

ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILES 8672

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Funding good people and projects is not the only, or even possibly the largest, problem Alaska faces. Alaska must also look at the structural barriers to long-term economic development and technology development. We must improve the efficiency of the "innovation pipeline"—that is, the stages of commercialization as research or ideas are turned into a prototype, and the prototype becomes a product that is later produced and marketed on a large-scale.

Third Reason—Differing Perspectives

Finally, ASTF has come to realize that its understanding of how economic development happens is often substantially different from what many other individuals and organizations in Alaska's public and private sectors believe or act upon as necessary for economic growth. Whether ASTF's perspective is right or wrong, as a public body with public resources ASTF believes it should articulate its viewpoint so fair public debate can begin on how Alaska secures long-term economic development.

The broad-based perspective of the Foundation is defined by the Foundation's role as investors working with public resources. This is contrasted to the more optimistic, and predictable, marketing orientation of those private and public sector individuals seeking public funds to carry out projects and continue programs. Proposers often believe that only the absence of money stands in the way of success. This difference may also be partly attributed to the fact that the ASTF Board and staff have often observed and participated in the full process of economic development from idea to product to established business and so have a different perspective than participants who often know well only their own role.

So, for example, professors and other researchers often insist that for a problem to be solved "more research is needed" with insufficient appreciation for what must be done for an idea or infant technology to be produced and marketed. Similarly, business people often believe research is easy and "many good ideas and technologies are already available," but the difficult part is manufacturing and marketing. Similarly, entrepreneurs often complain about risk aversion in bankers and venture capitalists to new business ideas, while the providers of capital are equally insistent that there is plenty of capital for competent individuals with good business plans.

There is a measure of truth to each of these particular perspectives. But, by viewing the economic world through a single perspective, no one in this standoff moves closer to understanding the process of long-term economic development in a way that will help individuals to play their roles more productively to increase innovations and build businesses. Though the ASTF Board and staff is drawn from these different worlds of business, research, banking, and the public sector, our backgrounds and the lessons learned from projects that have succeeded and others that have failed, has led the Foundation to develop an essentially consistent viewpoint on the process of economic development.

The Foundation—A Brief History of ASTF

The Alaska Science & Technology Foundation was created in 1988 as a public corporation with a nine-member Board of Directors appointed by the Governor for staggered four-year terms. The mission of the Alaska Science & Technology Foundation is to "promote and enhance, through basic and applied research, economic development and technological innovation in Alaska, public health, telecommunications, and sustained growth and development of Alaska science and engineering capabilities".

In addition to these duties, ASTF, through Executive Order #90, which transferred ASTF from Department of Revenue to Department of Commerce & Economic Development, was also given the responsibilities of the former Alaska Science & Engineering Advisory Commission. As a result of this transfer, ASTF now also serves a science advisory role for the Legislative and Executive Branches.

ASTF's approach to economic development is through shared investment in Alaska's science and technology development. The Foundation invests in projects at an early stage of technology development, and by providing financial resources, business expertise, and a workable model for success, encourage every ASTF grantee and proposer to think about all the elements required for success before they start their project. ASTF is interested in funding projects that are vertically integrated—that is, that address the issues of technology development, the market, management, and government or regulatory requirements.

The Foundation funds projects that fall into two general categories. One category is projects that advance Alaska's understanding and utilization of Alaska's resources and the state of technology and projects in management, harvesting, processing, or restoration. The other general category is technology based businesses. These are projects which are undertaken by businesses or entrepreneurs, and research, develop, and apply technology for profit.

The Board adopted strict criteria for successful proposals. The principal one being a clear benefit to Alaska and Alaskans. The other criteria were specifically designed to ensure that successful projects are actually implemented - success is determined by project results. These criteria include technical merit, a competent and complete project team, market need, participation of end users during the course of the project, and adequate co-investment. Grant funds are disbursed based upon completion of project benchmarks, and all projects are audited. In addition, the grant agreements contain provisions for repayment of the grant into the corpus of the endowment if the enterprise is successful.

In evaluating previous grant programs in Alaska and elsewhere, it was evident that providing money was not the secret for successful economic development and diversification. Providing money is usually the easiest part of establishing small business and new products. Put very simply, there are three requirements for success in business: money, markets and management. The focus is usually put on the money, but we have learned that the market or need, and the management team are far more important.

A Unifying Vision and Acknowledgments

The Board and staff include successful entrepreneurs who have built significant companies, scientists or engineers who have both done good research and translated it effectively in working with industry and government, managers of technology programs in corporations, and managers of nationally recognized technology and risk capital programs in other states. Coming from different backgrounds and possessing different politics, appointed by three different Governors, the Board and staff nevertheless have developed a unified perspective on the requirements for Alaska's long-term economic development.

That common perspective was strengthened by coming to terms with research ASTF commissioned on Alaska's economy. ASTF acknowledges the excellent research on Alaska's economic base done by Professor Oliver Scott Goldsmith of the University of Alaska Anchorage and on the competitiveness of different sectors of Alaska's economy done by Tom Lane of the Alaska Department of Labor. The economic analysis of both economists cited in Chapter 2 offers some key insights into understanding Alaska's economy. The Appendix contains the full reports of both economic analysis; the reader will find both stand on their own merits. However, the interpretation of this analysis and policy directions drawn from this evidence is solely the responsibility of ASTF.

The first two chapters interpreting Alaska's economic history were drafted as a volunteer activity by then ASTF Board member Jamie Kenworthy who also took the first cut at the Forestry section. The chapter on Mining as drafted by Don Stevens, on Agriculture by Carol Lewis, Roger Pearson, and Charles Knight, on Non-Oil Energy and Coal by Warrick Wilson, on Fish and Groundfish by Sandra Tavanis, Roger Painter, and Steve Street. The commentators on these draft chapters are too numerous to mention but ASTF remains welcome to all. Future sector analysis is planned on the

telecommunications, research, and energy. It is also expected that these sector analysis will be continually updated as the Alaska economy matures.

Sector Analysis and Appendices

ASTF's purpose behind focusing on economic sectors of the Alaska economy was to create a mechanism for beginning a constructive dialogue between various competing and cooperative interests in the state: both private and public. Successful dialogues will identify changes and change-agents that can develop long-term solutions and opportunities that will strengthen both the private and public sectors of Alaska's economy.

Each of these sector analysis has been written with the objective of presenting a concise picture of each sector and its place in Alaska's economy. It is hoped that critical details have not been overlooked in this effort.

Three appendices are included with this report. Appendix One is a Structural Analysis of the Alaska economy done through the Institute of Social and Economic Research (ISER) by Scott Goldsmith. Appendix Two is a Shift-Share analysis that was prepared by Tom Lane of the Alaska Department of Labor.

In Closing—Releasing a Draft Strategic Document

While differing members of the ASTF Board came to consider Alaska's economy from different perspectives, all felt an equal responsibility to modify their beliefs in the face of clear facts. Rather than examining what should be done in terms of our individual political beliefs about the proper role of the public or private sector or our individual roles in different parts of the Alaskan economy, ASTF sought to ground its recommendations in terms of an analysis of Alaska's economy and known evidence and experience about what steps have worked elsewhere or in Alaska to address these challenges.

This draft strategy is written then in the hope that an Alaskan reader may by a similar process suspend prior opinions about the state's economy long enough to test his or her beliefs against the economic analysis and reasoning presented here. The authors hope that in this process the reader will either agree with the description of the problem presented here or be willing to suggest how this analysis is faulty or incomplete. And from that revised understanding of Alaska's situation, Alaskans may begin a more productive and focused discussion of what must be done to grow the state's economic base.

Rather than consider this draft strategy a one-time event soon forgotten (the fate of many government strategic plans), the Board hopes this draft strategy is the start of an ongoing conversation with Alaskans about their understanding of their future and what Alaskans must do to secure the state's prosperity.

This report is not intended as a one-way lecture on what must be done. Rather, ASTF offers this draft report as a start of an ongoing discussion about Alaska's economic future. Where the assumptions, evidence, or reasoning of this strategy are open to challenge, the authors of this report are willing to listen and modify recommendations in the face of new facts and sharper reasoning. The Foundation welcomes comments, critical or otherwise, on its understanding of Alaska's economy and its suggested directions for the future. Written comments may be addressed to: ASTF, 4500 Diplomacy Drive, Suite 515, Anchorage, AK 99508-5918.

Chapter I

Alaska's Economy

Understanding Alaska's economy does not automatically provide clear guideposts for the state's future. But a clearer understanding of what has driven Alaska's economy in the past is a necessary first step for any discussion of Alaska's long-term economic development. So the authors commissioned research on how key sectors of the Alaska's economy have performed since statehood. (A full copy of that research is in Appendix A.) This analysis of Alaska's economic structure and competitive performance will be used to answer two broad questions.

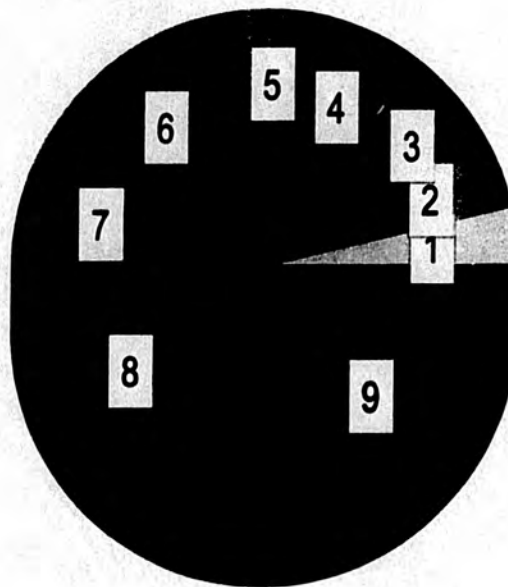
First, how has Alaska's economic base changed and grown? More particularly, what changes in the private and public sectors have resulted in today's economy? Even with a higher cost of living, Alaskans still have above-average personal incomes compared to other states, and they remain relatively wealthy compared to most of the world. Yet, as will be seen in an examination of the state's economic foundation, it is of some concern that Alaska's future economy depends primarily on two sets of decisions made outside with little input from Alaskans—the decision of world markets concerning what to pay for a barrel of oil and the decision of the federal government on how many federal dollars should be spent in Alaska. An examination of Alaska's changing economic structure should provide a clearer sense of how malleable the state's economy is, that is how much Alaskans can shape their economic prospects.

Second, how competitive is Alaska's economy? If we take a microscope rather than a telescope to the Alaskan economy, can we see in the performance of certain sectors signs that Alaska is able to compete in world markets? Rather than expect new industry to come to Alaska or the federal government to make decisions which increase Alaska's wealth, can Alaska grow its own economy? Comparing the performance of Alaska's firms with their competitors nationally provides some clues of how a higher wage, higher value Alaskan economy can emerge from an economy now primarily based on federal spending and the extraction of natural resources.

First, a brief picture of Alaska's economy. The state currently provides jobs for nearly 280,000 people. Some people are self-employed but most work in the state's approximately 40,000 businesses. As in other states, most of these jobs are in retail, services, transportation and government.

In fact, only about one in seven jobs in Alaska is in natural resources and the processing and manufacturing of those resources—primarily oil, seafood, timber, and mining. In the Lower 48 approximately one job in four is in these sectors of manufacturing, natural resources, and agriculture. Alaska has a significantly smaller share of its economy devoted to producing a good or service sold outside the state.

Total Employment 1997



- 1. Mining & Oil---9,954
- 2. Construction---12,782
- 3. Manufacturing---16,092
- 4. Transportation, Communication---23,854
- 5. Wholesale Trade---8,818
- 6. Retail Trade---47,067
- 7. Finance, Insurance, Real Estate---12,061
- 8. Services---64,798
- 9. Government---73,210

Source: U.S. ADOL, Annual Average, November 1997

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Alaska's Economic Base

Economists call the jobs which sell a good or service outside the state the state's "economic base." While Alaska's economic base is narrower than other states, this economic base is just as important in driving the entire state economy.

While every job in an economy is important, all jobs are not equal in terms of the impact they have on the state's economy. Broadly speaking, economic base industries bring new money into Alaska by selling to customers in the rest of the world. By contrast, jobs in the local market economy simply recirculate that money within the state.

For example, the out-of-state buyer of timber from Ketchikan, seafood from Kodiak, zinc ore from Kotzebue, and, most important, oil from Alaska, is putting money into the pockets of the sawmill workers, the seafood workers, the miners, and oil field workers in Alaska. Even more important, that money then recirculates to the many businesses which supply goods and services to those economic base industries—the utilities, the parts suppliers, the trucking firms, the business firms providing such services as accounting and legal work, and the banks. Employees in those economic base firms and the firms which supply them goods or services then circulate their wages and profits by buying goods and services in the local market economy—housing, clothes, food, such private sector services as medicine or entertainment, and public services such as education, roads, public health, and law enforcement.

In addition, an Alaskan firm is also part of the state's economic base if it sells a product or service to an Alaskan resident who otherwise would have purchased that product from outside. By providing a substitute for an import into the state, such firms provide the same ultimate benefit as an exporting firm—they make the state wealthier.

Economists call the impact of outside dollars circulating through the local economy the "multiplier effect" and on average estimate that every \$1 dollar brought into the state generates more than three dollars of economic impact before it is fully absorbed by the local market and is used by an Alaskan to purchase a good or service from outside the state.

In terms of economic impact, all jobs are not equal because jobs in the economic base and, to an even greater degree, higher wage jobs in that base, make the state wealthier by bringing dollars into Alaska which then multiply through the state's economy. In contrast, an Alaskan restaurant, store, or bank which sells a product or service to a state resident is not bringing money into the state. Such an Alaskan business simply moves dollars from one resident—its customer—to another resident—its employee. The amount of money in the state has not been increased, only recirculated. However, when that restaurant or store sells a product or service to a tourist visiting Alaska, then a proportion of that business becomes part of another of Alaska's base industries—tourism.

