
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(a) Codes in parentheses indicate ISER names for MAP Model SCEN_case files, and codes in brackets indicate MAP variable names.
7. Miscellaneous Petroleum Revenues
   Zero [RP9X].

8. Federal-State Petroleum-Related Shared Revenues
   Increasing $1 million annually from current level of $25 million [RSVDNPX].

9. Windfalls
   During FY 1987, $250 million accrues to Alaska from a litigation settlement with ARCO and $300 million in settlement of the TAPS tariff dispute.

B. FISCAL ASSUMPTIONS

1. State Appropriations
   If funds available, ceiling established by Constitutional Spending Limit; otherwise appropriations equal revenues plus 20 percent of general fund balance available for appropriations.

2. Capital/Operations Split
   Two-thirds operations if Spending Limit in effect; three-fourths operations otherwise [EXSPLITX].

3. General Obligation Bonds
   Bonding occurs up to point where debt service is 5 percent of state revenues.

4. Federal Grants-in-Aid for Capital Expenditures
   Constant at $75 million [RSFDMCAAX].

5. State Loan Programs
   New capitalization terminated after FY 1987 [EXKTR1X]. Programs continue functioning on existing capitalization including AHFC [EXKLOAN2] and APA revenue bond expenditures [EXGPR1].

6. Municipal Capital Grants
   Funding terminated after FY 1987 [RLTMCP].

7. State-Local Revenue Sharing
   Continuation proportional to total state expenditures [RLTRS].

8. State-Local Municipal Assistance
   Continuation proportional to total state expenditures [RLTMA].

9. Permanent Fund/Other Appropriations in Excess of Spending Limit
   None for operations [EXGFOPSX]; none for capital [EXSPCAP].

10. Permanent Fund Dividend
    Dividend continues [EXPFDIST].
11. Use of Permanent Fund Earnings
   All earnings not used for dividend reinvested [EXPFTOGR].

12. Permanent Fund Principal
   Continuous accumulation.

13. Personal Income Tax
   None

14. Miscellaneous Local Revenue Sources
   Miscellaneous state-local transfers [RLTX], large project property taxes [RLPTX], petroleum-related federal transfers [RLTFPX] all set to zero.

15. New Federal-State Shared Revenues
   Zero [RSFDNX].

16. Large Project Corporate Income Taxes
   Zero [RTGSX].

C. INDUSTRY ASSUMPTIONS

1. Trans-Alaska Pipeline
   Operating employment remains constant at 990 through 2010 (TAP.F84).

2. North Slope Petroleum Production
   Petroleum employment increases through the early 1990s to a peak of 4,6 thousand and subsequently tapers off gradually. Construction employment is eliminated by the late 1990s. This case presumes no significant change in current oil price trends (NSO.84B).

3. Upper Cook Inlet Petroleum Production
   Employment in exploration and development of oil and gas in the Upper Cook Inlet area declines gradually beginning in 1983 by approximately 2.5 percent per year (UPC.F84).

4. OCS Development
   Exploration and development activity grows through the mid-1990s, and direct employment continues through the following decade at a slightly reduced level of approximately 7,000 (OCS.CM3(-3)).

5. Oil Industry Headquarters
   Oil company headquarters employment in Anchorage rises by 1,150 between 1983 and 1986 to remain at around 4,600 through 2010 (OHQ.F84).
6. Beluga Chuitna Coal Production

Development of 4.4 million ton/year mine for export beginning in 1990 provides total employment of 524 (BCL.04T(-4)).

7. Healy Coal Mining

Export of approximately 1 million tons of coal annually will add 25 new workers to current base of 100 by 1986 (HCL.84X).

8. U. S. Borax

The U. S. Borax mine near Ketchikan is brought into production with operating employment of 790 beginning in 1989 and eventually increasing to 1,020 (BXM.F84).

9. Greens Creek Mine

Production from the Greens Creek Mine on Admiralty Island results in employment of 150 people from 1988 through 2003 (GCM.F84).

10. Red Dog Mine

The Red Dog Mine in the Western Brooks Range reaches full production with operating employment of 428 by 1993 (RBD.F84).

11. Other Mining Activity

Mining employment not included in special projects increases from current level at 1 percent annually (OMN.F84).

12. Agriculture

Moderate state support results in expansion of employment in agriculture by 4 percent per year (AGR.F83).

13. Logging and Sawmills

Employment expands to over 3,200 by 1990 before beginning to decline gradually to about 2,800 after 2000 (FLL.F84).

14. Pulp Mills

Employment declines at a rate of 1 percent per year after 1991 (FPU.F84).

15. Commercial Fishing—Nonbottomfish

Employment levels in traditional fisheries harvest remain constant at 7,500 through 2010 (TCP.F84).
16. Commercial Fish Processing--Nonbottomfish

Employment in processing traditional fisheries harvests remains at the level of the average figure for the period 1978–1982, or around 7,300 (TPP.F84).

17. Commercial Fishing--Bottomfish

The total U.S. bottomfish catch expands at a constant rate to allowable catch in 2000, with Alaska resident harvesting employment rising to 733. Onshore processing capacity expands in the Aleutians and Kodiak census divisions to provide total resident employment of 971 by 2000 (BCF.F83).

18. Federal Military Employment

Employment declines at 1 percent per year, consistent with the long-term trend since 1960 (GFM.F84).

19. Light Army Division Deployment

A portion of a new Army division is deployed to Fairbanks and Anchorage beginning in 1986, augmenting active-duty personnel by 2,600 (GFM.JPR).