While the growing service and retail sector contribute significantly to the quality of our lives, they are not part of the economic base. In fact, these local market activities exist only because economic-base industries bring money into the state and pay their employees, who then in turn can afford to purchase a home, buy a suit, pay for a meal, or see a doctor for a checkup. Local market activities compete with each other for the income ultimately brought into Alaska by the industries in the economic base. So, in effect, the ultimate source of jobs in Alaska is the industries in the state's economic base.

While it is theoretically true that a more efficient, lower cost local market sector can act as a magnet to attract new economic base firms, this is a minor or second order effect. In Alaska, with a small local market and a higher-priced service sector, this is an inefficient way to build a larger economic base. There is weak public policy justification for the state focusing on assisting local market firms; rather in carrying out its economic development responsibilities, the state in partnership with the private sector, needs to help grow the state's economic base. The local market or service sector firms can then compete for the increased number of customers that result from these efforts in a service sector now larger and more competitive.

CONCLUSION 1

For all practical purposes, a state becomes more prosperous in only one way—by increasing the value of the goods and services that its economic base industries sell, directly or indirectly, outside the state. This increases the earnings of residents who work for those industries. As these workers earn more, they have more to spend and so they create more jobs and income in the local market economy. Therefore, the central focus of any state economic development efforts must be the expansion of the state's economic base.

Government and Alaska's Economic Base

The relationship of government jobs to the state's economic base requires special consideration. The latest official statistics from November, 1997 show that there were 16,700 civilian and military federal employees in Alaska, not counting another approximately 19,000 active-duty military personnel. This number of federal employees is twice the 8257 jobs in the oil and gas industry and more than the 17,000 jobs in manufacturing, which includes seafood, forestry, mining, printing and publishing, and all the other goods producing sectors. Since the jobs of federal workers in Alaska are supported by the taxes paid by all U.S. residents, more than 99% of whom live outside, all these jobs should be considered a large part of Alaska's economic base. (While Alaskans pay taxes to support federal services in all states, Alaska's proportion of federal employees is three times the national average.)

In November 1997 there were 57,400 jobs in state and local government, of which approximately 27,700 were in education. In other states these jobs are supported by the local taxes collected primarily from state residents and so they are considered as part of the local market economy and not part of the state's economic base.

However, as is well known, in Alaska oil revenue supports 85% of the state's General Fund unrestricted revenues, including state aid to local government, and the oil industry pays a third of local property taxes. So approximately 70% of these 57,400 jobs, or 40,000, can be considered the largest number of jobs in the state's economic base. These public sector jobs are in effect the result of oil being purchased by consumers and corporations located outside Alaska.

While the oil and gas industry in Alaska directly employs less than 9,000 people, oil revenue directly supports 40,000 public jobs. So the impact of the oil industry on the state is far larger than its apparent size. The following chart of Alaska compares employment in Alaska's basic industries. (A later discussion of Alaska's economic base

will focus on income, not jobs, and include the impact of tourism and other activities which bring money into the state.)

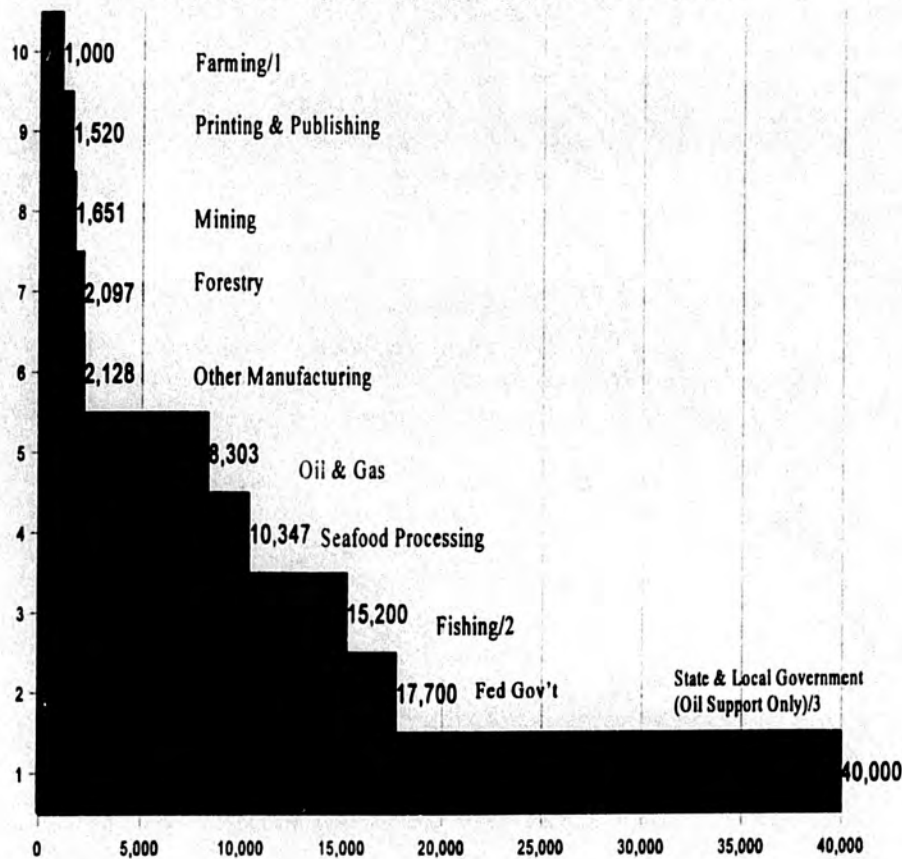
Because of the multiplier effect of jobs and income being added to the base rippling through the local economy, even a small increase or decrease in the economic base has a much larger impact on the whole economy. This is particularly true for some durable goods like the price and availability of housing where a small increase or decrease in the number of jobs in an area will have a much larger effect on the price of existing housing and the pace of new construction. A sudden change in the demand for workers in an area can also have a dramatic effect in bidding up or down the wages employers pay their employees.

Economists may talk drily of "multiplier effects" and "shifting demands for labor" but longer-term Alaska residents have little trouble remembering what happened during the construction of the pipeline in 1975-76 to the price and availability of housing in Anchorage or the number of construction jobs in Fairbanks and the higher wages paid these workers.

The changes triggered when a state's economic base contracts are equally severe and can be even more distressing. In the recent past, Alaska's economy has had at least four turning points. The first low point was the postpipeline economy of 1978 with government employment still increasing while private sector employment had bottomed out. The Alaskan economy then peaked in 1985, an upswing brought on by high oil prices and an oil-financed state government construction boom. With the collapse of oil prices and state revenues, Alaska entered a steep recession in 1987 characterized by a sharp drop in housing prices. By 1997, the latest year figures are available, the economy has recovered but Alaska's employment growth has lagged the five year national expansion.

Alaska's recent history underscores the point that changes in Alaska's economic base have larger impacts on the rest of the state economy. To stretch a familiar metaphor, when Alaska's economic base has had the sniffles, the rest of the economy came down with a cold. And when the base caught a cold, the economy came down with pneumonia.

Alaska's Base Industries Jobs 1997



Government

1. 40,000---State & Local Government (Oil Support Only)/3
2. 17,700---Federal Government

Goods-Producing

3. 15,200---Fishing/2
4. 10,347---Seafood Processing
5. 8,303---Oil & Gas
6. 2,128---Other Manufacturing
7. 2,097---Forestry
8. 1,651---Mining
9. 1,520---Printing & Publishing
10. 1,000---Farming/1

1/ Based on survey of employment for the week of 7-13, this number is not an annual average. Source---USDA.

2/ Source---National Institute for Occupational Safety and Health and Alaska Seafood Industry Study, McDowell Corporation.

3/ Represents 75 percent of total state and local employment.

Source---U.S. Bureau of Labor Statistics, Alaska Department of Labor, Research and Analysis, USDA, and private forecast for fishing.

SPLAN:AKBASE97

Alaska's Changing Economic Structure

Because of the importance of the state's economic base, the authors of this report commissioned research on the structure of Alaska's economy from statehood to the present. That research focused both on the jobs in the economic base and, more important, on income attributed to that base. While the number of jobs in the economic base is important, even more important is the income which supports the base and is paid as wages to employees, purchase of goods and services to suppliers, and taxes and fees to government. It is important to calculate the income flows generated by different sectors because some industries pay higher wages or purchase more supplies and services from local businesses; that is, some industries have a higher "multiplier." In addition, income flows to the state's economic base defines the impact of the state's oil industry.

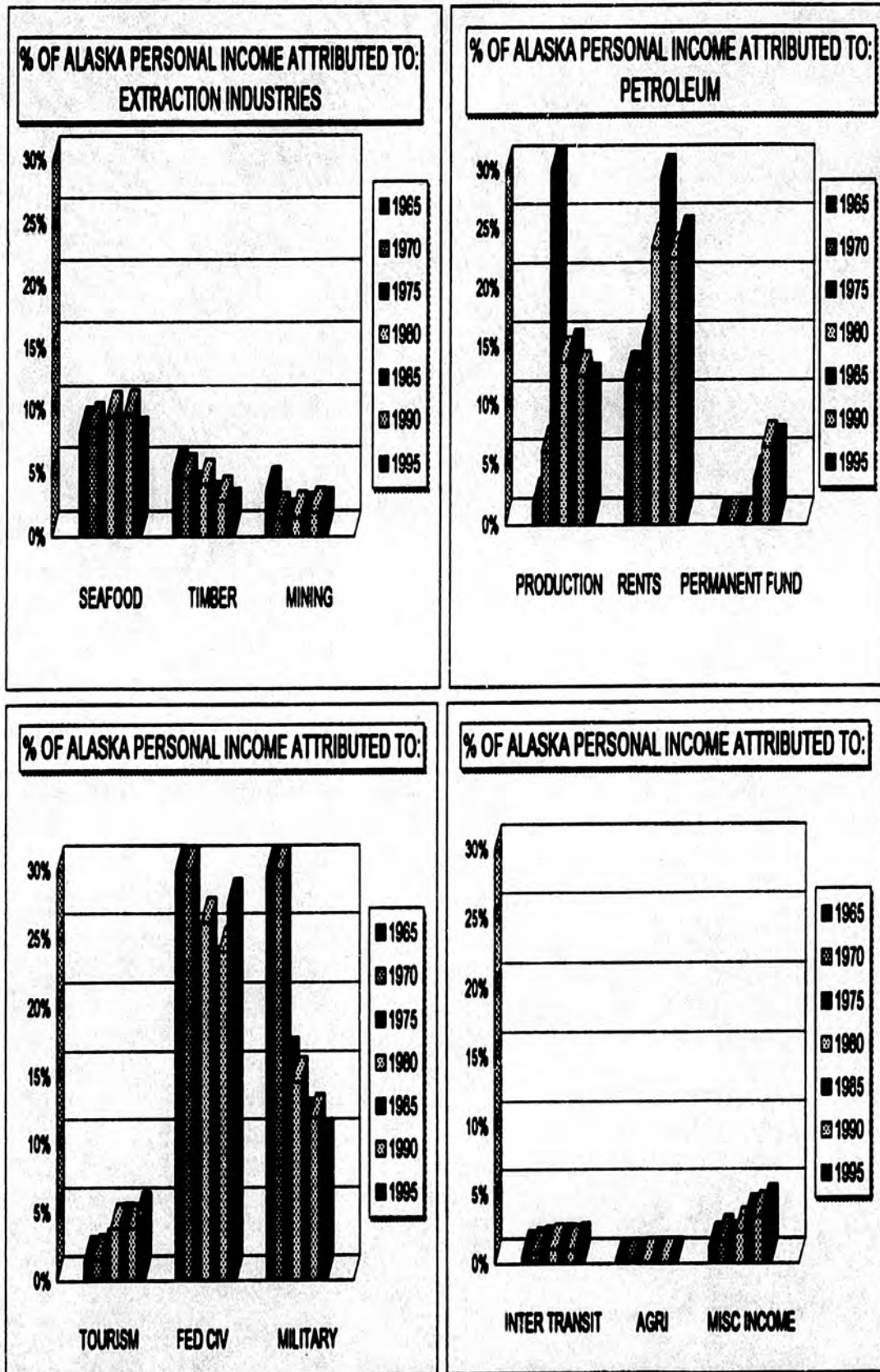
Rather than being stable, Alaska's economic base is dynamic and it has shifted dramatically within the relatively recent past. Looking at the income flowing from outside the state into Alaska shows significant changes in the composition of the

SHARES OF ALASKA PERSONAL INCOME ATTRIBUTABLE TO SECTOR

	1965	1970	1975	1980	1985	1990	1995
OIL PRODUCTION	1.8%	6.2%	30.5%	13.7%	14.3%	12.6%	11.5%
OIL RENTS	12.5%	12.2%	15.5%	23.3%	29.2%	22.5%	23.9%
PERMANENT FUND	0.0%	0.0%	0.0%	0.0%	3.5%	6.4%	6.1%
SEAFOOD	8.2%	8.6%	5.6%	9.5%	6.7%	9.7%	7.4%
TIMBER	5.0%	4.5%	3.1%	4.1%	2.3%	2.8%	1.8%
MINING	3.5%	1.4%	0.9%	1.5%	1.4%	1.8%	1.7%
TOURISM	1.4%	1.6%	2.0%	3.9%	3.9%	3.8%	4.8%
FEDERAL CIVILIAN	33.0%	31.7%	24.3%	26.2%	22.7%	24.1%	27.6%
FEDERAL MILITARY	32.8%	31.3%	16.0%	14.5%	11.5%	11.9%	10.0%
INTERNATIONAL TRANSIT	0.6%	0.8%	1.0%	1.1%	1.1%	1.0%	1.2%
AGRICULTURE	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
MISCELLANEOUS INCOME	1.2%	1.7%	1.2%	2.2%	3.2%	3.4%	3.9%
	100%	100%	100%	100%	100%	100%	100%

state's economic base since 1965.