20. Federal Civilian Employment

Rises at 0.5 percent annual rate consistent with the long-term trend since 1960 (GFC.F84).

21. Tourism

Number of visitors to Alaska increases by 30,000 per year to over 1.3 million by 2010 (TRS.J85).

22. State Hydroelectric Projects

Construction employment from Alaska Power Authority projects peaks at over 700 in 1990 for construction of several projects in Southcentral and Southeast Alaska (SHP.F83).

D. NATIONAL VARIABLE ASSUMPTIONS

1. U.S. Inflation Rate

Consumer prices rise at an annual rate of 5 percent in the late 1980s, rising gradually to 6.4 percent after 2000.

2. Real Average Weekly Earnings

Growth in real average weekly earnings averages 1 percent annually.

3. Real Per Capita Income

Growth in real per capita income averages 1.5 percent annually.

4. Unemployment Rate

Long-run rate of 7 percent.
APPENDIX B

ASSUMPTIONS IN ALTERNATIVE CASE SIMULATIONS

I. DOR DEC 1985 Level 1 Revenue Augmentation (A5.4B2)
Differences from the DOR DEC 1985 Business as Usual Case

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<td>B. FISCAL ASSUMPTIONS</td>
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<tr>
<td>11. Use of Permanent Fund Earnings Half of earnings allocated to general fund [EXPFTOGF].</td>
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<tr>
<td>C. INDUSTRY ASSUMPTIONS</td>
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<tr>
<td>D. NATIONAL VARIABLE ASSUMPTIONS</td>
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II. $13 Oil – Business as Usual (A5.4L)
Differences from DOR DEC 1985-Business as Usual Case

A. PETROLEUM REVENUE ASSUMPTIONS

1. Severance Taxes
   Based on $15 world oil price run through PETREV December 1984 specification. Because TAPS settlement not factored into analysis and actual production levels exceed those anticipated last year, this is roughly equivalent to revenues if oil price were $13 (H85.15C).

2. Royalties
   Based on $15 world oil price run through PETREV December 1984 specification. Because TAPS settlement not factored into analysis and actual production levels exceed those anticipated last year, this is roughly equivalent to revenues if oil price were $13 (H85.15C).

5. Petroleum Corporate Income Tax
   Corporate Income Tax from petroleum falls to zero (H85.15C).

B. FISCAL ASSUMPTIONS

C. INDUSTRY ASSUMPTIONS

2. North Slope Petroleum Production
   Production from Sadlerochit only. No new exploration or development (NS0.84BW).

4. OCS Development
   None (OCS.CM3Z(-3)).

5. Oil Industry Headquarters
   Low-level consistent with downscaling of industry (OHQ.F84W).

6. Beluga-Chuitna Coal Production
   None.

D. NATIONAL VARIABLE ASSUMPTIONS
III. $13 Oil - Level 1 Revenue Augmentation (A5.4L2)
Differences from $13 Oil-Business as Usual Case

DESCRIPTION(a)

A. PETROLEUM REVENUE ASSUMPTIONS

B. FISCAL ASSUMPTIONS

10. Permanent Fund Dividend
    Eliminated in FY 1987 [EXPFDIST].

11. Use of Permanent Fund Earnings
    Half of earnings allocated to general fund [EXPFTOCF].

13. Personal Income Tax
    Reimposed FY 1989.

C. INDUSTRY ASSUMPTIONS

D. NATIONAL VARIABLE ASSUMPTIONS
IV. $13 Oil - Level 2 Revenue Augmentation (A5.4L3)
Differences from $13 Oil-Level 1 Revenue Augmentation

DESCRIPTION(a)

A. PETROLEUM REVENUE ASSUMPTIONS

B. FISCAL ASSUMPTIONS

11. Use of Permanent Fund Earnings

All earnings allocated to the general fund [EXPFTOGF].

C. INDUSTRY ASSUMPTIONS

D. NATIONAL VARIABLE ASSUMPTIONS
V. $13 Oil - Level 3 Revenue Augmentation (A5.4L4)
Differences from $13 Oil-Level 2 Revenue Augmentation

DESCRIPTION(a)

A. PETROLEUM REVENUE ASSUMPTIONS

B. FISCAL ASSUMPTIONS

11. Use of Permanent Fund Earnings
   Two times earnings allocated to the general fund [EXPFTOGF].

C. INDUSTRY ASSUMPTIONS

D. NATIONAL VARIABLE ASSUMPTIONS
VI. $13 Oil - Constant Real Wage in State Government (A5.4L5) Differences from $13 Oil-Level 3 Revenue Augmentation

DESCRIPTION(a)

A. PETROLEUM REVENUE ASSUMPTIONS

B. FISCAL ASSUMPTIONS

Real average annual wage in state government constant at 1986 level.

C. INDUSTRY ASSUMPTIONS

D. NATIONAL VARIABLE ASSUMPTIONS
VII. $13 Oil - No State Capital Expenditures (A5.4L6)
Differences from Constant Real Wage in State Government

DESCRIPTION(a)

A. PETROLEUM REVENUE ASSUMPTIONS

B. FISCAL ASSUMPTIONS

2. Capital/Operations Split 100 percent operations [EXSPLITX].

C. INDUSTRY ASSUMPTIONS

D. NATIONAL VARIABLE ASSUMPTIONS
FIG 1. Oil Price Projections

FIG 2. General Fund Petroleum Revenue
FIG 3. General Fund Appropriations:
DOR Dec 1985, Business As Usual

FIG 4. Alaska Employment
DOR Dec 1985, Business As Usual