Source—Institute of Social & Economic Research, University of Alaska Anchorage



Source—Institute of Social & Economic Research, University of Alaska Anchorage

On this chart the revenue from jobs in the oil industry and suppliers are separated from the "economic rents" attached to the oil industry, primarily revenue flowing to the state. Entrepot includes those jobs created by moving goods through Alaska or from Alaska to another state so the Federal Express job in Anchorage is a part of the state's economic base but not the job of an Anchorage bus driver. Miscellaneous Income includes all funds flowing from the federal government to Alaska (social security, Medicare, etc.) and the income from the assets owned by state residents such as dividends on stocks.

A close examination of the changing composition and size of Alaska's economic base divides Alaska's economic history since statehood into three rough periods.

Stage 1—Colonial Economy

When Alaska became a state in 1959, its population and economy were less than half its current size. Tracing the impact of all forms of federal spending, including federal civilian and military employees and the federal purchase of Alaskan products and services, shows that in 1960 this spending created 66,000 jobs or approximately 74% of all jobs in the state's economic base. This is **not** to say that in 1960 74% of Alaskans were employed by the federal government or employed providing goods or services to the federal government. Rather 74% of the economic base was attributed to federal spending including federal employment so, in effect, if in 1960 all federal spending had been withdrawn from the economy, the ripple effect of this loss of federal dollars on all the other sectors of the economy would have led three Alaskans out of four to lose their jobs.

Since 1960 federal civilian employment has been relatively steady at 20,000 jobs, while military personnel has declined from 35,000 to 23,000 jobs. The state's dependence on the federal government has steadily lessened as the state's economic base has grown and diversified. While approximately 20% of Alaskans worked for the federal government in 1960, less than half that proportion work for the federal government today.

By 1974, the year before pipeline construction, the federal spending composed half of the outside dollars in the state's economic base. Since 1974, while the number of federal jobs and federal spending has been relatively steady, the growth of the oil industry and other basic sectors has lowered the federal share of income to the state's economic base to approximately 38% today.

In effect, Alaska's economy in 1960 was almost twice as dependent on federal spending as it is today; in prepipeline 1974 Alaska's economy was 40% more dependent on federal spending than it is today. As Alaskans wonder what impact the end of the Cold War will have on military spending and look at various efforts to lower the federal budget deficit and the relative size of the federal government, it should be considered good news that Alaskans have developed a lessened dependence on federal spending to drive the state's economy. Nevertheless, with the exception of the Washington, D.C., area, no other state's economic base depends so heavily on federal spending.

Yet the declining importance of federal spending holds some important lessons for Alaska's economic future. This history shows it is possible to change the structure of a state's economy and alter its economic base. A state's economic base can be broadened and diversified relatively rapidly. This change is positive and relatively

painless if a state can, like Alaska in the 1960s and 1970s, diversify its economy into other sectors from a relatively steady base.

However, when a region has an eroding or collapsing base, a local economy can suffer painful losses of income, population, and social turmoil as it seeks to find a new economic base. When the textile and shoe industry moved south from New England in the 1950s, Massachusetts and New Hampshire led the nation in unemployment. When Boeing downsized in the late 1960s, Seattle's economy collapsed with it. Michigan's economy contracted sharply in the early 1980s when U.S. automakers lost markets to foreign-based companies. Currently California's economy is restructuring as jobs in electronics and entertainment replace a smaller Defense sector.

Some regional economies recover as their lead industry recovers or new basic industries expand, but there is nothing natural or automatic or painless about this process. Some auto workers in Detroit, oil workers in Texas, and Defense workers in California will never recover their lost jobs and incomes. And some communities never replace a lost economic base; when the mines closed in some Western towns, the communities simply disappeared.

Conclusion 2

States are in a better position to grow their economy by building on an existing base rather than waiting until its economic base is eroding and then seeking to replace it.

Stage 2—The Postpipeline Economy

With the completion of the pipeline in 1977, Alaska's economic base shifted to depend primarily on petroleum. The subject of Alaska's dependence on oil revenue is such a familiar, even painfully obvious, topic that it may appear to require no further comment. However, the information cited to describe this dependence vary significantly as do the assumptions behind different presentations of data. With varying diagnoses of this alleged problem and no widely agreed upon understanding of the impact of oil on Alaska's economy, it is not surprising that the proposed solutions to Alaska's oil dependence cover the political landscape.

By focusing on the state's economic base and understanding the role of oil as part of this base, a common understanding of the impact of oil industry and revenues on the Alaskan economy is possible. This common understanding rests both on recalling the difference between the economic base and local market economy and on distinguishing between three income flows attributed to the petroleum industry—the direct and support jobs in the oil industry itself, the economic rents paid by the oil industry to the state to support state government, and the oil income paid to the Permanent Fund which passes directly to Alaskan citizens.

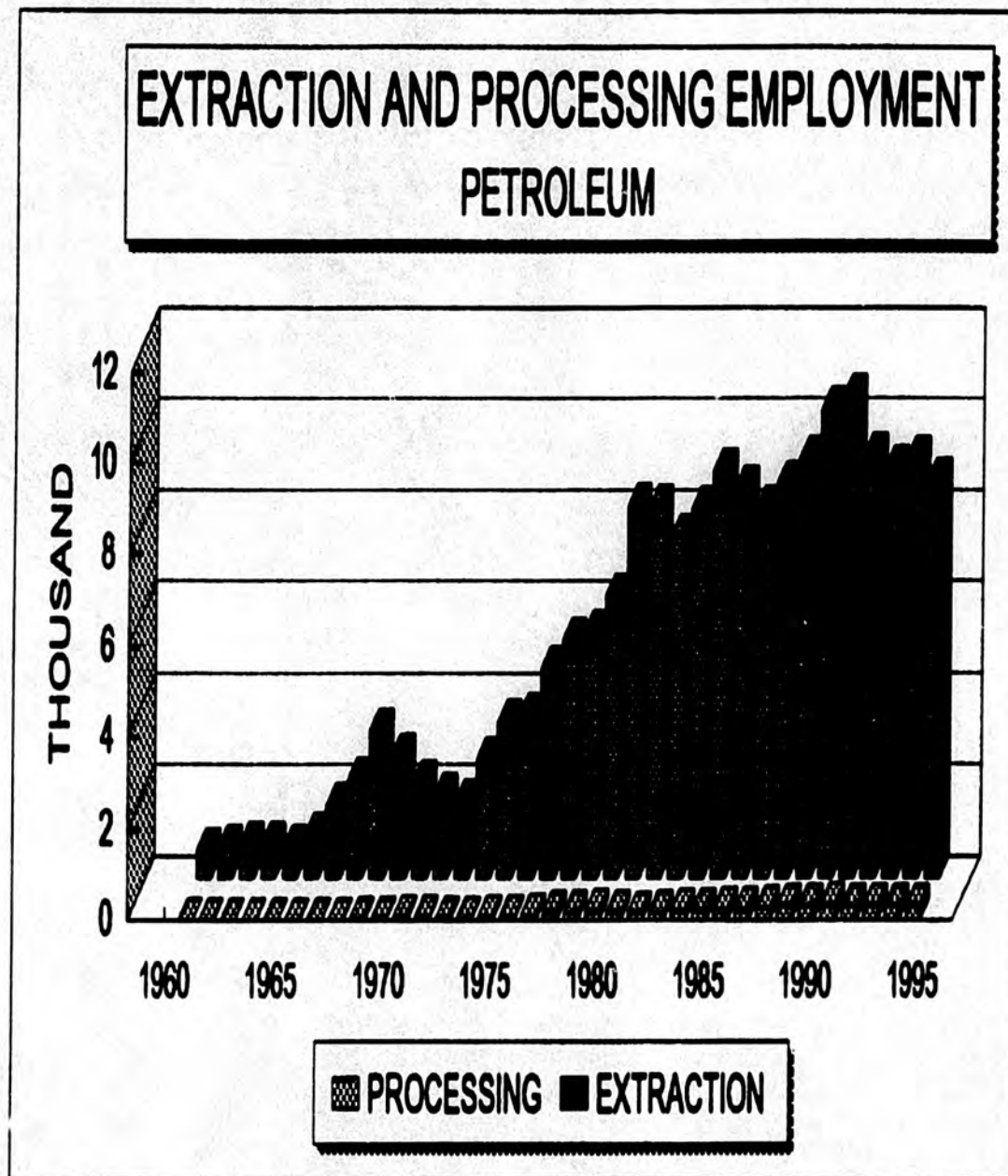
The number of direct and support jobs in the oil industry is easy to track. Employment in the oil industry and the firms which directly support the industry peaked in 1976 at the height of pipeline construction providing then 23.6% of the income in the state's economic base. (Again, this is NOT to say that in 1976 every fourth Alaskan worked for the oil industry or a firm directly supplying the oil industry. Rather the direct and multiplier effect of income from outside the state flowing to Alaska to support jobs in the oil and oil supply industry was to employ every fourth person in the state.)

Chapter I— Alaska's Economy

Since 1976 the number of direct and support jobs in petroleum has declined so now only 12% of the economic base (again, not 12% of all jobs) are in the oil industry or a firm which supplies the industry. In effect, without this direct and support employment of the oil industry, the Alaskan economy would be nearly one-eighth smaller. Compared to the pipeline boom year of 1976, the overall Alaskan economy today is half as dependent on the direct and support jobs of the oil industry.

	CORE JOBS	TOTAL JOBS	RATIO	SHARE OF ALL JOBS
61	0.73	1.20	1.6	1.3%
62	0.83	1.39	1.7	1.4%
63	0.90	1.44	1.6	1.4%
64	0.92	1.49	1.6	1.4%
65	0.81	1.35	1.7	1.2%
66	1.15	1.96	1.7	1.7%
67	1.96	3.45	1.8	2.9%
68	2.65	4.80	1.8	4.0%
69	4.03	7.43	1.8	5.8%
70	3.32	6.52	2.0	4.9%
71	2.72	5.20	1.9	3.8%
72	2.31	4.43	1.9	3.1%
73	2.14	3.84	1.8	2.6%
74	7.28	15.87	2.2	9.6%
75	20.70	47.36	2.3	23.7%
76	24.40	58.20	2.4	27.7%
77	15.35	37.04	2.4	18.2%
78	10.23	23.01	2.2	11.3%
79	9.34	21.41	2.3	10.3%
80	10.59	24.18	2.3	11.5%
81	14.59	32.40	2.2	14.3%
82	15.38	33.89	2.2	14.0%
83	15.66	36.44	2.3	14.2%
84	15.21	36.47	2.4	13.6%
85	15.34	34.98	2.3	12.7%
86	14.42	31.84	2.2	12.1%
87	12.90	27.15	2.1	10.7%
88	12.96	27.23	2.1	10.5%
89	14.22	29.69	2.1	10.9%
90	15.53	33.04	2.1	11.7%
91	16.21	34.62	2.1	11.9%
92	14.57	31.65	2.2	10.7%
93	14.26	31.10	2.2	10.3%
94	15.04	33.50	2.2	11.0%
95	14.41	33.13	2.3	10.8%

Source—Institute of Social & Economic Research, University of Alaska Anchorage



Source—Institute of Social & Economic Research, University of Alaska Anchorage

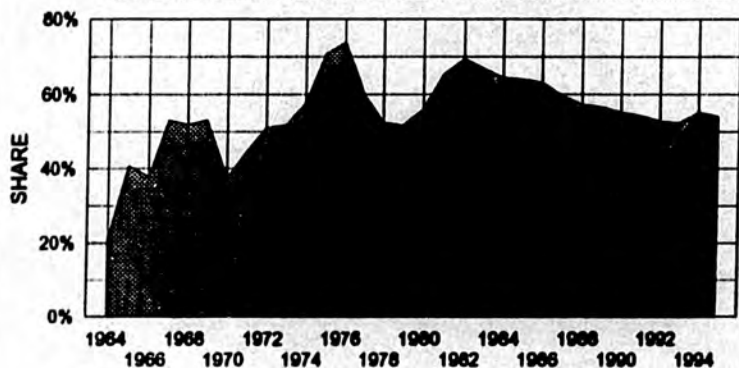
However, since 1976 the Alaskan economy has grown far more dependent on a second source of oil revenue—the taxes or economic rents charged the industry and collected by state government. This oil revenue is paid by oil companies to the state of Alaska but it is, in effect, a pass through tax paid by out-of-state consumers to state government. State government then pays the wages of state employees and purchases local goods, and the income from these sources circulates through the local market economy. These economic rents from oil and gas accounted for less than 10% of Alaska's economic base before 1965, peaked at 29% in 1985, and have declined somewhat to 25% in 1991, the latest year figures are available.

	CORE JOBS	TOTAL JOBS	RATIO	SHARE OF ALL JOBS
61	1.54	2.34	1.5	2.5%
62	1.77	2.71	1.5	2.8%
63	5.02	7.52	1.5	7.5%
64	5.38	8.15	1.5	7.9%
65	7.51	11.32	1.5	10.3%
66	7.67	11.68	1.5	10.3%
67	9.36	14.75	1.6	12.5%
68	9.29	14.93	1.6	12.3%
69	9.70	15.94	1.6	12.5%
70	8.49	14.86	1.7	11.1%
71	11.52	20.16	1.7	14.7%
72	14.54	25.50	1.8	18.0%
73	16.88	29.06	1.7	19.8%
74	16.94	30.08	1.8	18.3%
75	18.42	31.99	1.7	16.0%
76	18.50	31.56	1.7	15.0%
77	17.56	33.63	1.9	16.5%
78	19.70	39.78	2.0	19.6%
79	21.27	42.50	2.0	20.5%
80	22.66	45.74	2.0	21.8%
81	30.69	59.08	1.9	26.0%
82	33.20	62.74	1.9	25.9%
83	36.64	72.22	2.0	28.2%
84	37.35	75.94	2.0	28.4%
85	40.10	80.14	2.0	29.2%
86	38.75	74.07	1.9	28.0%
87	35.20	65.82	1.9	25.9%
88	34.32	63.62	1.9	24.6%
89	37.01	68.50	1.9	25.1%
90	36.39	67.71	1.9	23.9%
91	36.15	68.62	1.9	23.6%
92	37.91	71.83	1.9	24.3%
93	38.39	74.42	1.9	24.6%
94	39.13	77.93	2.0	25.7%
95	37.77	76.64	2.0	25.1%

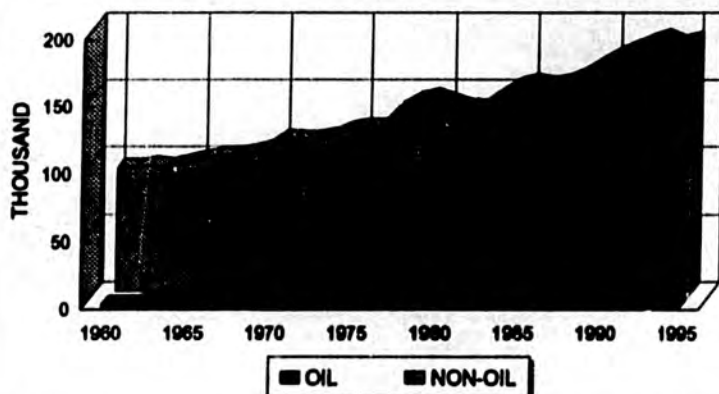
Source—Institute of Social & Economic Research, University of Alaska Anchorage

Adding together the jobs from oil production and the jobs from economic rents on oil shows that at its peak in 1984 over 40% of Alaska's economy was dependent on the oil industry, a figure which declined slightly

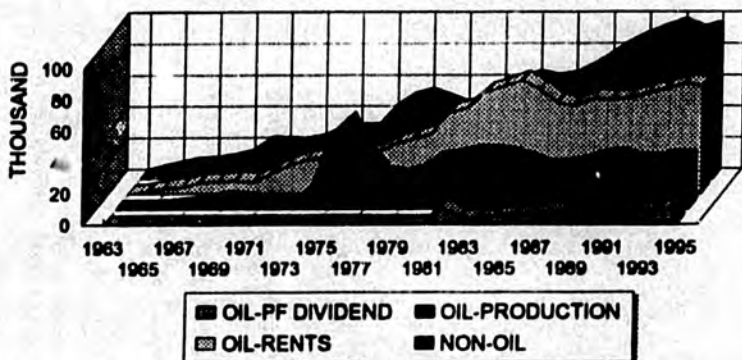
ALASKA JOB GROWTH SINCE 1963
WHAT SHARE IS DUE TO OIL?



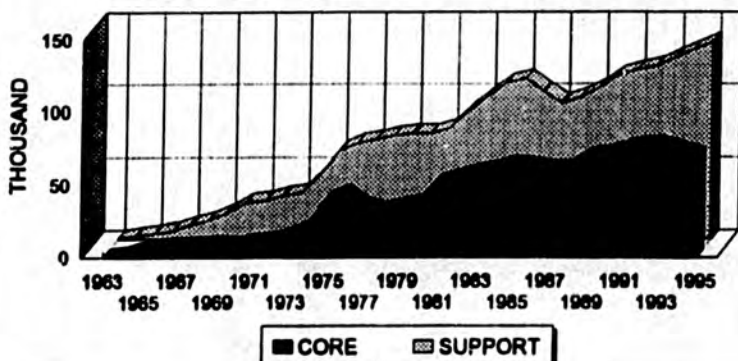
OIL & NON-OIL BASED ALASKA JOBS



ALASKA JOB GROWTH SINCE 1963
HOW MUCH IS DUE TO OIL?



ALASKA JOB GROWTH SINCE 1963
HOW MUCH IS THE CORE? HOW MUCH IS SUPPORT?



to 36% by 1995. The oil industry employs fewer than 10,000 Alaskans and produces public revenues which directly employ another 40,000 public employees but the full

effect of this industry as its impact is multiplied from base jobs to the local market is to support another 50,000 jobs in Alaska's 280,000 job economy. In effect, without an Alaskan oil and gas industry and the oil revenue annually flowing to the state, every third Alaskan would be out of work

The third, and final, income flow of the oil industry is attributed to the income of the Permanent Fund. The \$780 million paid annually to individuals accounts for 6.1% of the state's total personal income in 1995. This payment, when multiplied through the economy, is a \$2 billion boost to the state economy. Besides the Permanent Fund dividends, Alaskans receive income on such miscellaneous assets as stocks and bonds and federal transfer payments (social security, Medicare, etc.) for another 4% of their total income. In effect, a tenth of the state's economic base is revenue from the Permanent Fund and other miscellaneous assets.

The oil industry has measurably increased Alaskans wealth. As the oil industry matures, the impact of this wealth has shifted from providing direct jobs to providing public revenues to purchasing income-producing assets (primarily non-oil equities and fixed income securities) whose incomes support dividends to individuals and revenue for the state.

There is no better sign of the maturing of the Alaska oil industry and the maturing Alaskan population than the shift in the form by which Alaskans have benefitted from oil. The share of the economic base attributed to direct and support jobs in the oil industry peaked at 28% in 1976, the share attributed to economic rents peaked ten years later in 1985 at 29%, and the share attributed to miscellaneous income (some Fund dividends, some other assets, some transfer payments) continues to rise to 10% in 1995, the latest year figures are available, and is no doubt even higher today.

In effect, as the oil wealth in Alaska has matured, it has lost some of its color and fingerprints. In the mid-1970s, the primary mode an Alaskan benefitted from the oil industry was through the direct employment generated by the industry and its suppliers. In the 1980s and 1990s oil wealth is primarily received by Alaskans as public services or goods (roads, education, etc.) paid by oil revenue or as income from someone paid directly or indirectly by the state. In the near future Alaskans will receive an increasing share of oil wealth as a return on public and private assets financed originally by oil revenue.

Since the early 1980s Alaska's economic base has shown a modest ability to diversify from its dependence on oil. Counting all three sources of income to the state's economic base (the jobs in the oil and oil supplier industry, the economic rents, and the Permanent Fund), the industry's share of the total income in the economic base which was 33% in 1975, peaked at almost 50% in 1982 (the first year of Permanent Fund dividends), and has remained fairly steady around 40% since 1987.

The 40% of the economic base attributed to the oil industry is almost as much as all other sectors of Alaska's base industries combined—federal spending, seafood, forestry, mining, tourism, and agriculture. Excepting the agricultural industry in a handful of sparsely populated Great Plains states, no other state is as dependent as Alaska is on one industry for its economic base. Michigan is less dependent on its auto industry, California is less dependent on its Defense sector, Iowa is less dependent on its farm economy, than Alaska's economy is dependent on its oil industry.

Dependence, or concentration, in one basic industry is not necessarily bad if that sector continues to grow—as the oil industry and revenues have not since the mid-1980s—or if the sector is relatively stable, as federal employment and spending in Alaska have

been since 1960. However, a high concentration of one industry as a state's economic base describes a volatile economy continually in a "boom or bust" cycle.

A diverse economy is more resilient to weather dislocations if it depends on selling a variety of goods, with the demand for each having different ebbs and flows. An economy becomes even more volatile when the chief good produced is an internationally traded commodity like oil or wheat, as opposed to a final product like a car or bread. The residents living with an economy, primarily dependent on an internationally priced commodities can be described as largely captives on a roller coaster with someone else at the controls.

Considered for its economic impact, the oil industry has been a wonderful industry for Alaska. It has been primarily responsible for the doubling of the state's economy. It pays the lion share of the state's public services and infrastructure costs. It has greatly increased the wealth of both the state and the assets of individual Alaskans to the point where a quarter of their income is earned from the assets largely purchased with oil revenue or saved because of forgone taxes paid by oil revenues.

But with the price of North Slope crude oil at \$16 a barrel, North Slope production still declining, and a world surplus of oil for the foreseeable future, it seems likely that without building a broader economic base, Alaska's economy will remain on an economic roller coaster with each peak lower than the previous peak and each trough lower than the previous trough.

Conclusion 3

While Alaska is still highly dependent on the oil industry, this dependence has declined. In addition, the form of this dependence is shifting. In the foreseeable future, Alaska will depend less on the oil industry and oil revenues than on how productively the citizens and government of Alaska has invested its oil wealth.

Stage 3—Alaska's Emerging Economy

A more detailed inspection of Alaska's basic industries shows that Alaska's economy has started on a third stage of development. While this emerging economy is still largely based on oil, it is becoming less dependent on oil and so increasingly diversified. This emerging economy is more controlled by Alaskans because it depends less on harvesting or extracting natural resources and more on the processing and distribution of those resources with more value being captured by Alaskans.

The question for Alaska is whether this emerging economy can grow fast enough to replace the gradual decline of oil revenues.

To answer this question, and to understand better what is happening in key basic sectors of the Alaskan economy, requires comparing the performance of different sectors of the Alaskan economy with their national competitors. This tool—called "shift-share analysis" by economists—can be helpful in explaining the performance of an industry by separating out the influence of the ups and downs of the business cycle from underlying competitive factors. If, for example, an industry in Alaska grew 20% during a period of time when its competitors nationally grew only 10%, then we know that the Alaskan industry has a positive competitive shift. Alaskan firms in that industry must be doing something right to become more productive and increase their

market share or, possibly, those firms benefitted from receiving higher quality inputs from the local economy, such as higher skilled workers, or lower business and regulatory costs. If Alaskan firms grew only 5% while their competitors grew 10%, the Alaskan industry might still be growing, but it is less competitive. On the other hand, if in a recession the national industry shrunk by 20% when the Alaskan industry shrunk by only 10%, the Alaskan industry is becoming more competitive even in a downturn.

This form of analysis is not a perfect tool for two reasons. First, Alaska competes not just nationally but internationally so comparing Alaskan firms and their U.S. counterparts offers meaningful but not perfect comparisons. Second, because the structure of Alaska's economy is different than the national economy (more oil, less manufacturing, etc.), shift share analysis is more useful for understanding how different sectors of the economy perform than explaining the performance of the economy as a whole. The Alaska economy is more driven by the price of oil than whether the national economy is growing or in recession.

Comparing Alaska's economy at its earlier peak of 1985 with its recent peak of 1995, shows an economy which gained 27,122 jobs. However, if in that period Alaska's economy had grown as fast as the nation's economy, the state would have added 45,519 jobs. In effect, Alaska "lost" 18,398 jobs (or negative competitive shift) because the state grew more slowly than the nation. The oil industry cannot be blamed for this relative decline. In that period, the Alaska oil industry lost 102 real jobs but because the oil industry was declining much faster nationally than in Alaska, the oil sector had a positive competitive shift of almost 4,000 jobs.

There are important signs of the state's economic future in comparing how Alaska has recovered from the last two business cycles (1978 trough to 1985 peak versus 1987 trough to 1995 peak). While Alaska's had a 43,072 positive competitive shift in the 1980s recovery compared to a positive shift of 17,496 jobs in the recent 1990s expansion, the composition of the recent recovery is more healthy and diverse. The 1980s expansion was driven by big increases in construction and government; in effect by oil revenue. The recent expansion has been manufacturing and mining (including oil) with smaller increase in retail and services. While Alaska's public sector remains a much larger part of the state's economy than the nation, this sector is growing more slowly here than outside.

The star performer of Alaska's base economy has been seafood and, secondarily, mining and other manufacturing. The seafood processing industry does not include seafood harvesters (fishers), most of whom are self-employed. Whether measured from trough to peak (1987 to 1995) or peak to peak (1985 to 1995), Alaska's manufacturing sector led by seafood, but also including durable and nondurable goods, is growing both absolutely in real numbers and relatively compared to national competitors.

On the other hand, the forestry sector of the economy is becoming a smaller part of our state's base and is going in the opposite direction from value-added manufacturing. Since 1985 the state has added 708 jobs in logging while this sector declined modestly nationally. At the same time the state has been losing jobs in producing pulp and wood products from timber. While the dispute over timber availability has dominated concerns about this sector, this factor does not explain why Alaskan firms producing products from timber have been losing market share.

If the seafood sector is an example of what happens when a sector becomes more competitive, the "value-losing" forestry sector shows what results from becoming less competitive.

Engineering and management services have been growing in Alaska compared to the national sector since this sector started being counted separately in 1987. The "contracting out" of engineering design and management functions from, for example, an oil company to a service firm is a trend that is happening here even faster than nationally. This sector is becoming a significant success story in Alaska. While counted as a service sector, in effect the competitiveness of this sector is a part of the state's base both because its customers are often in the base and because these firms are increasingly selling their services outside Alaska.

Business services, primarily temporary help, is one service sector which did not grow at all in Alaska in the latest recovery as the sector lost 710 real jobs and had a negative competitive shift of 7,381 "lost jobs" because this sector was simultaneously booming nationally. This sector counts temporary employment both high skilled—information technology, accounting, software—and lower skilled office and production work. It is not clear if this decline is due to the state's weak business infrastructure or a relatively small critical mass of firms to support with these services. In either case, this weak business service sector is a cause for some concern.

Recent competitive shifts in Alaska's economic base and their ripple effects have made Alaska's economy resemble less a frontier economy and look more like the national economy. There has been growth in Alaska's small manufacturing sector and less dependence on Alaska's large oil and oil-financed state and local government sector and the oil-driven construction sector. Alaska's service sector, including retail, is growing here faster than nationally.

Peak-to-Peak (1985-1995) Comparisons			
Industry	State Growth Rate	National Growth Rate	State Component
All Industries	11.8	19.7	-18,398
Seafood	71.6	10.5	3,757
General Merch & Apparel	71.7	8.1	3,399
Oil & Gas Field Services	29.8	-51.0	3,333
Eng & Management Services *	5.5	-21.0	1,589
Water Transportation	45.5	-13.6	815
Logging	67.7	-3.4	744
Hotels, Motels	37.0	22.1	699
Other Mining	74.9	-23.6	635
Oil & Gas Extraction	-28.0	-41.0	618
Federal	0.7	-1.9	459
Wholesale Nondurables	25.8	14.2	399
Utilities	15.4	-1.1	333
Health Services	51.0	47.3	329
Pipelines, Exc. Natural Gas	22.7	-11.8	321
Auto Dealers & Service Stations	24.2	17.2	267
Other Durables	16.1	-8.5	212
Other Nondurables	21.0	-1.8	211
Membership Organizations	40.6	35.8	190
Railroads	432.3	-33.6	48
Trucking & Warehousing	37.7	38.0	-8
Local Pass Transport	57.6	61.5	-43
Pulp Mills	-15.9	-8.1	-49
Miscellaneous Retail	19.1	20.4	-68
Food Stores	19.6	21.0	-88
Repair Services	23.4	30.4	-170
Transportation Services	38.2	54.1	-175
Other Wood	-35.4	7.9	-273
State Education	17.7	24.1	-305
Personal Services	-0.9	19.7	-398
Printing & Publishing	-17.2	9.1	-487
Communications	-9.7	3.0	-523
Legal Services	-4.7	34.5	-706
Bldg Materials & Furniture	-2.2	26.7	-945
Insurance	-25.2	21.9	-1,111
Air Transportation	27.4	46.7	-1,116
Social Services	41.2	71.5	-1,346
Banks, Credit Unions & S&Ls	-20.9	3.6	-1,392
Wholesale Durables	-19.3	7.8	-1,438
Local Gov't Education	14.4	24.2	-1,629
Rest of Services	-25.5	-6.0	-1,664
General Construction	-32.7	-0.9	-1,698
Heavy Construction	-39.6	-3.0	-1,819
Brokers, RE, Holding Company	-9.6	30.8	-1,908
Eating & Drinking Places	12.4	26.8	-1,925
State Noneducation	-1.7	17.4	-2,991
Local Noneducation	-2.7	20.2	-3,138
Special Trades Construction	-24.1	23.1	-3,915
Business Services	-8.6	80.5	-7,381
*1987-1995			
Source—Alaska Department of Labor, Research & Analysis			

Comparing Two Recoveries

Industry	SIC	1978-1985 (Trough1 to Peak1)				1987-1995 (Trough2 to Peak2)			
		Component			Total Change	Component			Total Change
		State	National Growth	Nat. Industry Differential		State	National Growth	Nat. Industry Differential	
Total Nonagricultural		43,072	20,586	0	63,657	17,498	30,185	0	47,683
Mining	10-14	3,505	680	-187	3,998	2,788	1,283	-2,884	1,108
Oil & Gas	13	1,897	633	1,202	3,732	2,423	1,159	-2,878	704
Oil & Gas Extraction	131,132	N/A	N/A	N/A	N/A	164	641	-1,847	-1,043
Oil & Gas Field Services	138	N/A	N/A	N/A	N/A	2,398	518	-1,170	1,747
Other Mining	10,12,14	335	47	-116	286	523	104	-225	402
Construction	15-17	5,065	1,513	-239	6,338	2,221	1,449	-863	2,807
General Construction	15	1,683	443	-376	1,760	817	424	-698	643
Heavy Construction	16	1,909	406	-660	1,657	145	409	-398	167
Special Trades Construct	17	1,746	662	523	2,831	1,472	616	-80	2,008
Manufacturing	20-39	881	1,473	-2,208	148	4,393	1,855	-2,269	3,888
Seafood	2081,2092	599	774	-1,498	-125	3,667	958	-736	3,890
Logging	241	-41	135	-140	-46	154	241	-317	77
Other Wood	Rof24	-90	97	-164	-167	-97	72	-68	-91
Pulp Mills	261	-242	130	-309	-422	-210	127	-268	-351
Printing & Publishing	27	788	110	65	962	-116	229	-172	-58
Other Nondurables		31	122	-221	-67	211	132	-145	198
Other Durables		58	106	-161	3	351	97	-134	325
Transport, Commun. & Utl	40-42,44-49	1,307	2,016	-988	2,336	2,664	2,524	201	5,390
Local Pass Transport	41	225	100	-41	285	-110	174	457	521
Trucking & Warehousing	42	-250	295	-187	-142	15	345	334	695
Water Transportation	44	345	144	-275	214	1,056	148	-224	980
Air Transportation	45	-49	560	709	1,221	616	761	667	2,044
Air Trans Scheduled	451	N/A	N/A	N/A	N/A	1,374	406	143	1,923
Air Trans. Nonscheduled	452	N/A	N/A	N/A	N/A	-2,862	272	2,574	-16
Airport, Flying Field, Svcs	458	120	42	121	283	-152	84	205	137
Pipelines, Exc	46	-366	167	-230	-428	336	132	-244	224
NaturalGas									
Transportation Services	47	377	55	223	656	7	151	312	470
Communications	48	-176	499	-241	82	-122	522	-306	95
Utilities	49	380	171	75	626	396	283	-323	357
Railroads	40	-114	23	-85	-176	17	7	-18	5
Wholesale Trade	50-51	2,151	708	148	3,004	683	1,085	-452	1,186
Wholesale Durables	50	1,021	453	168	1,631	-46	582	-309	228
Wholesale Nondurables	51	1,117	254	2	1,373	619	482	-143	959
Retail Trade	52-59	9,377	2,870	1,642	13,789	7,442	4,845	-420	11,667
Bldg Materials/Furniture	52,57	945	242	117	1,304	711	304	69	1,084
General Merch & Apparel	53,56	927	521	-330	1,118	4,143	703	-564	4,281
Food Stores	54	1,783	415	464	2,663	572	840	-53	1,359
Auto Dealers & Svc Statn	55	1,279	306	-269	1,317	1,021	481	-127	1,376
Eating & Drinking Places	58	3,243	944	1,600	5,787	349	1,788	537	2,674
Miscellaneous Retail	59	865	442	295	1,602	434	730	-69	1,095
Finance, Insurance & R.E.	60-67	1,171	1,135	1,251	3,557	-1,619	1,628	-907	-797
Banks, Credit Unsa/S&Ls	60,61	442	511	586	1,539	-403	726	-879	-656
Insurance	63,64	327	217	58	601	-434	285	-73	-222
Brokers, RE, Holding Co.	62,65-67	135	406	874	1,417	-654	616	18	-19
Services & Misc.	07,70-99,99	6,660	3,487	6,387	16,533	1,675	6,101	9,193	18,869
Hotels, Motels	70	564	377	686	1,627	1,283	686	-157	1,791
Personal Services	72	604	141	39	784	-55	254	-50	148
Business Services	73	-389	634	2,900	3,146	-3,736	1,047	2,978	289
Repair Services	75,76	777	156	216	1,149	355	307	177	840
Health Services	80	1,540	677	1,043	3,261	896	1,298	1,992	4,186
Hospitals	806	787	318	148	1,263	639	543	267	1,448
Other Health Services	R of 80	661	359	988	2,008	145	755	1,837	2,738
Legal Services	81	-143	148	596	601	-517	276	35	-206
Social Services	83	151	396	686	1,233	-976	667	1,945	1,636
Membership Organizations	86	807	387	-354	840	27	626	581	1,234
Engineering & Mgmt Svcs	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rest of Services	07,96,R70-89	2,222	670	1,100	3,993	605	960	-1,900	-335
Government		11,452	6,706	-4,204	13,953	-3,608	9,458	-682	5,265
Federal		-2,636	2,388	-1,628	-1,778	551	2,670	-3,312	-190
State		4,610	1,773	-291	6,092	-672	2,692	307	2,326
State Education	82	1,406	373	9	1,788	239	648	274	1,161
State Noneducation		3,305	1,400	-401	4,304	-890	2,044	-189	1,165
Local		9,113	2,548	-2,021	9,640	-1,942	4,194	877	3,129
Local Govt Education		3,884	1,491	-851	4,625	78	2,295	664	3,037
Local Noneducation	82	5,170	1,057	-1,111	5,115	-406	1,700	186	1,479

Subtotals may not add to totals due to rounding.

Based on nonagricultural wage and salary employment; 1992 data subject to revision.

- National Growth Component = Change in number of jobs if Alaskan industry had grown at the same rate as all U.S. nonagricultural employment.
- National Industry Differential Component = Change in number of jobs if Alaskan industry had grown (or declined) at the same rate as its national counterpart minus change in number of jobs attributable to growth of all U.S. nonagricultural employment (National Growth Component).
- State Component = Actual change in number of jobs minus change in number of jobs if Alaskan industry had grown (or declined) at the same rate as its national counterpart.

Sources—Alaska Department of Labor, Research and Analysis Section; and U.S. Department of Labor, Bureau of Labor Statistics

Shift-Share Components—Between Cycles

Industry	SIC	1978-1987 (Trough to Trough)				1985-1995 (Peak to Peak)			
		Component			Total Change	Component			Total Change
		State	National Growth	Nat. Industry Differential		State	National Growth	Nat. Industry Differential	
Total Nonagricultural		13,708	29,388	0	43,096	-18,398	45,519	0	27,122
Mining	10-14	4,141	971	-1,839	3,273	3,952	1,878	-5,449	381
Oil & Gas	13	3,259	904	-1,237	2,927	3,959	1,751	-5,811	-102
Oil & Gas Extraction	131,132	N/A	N/A	N/A	N/A	618	937	-2,886	-1,331
Oil & Gas Field Services	138	N/A	N/A	N/A	N/A	3,333	813	-2,917	1,229
Other Mining	10,12,14	441	67	-162	346	635	127	-279	483
Construction	15-17	-4,300	2,159	-45	-2,185	-8,020	3,672	-1,369	-5,716
General Construction	15	-901	632	-371	-640	-1,698	1,054	-1,103	-1,748
Heavy Construction	16	-111	583	-939	-467	-1,819	981	-1,129	-1,967
Special Trades Construct	17	-2,878	944	855	-1,078	-3,915	1,638	277	-2,001
Manufacturing	20-39	1,840	2,103	-2,980	963	5,333	2,387	-2,918	4,803
Seafood	2091,2092	728	1,104	-1,443	389	3,757	1,214	-566	4,404
Logging	241	577	192	-184	584	744	206	-242	708
Other Wood	242	-271	139	-158	-290	-273	125	-75	-224
Pulp Mills	261	-74	185	-281	-170	-49	124	-175	-100
Printing & Publishing	27	471	157	75	702	-487	365	-197	-318
Other Nondurables		32	175	-277	-71	211	183	-199	195
Other Durables		-102	151	-232	-182	212	170	-243	139
Transport, Commun. & Util	40-42,44-49	-242	2,878	-1,420	1,216	838	3,688	-257	4,270
Local Pass Transport	41	283	143	-30	396	-43	217	459	633
Trucking & Warehousing	42	-288	421	-123	11	-8	444	412	848
Water Transportation	44	62	206	-406	-138	815	273	-460	628
Air Transportation	45	-1,420	800	1,373	753	-1,116	1,138	1,555	1,577
Air Trans Scheduled	451	N/A	N/A	N/A	N/A	100	668	593	1,361
Air Trans. Nonscheduled	452	N/A	N/A	N/A	N/A	-3,294	347	3,065	119
Airport, Flying Field, Svcs	458	-18	60	201	243	-394	123	368	96
Pipelines, Exc Natural Gas	46	-386	239	-294	-441	321	184	-293	211
Transportation Services	47	277	79	250	608	-175	218	378	421
Communications	48	-550	713	-576	-414	-523	815	-693	-401
Utilities	49	319	244	17	580	333	398	-420	310
Railroads	40	-57	13	-112	-137	48	2	-6	45
Wholesale Trade	50-51	690	1,008	-17	1,681	-1,047	1,723	-813	-137
Wholesale Durables	50	-273	646	8	382	-1,438	1,047	-630	-1,022
Wholesale Nondurables	51	958	362	-21	1,300	399	677	-190	886
Retail Trade	52-59	4,254	4,098	2,085	10,437	968	7,317	230	8,514
Bldg Materials/Furniture	52,57	-390	346	192	148	-945	645	227	-72
General Merch & Apparel	53,56	250	744	-328	666	3,399	1,054	-823	3,830
Food Stores	54	1,320	592	570	2,482	-88	1,190	77	1,179
Auto Dealers & Svc Staln	55	673	437	-250	860	267	750	-98	919
Eating & Drinking Places	58	1,547	1,348	1,889	4,784	-1,925	2,653	943	1,672
Miscellaneous Retail	59	477	631	387	1,496	-68	1,024	33	989
Finance, Insurance & R.E.	60-67	-1,408	1,621	1,905	2,118	-4,384	2,520	-371	-2,236
Banks, Credit Unns/S&Ls	60,61	-548	730	724	908	-1,392	1,122	-919	-1,189
Insurance	63,64	-251	309	171	229	-1,111	465	52	-594
Brokers, RE, Holding Co.	62,65-67	-939	582	1,340	983	-1,908	932	523	-453
Services & Misc.	70,71-89,99	504	4,977	8,695	14,176	-7,701	8,815	13,387	14,511
Hotels, Motels	70	95	539	936	1,570	699	925	109	1,734
Personal Services	72	341	202	76	619	-398	381	0	-17
Business Services	73	-2,800	905	4,041	2,147	-7,381	1,636	5,036	-710
Repair Services	75,76	397	223	263	873	-170	477	258	584
Health Services	80	1,247	967	1,329	3,543	329	1,728	2,412	4,468
Hospitals	806	583	454	160	1,197	345	757	291	1,392
Other Health Services	R of 80	539	512	1,295	2,346	-143	971	2,249	3,076
Legal Services	81	-329	211	839	721	-706	355	265	-85
Social Services	83	-70	565	936	1,430	-1,346	877	2,302	1,833
Membership Organizations	86	986	552	-318	1,220	190	785	640	1,615
Engineering & Mgmt Svcs	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rest of Services	07,99,R70-89	-210	814	1,449	2,053	-1,664	1,681	-2,192	-2,176
Government		6,779	9,573	-4,934	11,418	-9,292	13,489	-1,467	2,730
Federal		-2,794	3,405	-2,070	-1,459	459	3,468	-3,797	129
State		2,315	2,530	-490	4,358	-3,523	4,040	73	590
State Education	82	997	532	-48	1,482	-305	950	209	854
State Noneducation		1,398	1,998	-522	2,874	-2,991	3,090	-364	-264
Local		7,091	3,637	-2,207	8,522	-4,771	5,631	801	2,011
Local Govt Education		2,629	2,129	-883	3,875	-1,629	3,280	736	2,387
Local Noneducation	82	3,003	1,509	-1,252	3,260	-3,138	2,702	60	-376

Subtotals may not add to totals due to rounding.

Based on nonagricultural wage and salary employment; 1992 data subject to revision.

- National Growth Component = Change in number of jobs if Alaskan industry had grown at the same rate as all U.S. nonagricultural employment.
- National Industry Differential Component = Change in number of jobs if Alaskan industry had grown (or declined) at the same rate as its national counterpart minus change in number of jobs attributable to growth of all U.S. nonagricultural employment (National Growth Component).
- State Component = Actual change in number of jobs minus change in number of jobs if Alaskan industry had grown (or declined) at the same rate as its national counterpart.

Sources—Alaska Department of Labor, Research and Analysis Section; and U.S. Department of Labor, Bureau of Labor Statistics

Conclusion 4

Alaska is developing a healthier, more diversified economic base. The new Alaska economy is less driven by oil and oil-financed government jobs and more driven by the private sector—services, retail, transportation, communication, and—most importantly—seafood processing and other forms of value-added manufacturing.

Conclusion

While the good news is that Alaska's emerging economy is increasingly diversified, the disturbing news is that it is not yet clear whether this transition is happening fast enough to replace oil-dependent jobs. As shown from economic history, it makes a big difference whether a community or state has the good fortune to grow an economic base by expanding from a stable base or whether it first suffers from the job losses and social dislocations of a collapsing base before a new base can be established.

So the question of whether Alaska's economy keeps growing is not answerable because it depends in part on a mixture of the largely unknown—what the world markets in the future will pay for oil—with the largely known—the changing structure of the Alaskan economy and how competitive that economy is. While the wealth deriving from Alaska's oil resources hinges on decisions made almost entirely out of the state, Alaskans have more influence over the other sectors of their economy. While Alaskans have negligible influence over the price of oil and the business cycle, Alaskans can influence how competitive its industries are. A closer look at two of Alaska's important basic industries shows one already playing a larger role and one whose importance is increasingly threatened.

While still relatively small at 11,000 jobs, the seafood processing industry in Alaska is the only industry in Alaska to employ a large fraction of the U.S. workers in that industry. Better yet, the fraction of the industry in Alaska is growing. While Alaska had less than 10% of the industry in 1975, by 1992 the industry was more than 20% Alaskan. This growth occurred less because the national industry was declining than because the Alaskan industry was growing. While there has been significant turmoil in specific fisheries and a large expansion of the bottomfish industry, as a whole the industry has grown fairly steadily since 1975.

The much smaller timber industry has not grown as fast as the seafood industry. With the closing of the Sitka and Ketchikan mills and continued disputes over timber sales from the Tongass National Forest, the forestry industry may no longer be a growing part of Alaska's economic base. But these recent events only highlight long-term trends.

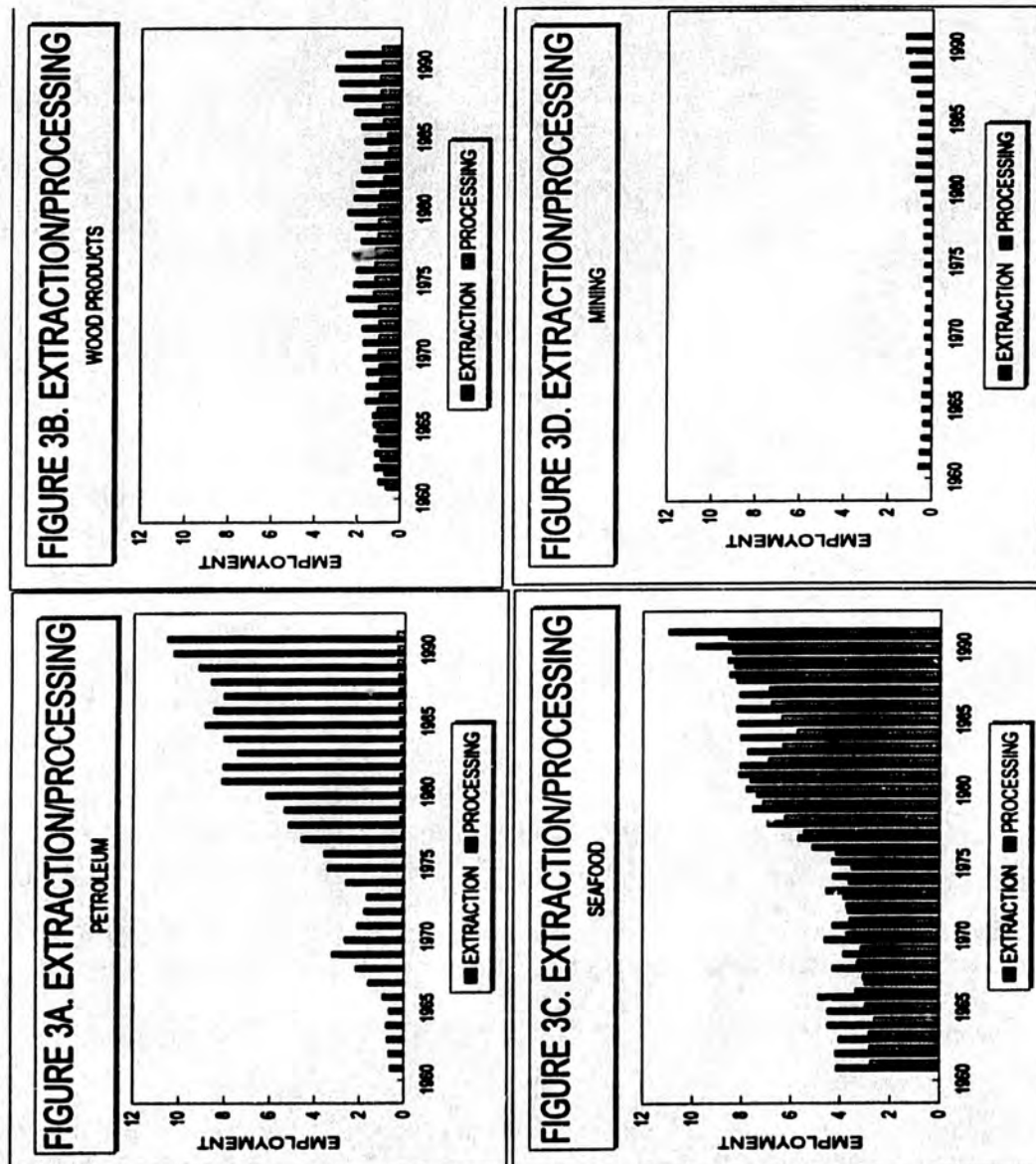
The number of seafood processing jobs first exceeded the number of fishing jobs in 1972, growing from being only a quarter of the industry in the early 1960s to more than half today. On the other hand, the trend in the timber industry has been the other way. Before 1965 there were more jobs processing timber than logging it. Since then the number of logging jobs has grown modestly while the number of jobs processing logs into forest products has held steady at 1500-1700. As a result, the seafood industry, which was twice the size of the timber industry in 1965, by 1990 had grown to be almost four times as large. (See page 9, Proportions of Income Attributable to Basic Sectors.)

Alaska's economy is based on natural resources—oil, fish, timber, and minerals. They can be considered the good cards that history has dealt Alaska. However, with declining oil revenue and prices for natural resources set on world markets, Alaska's economy

increasingly depends on how much value or wealth can be added to those resources. That is, rather than hoping for the luck of continued good deals, Alaska future will depend more on how well it plays its cards.

Conclusion 5

To add more value to Alaska's economic base will require more than the extraction and export of the state's resources. It will require the processing of those resources into products the world wants to buy.



Source—Institute of Social and Economic Research, University of Alaska Anchorage

Our next chapter will outline Alaska's strategic choices; that is, the options Alaska has in playing its cards.

Chapter II

Alaska's Choices

The reader of the previous chapter may consider its conclusions familiar, even obvious. Having distinguished between Alaska's economic base and its local market economy, traced the changing structure of that base, and examined the competitiveness of different sectors of the state's economy, the reader may have expected a more original prescription than Alaska's need to diversify its economic base beyond oil revenues and to add more value to its natural resources. This song has certainly been sung before.

There are at least three reasons to broadcast apparently old news. First, some people may not have heard it. A problem should be defined as clearly and specifically as possible so its reality cannot be denied. Alaska does not want to be like the man who, asked to explain why he walked into a tree, replied, "I saw it, but I did not realize it." Without a common definition of the situation and an agreed upon understanding of what led to where we are, it is hard to agree on next steps.

Second, the news may have been heard, but it may be far less clear what can be done about it. While some may even find it encouraging to know that the signs of Alaska's more diversified and competitive economy are already apparent, many more may feel pessimistic about an Alaska of decreasing oil wealth or react passively believing that Alaskans or their state government can't do much—good or bad—about it. Hopefully, a better understanding of the state's economic base will narrow the focus when considering what to do.

Finally, the news may just appear to be old. As will become apparent, this earlier analysis of the Alaskan economy will suggest a new approach to defining Alaska's future. The clearest way to start to distinguish this new approach from the old is to first examine a few basic myths Alaskans have about their state. The first myth is that Alaska's abundant resources will assure a vibrant economy. The second myth is that Alaska's strategic location puts it in a favored place to take advantage of the emerging world economy. The final myth is that whatever the threats to Alaska's economy, a better government can fix it.

These three myths have been central to how Alaskans have understood themselves, their prospects, and their limits. Myths—like the myth of the frontier—can be powerful ways of understanding the world. Myths are not necessarily completely wrong but as the world changes they need to be reexamined to separate what is still true from what is now false. Unless so reexamined, myths can leave their believers as prisoners of the past, unable to diagnosis their situation correctly and unable to undertake the individual and collective actions necessary to earn a living from the world economy.

As Alaskans consider their choices, it's time to take these three myths head on

Myth I—Alaska's Abundant Resources Create Wealth

The belief that Alaska's prosperity is largely assured because of the state's abundant natural resources is a misreading of Alaska's past economy and, more fundamentally, shows a misunderstanding of how wealth is created.

Natural resources in the ground are not wealth and by themselves are not even the foundation for a healthy, competitive economy. If resources constituted wealth then Zaire,

Russia, Brazil, Indonesia, and Namibia would be among the richest countries in the world today and Japan, Singapore, Germany, and Switzerland would be among the poorest. The position of resource-poor Connecticut, the state with the highest per capita income, would be reversed with coal-rich West Virginia and oil-rich Louisiana, states near the bottom of per capita incomes.

As is apparent from history, even the development and export of natural resources are not a guarantee of wealth. It is the control of those resources, that is the ability to extract, transport, and sell in a final market which creates more wealth than the original ownership and extraction of the resource. So in the nineteenth century European colonial powers could often extract more wealth from Africa than was left behind when the mines were played out or when newly independent African states took control of their resources.

While the processing and sale of resources often creates more jobs and downstream wealth than the mere ownership and extraction of resources, it is even better when a country possess the general ability to process resources into final products the world wants to buy. Japan has negligible natural resources, but even with its recent banking problems it is still a manufacturing powerhouse because it has the industrial technology and trained work force which has produced, distributed and sold its products worldwide. (True, Japanese companies now own coal and mineral resources throughout the Pacific rim but these resources were primarily purchased after Japanese earned its manufacturing and final sale profits. They then had the capital to integrate upstream.)

Oil is the one natural resource which arguably may be the exception which proves the rule that resource ownership does not translate to a prosperous economy. As the world's major fuel and a commodity whose value is increased by little, once refined, petroleum is a unique resource. And those Middle Eastern nations like Saudi Arabia and the Gulf Emirates with few people and abundant oil resources certainly have high per capita incomes with its citizens paying no taxes and having access to free health and education services.

But even oil is a commodity subject to the same forces of supply and demand as other products. High oil prices in the 1970s led to increased conservation measures and the search for replacement fuels. The result is that the marketplace adjusted to higher energy prices by increased investments in making our cars and factories more energy-efficient, by energy costs continuing to be a declining share of product costs, and by increasing the use of coal and natural gas so as to act as almost replacement goods holding down the price of petroleum. Rather than being a monopoly which exercises market control over the price of oil, OPEC is now more a bystander watching both the market share for non-OPEC oil grow and the real price of oil steadily decline. With western technology and capital moving into the Commonwealth of Independent States to increase their oil exports and the continued development of renewable resources and fuel cell technologies, it is unlikely that the oil-rich Gulf states will survive into the next century as wealthy states based solely on their natural resources.

The relative increased value of goods as the resources moves downstream to the market is even greater for renewable resources like seafood and timber than it is for finite resources such as oil and gold which increase less in value before final sale. Prices tend to be more stable, or less elastic, for goods for which there are more immediate substitutes, such as eating more meat when seafood prices climb. When asked what is needed to insure prosperity, sellers of natural resources often hope for a repeat of the rare good year when temporary dislocations elsewhere created short-term windfall profits for Alaskans. So those dependent on the Alaskan oil industry, such as construction workers in the early 1980s building capital projects for the state, fondly remember the effect of the run-up of oil prices following the fall of the Shah of Iran in 1979, gold miners pleasantly recall the panic increase

in the price of gold to \$850 an ounce during temporary hyper-inflation of 1979, and timber sellers recall the good prices which come during housing booms.

But good times rarely last long as high prices decrease the demand for a good, increase the demand for substitute goods, and attract the increased investment which in time brings additional price-lowering supplies to the market.

So individuals who make a living in natural resource industries face a tough choice. They can try to survive by waiting for the rare good year, or they can increase the productivity of their operations so they can make money even at lower prices of normal years. And, if they want to be less dependent on the ups and downs of world commodity prices, Alaskans can have more control of their livelihood and steadier incomes if they can shift from being sellers of the resource into the processing, distribution, and sale of resource-based products.

For Alaska, with already declining oil production, the lesson cannot be postponed that the ownership and sale of natural resources will matter less in the future. Instead the state's wealth will depend more on the ability to add value to the resource and move this value downstream to the market where greater value and profits can be captured.

CONCLUSION 6

Alaska's natural resources should be considered opportunities, not assets. For these opportunities to be realized, Alaskans and Alaskan firms will have to extract, process, distribute and sell resources more efficiently than other competitors. To capture a larger share of the value of its resources, Alaskans will need to retain more ownership and control of how the resource is distributed and sold.

Myth II—Alaska's Strategic Location

The second myth Alaskans have is the belief that Alaska's strategic location will make the state a more important part of the world economy. With Alaska's location on the fast-growing Pacific rim and the opening of Russia, it may appear that, even if nothing else changes, Alaska's location alone should make the state more prosperous. Yet a closer examination of this belief reveals that, like the myth of Alaska's abundant resources insuring prosperity, the state's location is not an asset, only a potential asset. Unless the individuals and firms do the more important work of organizing themselves to produce products which compete globally, the asset of Alaska's location will remain largely uncaptured.

Two trends are making location an increasingly minor factor in the world economy. First, as shown by the approval of NAFTA and GATT, the world's trade barriers continue to fall. As a result, a good's cost and quality becomes an even larger factor in a product's ability to penetrate new markets. Correspondingly, the location of a product's origin is becoming an increasingly smaller factor. As trade barriers keep falling and telecommunications expand, the world is becoming one marketplace. In this global marketplace, it is becoming true that if a resource provider or manufacturer can't sell his product everywhere, they will not be able to sell it anywhere.

Second, declining energy prices and increasing efficiency of the movement of goods have made transportation costs a declining portion of total product costs. As a result (see table, page 9) the proportions of income in Alaska's base attributed to entrepot, the movement of goods and services through the state, has been relatively steady at 1% since statehood.

The expansion of capitalism and the creation of a world marketplace are making the key factors of production more mobile. To consider the three most important ingredients of economic growth—wealth or capital, technology, and labor—at least the first two factors, capital and technology, are increasingly mobile and stateless. Wealth can move between continents as fast as digits on an electronic screen can be sent. Technology—for example, a machine which more efficiently processes a natural resource or bends metal into parts—can be manufactured in the United States yesterday, be put on a plane today, and placed on a factory floor anywhere in the world tomorrow.

The large corporations which by their investments determine where the jobs are created and which communities will grow are increasingly stateless entities deploying their capital and technology wherever they can expect to earn the greatest returns for their shareholders. So rather than asking which locations in the world are strategic in the sense that they are located near important markets, investors are asking about the cost and quality of the local resources, workers, and community and then investing technology and capital at that location. Areas of the world with the right combination to produce competitive products becoming strategic as their products are shipped worldwide; other areas risk become the ignored byways of world commerce.

In the new world economy, even the concept of a strategic location can be questioned. Certainly few people considered Japan a strategic location in 1854 when Commodore Perry opened up that nation to the world. At that time the world's chief economic power was Great Britain. Exporting wealth from its colonies around the world, Britain was a leading manufacturer, shipper, trader, and financier of the world's commerce. Today, Britain is a lesser economic force with a national product and standard of living now below Italy. Was Britain, supposedly a strategic location in the 19th century, an "unstrategic" location in the 20th century?

So Alaskans should look to Russia as an opportunity for business but not a guarantee of opportunity. While it may be more convenient for a business person in Nome or Anchorage to go to Magadan, Magadan is becoming accessible to the world. With improved telecommunications, Magadan will soon be able to communicate with equal ease with whomever else in the world has a phone, a computer and a modem, or a satellite dish. Whatever business Alaska can do with Magadan will depend less on convenient flights and more on the ability of Alaskans to conduct business.

Conclusion 7

Where Alaska is located is less important than its ability to put together the resources, capital, technology, and know-how to produce products which can be sold both locally and globally.

Myth III—The Government Fix

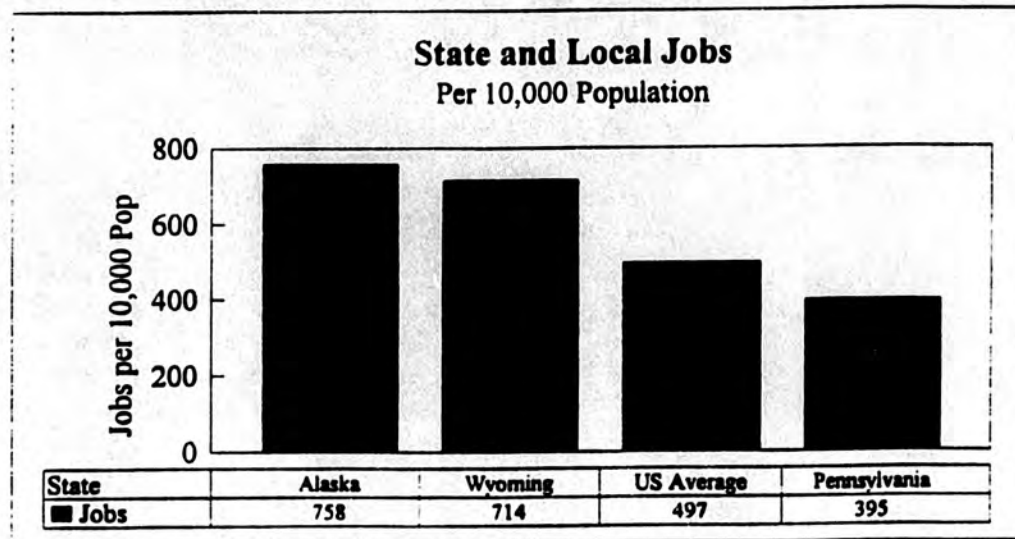
The final myth which has limited Alaskans' ability to come to terms with their economic future is the belief that only the government has to be fixed. Many Alaskans with quite different politics, different definitions of the problem, and quite different views of what the government should do about it, are united in the belief that if only the policies and budget of government were straightened out, Alaska's future would be secure.

Because this myth does not settle the debate about the proper role of government, does not point the way toward more intelligent ways in which government can act, and places the responsibility of fixing the problem solely on government and the politicians, the myth of the government fix is misleading, even dangerous. It becomes dangerous if commitment to this

myth forestalls the more fundamental steps both the public and private sector must take to build a more competitive economy.

The two sides of this myth can be examined; first, that the belief that a larger role for government is the answer and then its more entrancing opposite, the belief that shrinking the public sector will necessarily solve the problem.

More Government?



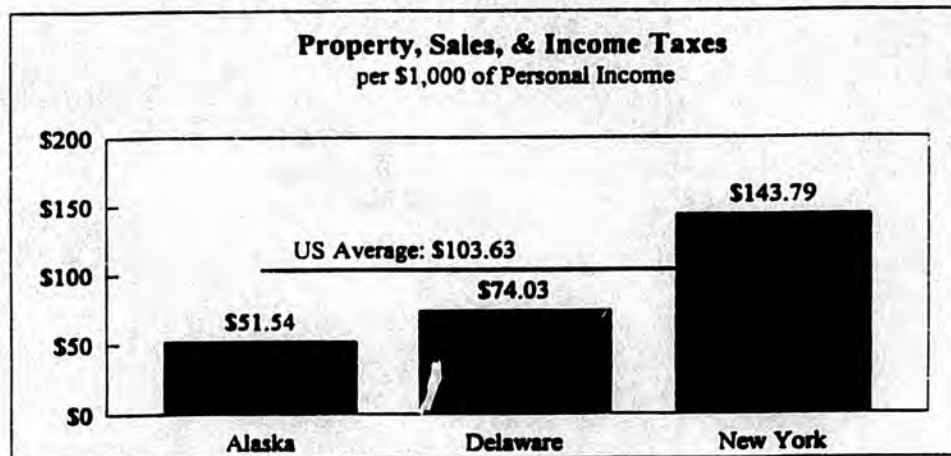
Source—Institute of Social & Economic Research, University of Alaska Anchorage

For most Alaskans, it is probably easier to first dismiss the argument that more government is the answer. Alaska already has the highest proportion of state and local government employees of any state.

Alaska has more than a third more state and local employees per capita than the U.S. average—6% more than Wyoming (the next highest state) and almost 50% more than Pennsylvania (the lowest state).

Alaska is also the only state besides New Hampshire without a statewide income tax, a statewide sales tax, or—not counting the oil revenue tax—a significant statewide corporate profits tax. And, as is well known, through the Permanent Fund, Alaska is the only state which can pay its residents annually a dividend to live there.

As a percentage of personal income, Alaska pays almost a third less in state and local property sales and income taxes than Delaware (the next lowest state) and a half less than the national average.



Source—Institute of Social & Economic Research, University of Alaska Anchorage

In looking at the amount of taxes paid by state residents, it makes sense not to count the state's oil revenues because this is a tax paid by out-of-state consumers and corporations. So setting aside the oil revenues, Alaska has the highest proportion of jobs in the public sector financed by the lowest per capita amount of taxes paid by residents and local businesses. So the argument of any U.S. business person that high business taxes make it hard to compete is less valid for an Alaskan than for a business person from any other state. (True, because of Alaska's location and the colder climate, the costs of goods and services is higher in Alaska than other states, but for now, only the argument that the cost of government makes Alaska uncompetitive is being considered.)

As described in the last chapter, while every fourth job in the U.S. economy is in manufacturing or agriculture, in Alaska only every seventh job is in these sectors devoted to producing goods sold outside the state. With Alaska having the highest proportion of its economy in the public sector, it is hard to believe that growing the public sector even larger will expand and diversify Alaska's economic base. Alaska's private sector economic base is already dangerously narrow.

Even if it is agreed that the declining oil revenue base mandates a stronger role for state and local government in growing the basic sector of seafood, timber, mining, tourism, and agriculture, it is not clear how this would be done. It is one thing to argue that the state and its government have an interest in creating a larger, more diversified economic base. It is another issue entirely to believe that state government itself has the ability to do this.

Even setting aside the quite mixed track record of the state in capitalizing dairy farms, sawmills, and other ventures, what is the economic case for state or borough governments owning or directly capitalizing new private sector businesses? With declining oil revenues, any public capital to finance private sector businesses would have to come from new taxes or more layoffs of public employees. In either case, money would first be withdrawn from the local market economy. Whether the state was just playing the role of investor to lend the public revenue to a "private sector" firm or whether the state directly owned and managed the new enterprise and the jobs were counted as "public sector" jobs, the true test of this strategy is the same. The new business must be able to sell a product at a profit so as to return to the public its investment. If the business purchased most of its goods and services from out of the state, didn't employ existing local workers or attracted workers who returned to Seattle when the business slowed down, and failed to earn sufficient revenue to repay the state, the effect of this failed "private sector" business could be even worse than if the state

had used the money to pay a public employee who provided a local service and spent most of his or her pay in Alaska.

The test of a public investment is not whether its used to purchase public sector good or service or a private sector good and service. Rather, the test is the value of the goods or service received compared to its cost and the return that public-financed purchase has on the Alaskan economy.

With its concern for both process and product, with its need to be both fair and productive, government has shown a limited ability to capitalize and run private sector businesses. In a capitalist economy a business has to be run in the interest of its owners or shareholders. Government has a broader responsibility, a wider and more equal set of stakeholders, and a commitment to fairness and humaneness as well as efficiency. Because government has to be more than a business, it is often unsuited to act in the nimble and practical way a business must be managed.

Governments which have developed extensive programs to try to protect its citizens from every economic change and threat have also imposed costs which have sapped the economy of much of its productivity, incentives, and resilience. As a result, nations as varied as Sweden, the European Economic Community, Japan, Russia, and, arguably, the United States, are now looking for ways to shrink the size of their public sector and to make its private sector more competitive. With its already too narrow private sector and a relatively large public sector, it is hard to argue that Alaska needs a larger role and size for state and local government.

Less Government?

Most Alaskans would consider cutting the size and cost of government to be a more politically attractive option to consider. But the belief that all that Alaska needs to do is shrink its public sector and better manage state finances is, at best, only a partial solution. Whether it is the public or private sector, cutting costs does not by itself make an economy more competitive. A firm, a government, or a local economy is competitive in terms of the value it creates, that is the difference between its costs and its sales whether measured as profits or services.

On the edge of bankruptcy, the Chrysler Corporation turned itself around not only by cutting costs (lower wages and salaries, creating a more flexible work force, and negotiating lower prices from its suppliers) and by the rare event of a government bailout. It did something else that provided far more wealth and economic security for its shareholders and employees—it made a better car.

While it is much harder to evaluate the cost and benefit of government goods and services compared to a firm's product, it is no less important to look at both sides of the coin—both cost and value, both price and quality. Just cutting government costs, as opposed to adding taxes, may make Alaska a cheaper place to live with whatever resulting loss of public services, amenities, and infrastructure. But Alaska's economic base will still be dependent on producing goods and services whose costs and quality must be attractive enough for the world to buy.

With the decline of oil revenues during the 1990s, Alaska's economy is becoming less dependent on state and local government spending as it previously had become less dependent on federal spending. But this forcible downsizing—proponents call it "rightsizing"—of government's large presence in the state's economy does not by itself make the state more competitive. Suppose, for example, that state government decided to cut its employees and services even more drastically and return the savings directly to citizens in

the form of increased dividend checks. It would not be hard to sort out the immediate winners and losers of such a decision. Losers would be the fired public employees and their families, many of whom would leave the state. Also losers would be those citizens most dependent on public services, students in the K-12 schools, the users of local libraries, health services, roads, fish hatcheries, etc. Immediate winners would be those citizens using few public services and receiving little income from the spending of the state or public employees. Communities with a more diversified base like Anchorage and Skagway would be hit less hard than Juneau and Fairbanks.

But would the state be better off? Just shrinking the public sector and increasing the income in the private sector would not by itself bring more income into the state and grow the economic base. Sorting out the immediate winners and losers, it would be hard to know whether the state as a whole would be better off without knowing what would happen with the revenue to the immediate net winners versus what would have happened if no change took place.

If the increased income of those net winners was used to purchase more goods, like cars or clothes, made outside the state than would have been purchased by public employees and their contractors, the local market economy would be worse off. Alaska could even be a loser if the net winners spent more of their income outside the state and the loss of public amenities led fewer tourists to visit the state. Even if net receivers of this transaction saved more of their additional income than the net losers had saved, if the winners found fewer opportunities in the local economy for their investments, the state could be a net loser. Without tracing all the income flows and speculating on what would have happened without the shift in public revenues, it is hard to predict if the state would be better off by redrawing the boundary between the public and private sector.

With Alaska facing declining oil revenues, no one can doubt Alaska has tough choices and tough politics ahead. Fewer public services, more layoffs, the restoration of the income tax, the capping of the Permanent Fund dividend —none of these choices will be without cost or pain. The state needs to balance its budget and manage the state's finances so as to not accentuate the economy's roller coaster responses to changing oil revenues. But with whatever balance of spending cuts and tax increases, no particular solution guarantees a growing economic base and a more competitive economy.

As oil revenues decline, the state government must do as good a job as possible in managing its finances better to insure a "soft landing," that is to modify the mix of service cuts and increased taxes so as to cause the least economic disruption. But unless the public and private sectors take steps now to grow its non-oil base, Alaska's citizens may weather the periodic downsizing of state government in a series of soft landings at destinations where few want to go. Put another way, the operation (managing Alaska's budget) could be a success but the patient (Alaska's economic base) could still relapse and not recover. Like a firm with half its sales and profits in one product which has declining sales and profit margins, Alaska must find new products to sell or increase the production and margins of its existing products.

Conclusion 8

A smaller, more efficient public sector is a necessary but not sufficient condition for a healthier, more diversified economic base. Cutting the size of government will not alone bring prosperity and in the short term may cause even more disruption to the state's economy. Whatever the size and services offered by Alaska's public sector, the economy will only grow and become less oil dependent based on the private and public sector organizing itself to sell more products and services which non-Alaskans want to buy.

Alaska—Smaller, Poorer, or Smarter?

If the remote prospect of higher oil prices doesn't materialize, if cutting the size of state and local government doesn't automatically make Alaska's economy grow, and if events do not make the cards history has dealt the state—Alaska's resources and location—more valuable, what choices do Alaskans have?

Examining the dynamics of the state's economy leaves Alaska with three realistic options—getting smaller, getting poorer, or getting smarter.

The Get Smaller option for the state's economy is the state's likely outcome if the state's emerging diversified economy cannot grow fast enough to replace the state's declining oil revenues. If there are further declines in oil production and prices, and if the state manages the oil contraction by not shrinking the public sector but just lowering the services and raising the costs on Alaska's narrow private sector, there is fair risk that the state's economy could actually shrink. Rather than Alaska looking more and more like the national economy with a quarter of its jobs in the good-producing sector and an efficient service sector with competitive prices, Alaska's economy would revert back to looking like the colonial economy of prepipeline Alaska, an economy based on federal spending and the export of unprocessed natural resources. Always a high wage economy, a postpipeline Alaska would now also be a high cost, slow or no growth colonial economy with resource decisions increasingly in the hands of non-Alaskans. Unless Alaska can somehow expand its non-oil economic base, this do-nothing scenario becomes more likely. Clearly, most Alaskans would find a contracting economy an unattractive option to be avoided if possible.

The Get Poorer option is a variation of the Get Smaller scenario based on a limited view of how to become competitive. This option concentrates on only the cost side of the cost-quality coin. As long as Alaskans are selling undifferentiated natural products to processors who have other sources of supplies, Alaska can only compete by lowering prices and taking what the processors or market makers offer. Unfortunately, there is no natural end to this process of cutting costs. If Russia or other Third World economies have plentiful supplies of timber, salmon, or oil and a lower standard of living and wage structure than Alaska, Japan or any resource buyer can play the Alaskan resource seller against the competition. The predictable result is that Alaska will sell for less or lose the sale.

As long as Alaska is primarily in the business of selling natural resources, only the occasional luck of external events—shortages caused by temporary dislocations elsewhere—will bring higher wages and profits to Alaska. Otherwise, in an increasingly open world market, Alaska as a high wage, high standard of living economy will be in an increasingly brutal competition with areas of the world always willing to pay its workers less and sell its resources cheaper. The Get Poorer Option does not necessarily lead to a state with fewer jobs but it is a poorer Alaska, an Alaska unable to employ its smarter, more educated young people in the high productivity, high wage jobs they were trained for. Clearly, the Get Poorer scenario is an option of last resort.

The Get Smart option recognizes that Alaska must compete in world markets, but it does so by both increasing quality and keeping costs competitive. Rather than depending on the sale of unprocessed resources, Alaskan firms are integrating their operations downstream to capture more value and profits from the processing, sale, and distribution of resource-based products. For example, instead of selling salmon for less than a dollar a pound to Japanese processors, the Alaskan salmon industry has restructured itself so harvesters, processors, and distributors have figured out how they can deliver a high quality, fresh salmon to large urban market in the Lower 48 where consumers understand the difference between pen-

raised European fish and a higher quality, higher priced Alaskan product. Competing both on quality and price, Alaskan products are high quality and customized for different niche markets. Rather than being a low wage, low value-added economy, a Get Smart economy uses capital, training, and the latest proven technology to be a higher wage, higher skilled, higher productivity economy based on both the extraction of resources and their processing into a variety of products. Clearly, if it can be done, a Get Smarter option for Alaska is a preferred option for Alaska's long-term economic future.

The following chapters will sketch out some more specific directions for how key sectors of Alaska's economy can work both harder and smarter in pursuing this higher productivity, higher wage economy. Then key changes in the structure of Alaska's public and private sector will be suggested which could facilitate the ability of every sector in Alaska's economy to compete in the world economy. Rather than depend on decisions in Washington or Saudi Arabia to bring wealth to Alaska, in this emerging integrated economy, Alaskans would have more control of their economic prospects.

For in history, as in cards, smart players seem to create their own luck.

Chapter Notes

Employment for all sectors from the U.S. Commerce Department except farming and fishing. The farming number is from a USDA estimate of 500 proprietors in farming in 1992; 900 were counted as involved in farming during one summer week but many of these jobs, including those counted as proprietors, represent individuals working seasonally and holding other jobs. So 500 probably represents a high number of full-time equivalent employment. The number of individuals in fishing is an as yet unreleased estimate from the McDowell Group which estimated employment based on the number of fishing licenses and average crew sizes for different species. Using similar methodology, the McDowell group estimated employment of less than 13,000 in 1987. Since 1987 estimated harvesting employment has increased by a third, processing employment is up two-thirds. Federal government employment does not include 24,200 active-duty military personnel.

Chapter III

Fisheries

The seafood industry is largest private sector employer and the second largest revenue generating industry in the state. More than 35,000 Alaskans work in the harvesting and processing sectors, accounting for more than one-sixth of Alaska's employment and payroll. Including jobs in support sectors such as transportation, more than one-fifth of Alaska employment is attributable to the seafood industry. The seafood industry is particularly important for coastal communities, where fish harvesting and processing are often the only significant private-sector activities, and fisheries taxes are the primary source of revenues to support local government. This key industry is facing major management and market challenges in the 1990s. As a result, profound and lasting changes are underway in the harvesting, processing, and marketing sectors that will transform the Alaska seafood industry as the next century approaches.

The industry can be classified in three separate categories, salmon, groundfish, and shellfish. The salmon include the five Pacific species, Chinook (King), Sockeye (Reds), Coho (Silvers), Chum (Dogs), and Humpys (Pinks). Groundfish species include, Pollock, Halibut, and Sablefish. Shellfish species include King, Tanner, and Dungeness crab, shrimp, as well as mariculture of oysters and other bivalves.

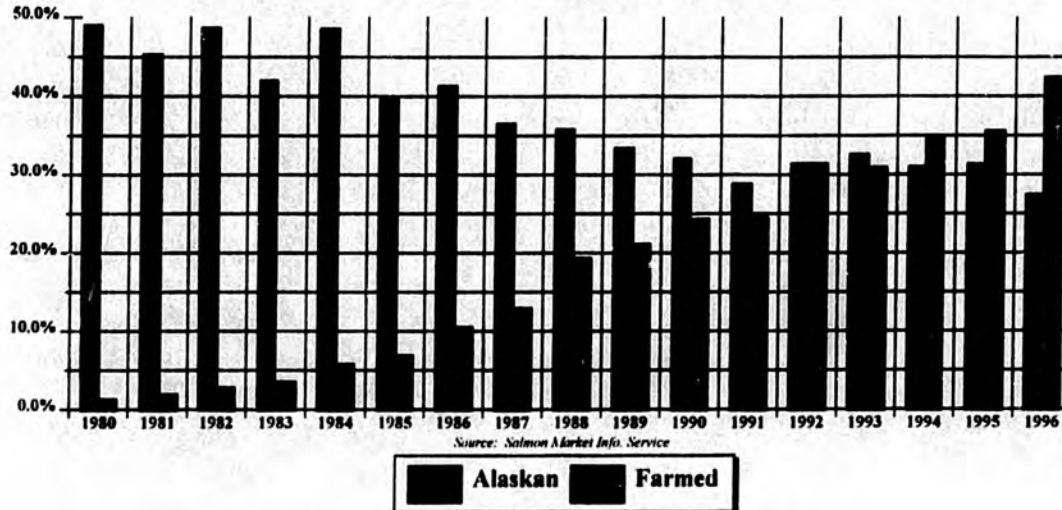
Alaska Salmon

The Alaska salmon industry has seen a dramatic increase in competition in recent years, primarily from farmed fish in Norway, Scotland, Chile, Japan and Canada. The market for Alaskan salmon has changed. What was an active product allocation market, is now a second grade, lower quality commodity, searching for any buyer, at (nearly) any price. The success of farmed salmon (and resultant over-production), ensure that in the future there will be a maximum retail price for Alaskan wild salmon that is lower than it has been in the past. Farmed fish are setting the quality, delivery time and pricing standard for all salmon, and in Alaska, that means the highest prices the market will bear are lower than previous normal levels. In short, the Alaskan salmon industry must change in order to compete in the new global environment in which it operates.

The present condition of the Alaska salmon industry may be best depicted by several graphs, the first one illustrates the decline of Alaska's percentage of world salmon supply from 1980-1996, and the second one which depicts the decline of the harvest value of Alaskan salmon from 1992-1997.

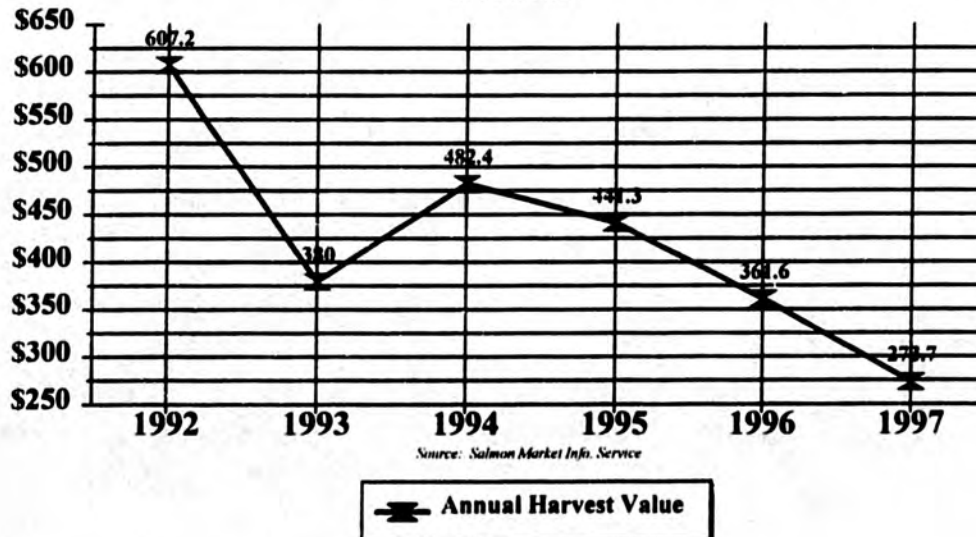
Percentage of World Salmon Supply

(% of estimated round weight)



Alaskan Salmon Harvest Value

In Millions



The question then is how did this once great fishery reach the tenuous position it is in today and how can Alaska regain control of its future.

Modern History of the Alaska Salmon Industry

Initial automation of the Alaskan salmon industry was a direct result of U.S. investment in the territory following the purchase of "Seward's Folly" in 1867. The first salmon canneries came to the state in 1873 as vertically integrated production plants with

control over all aspects of raw material collection, processing and harvesting. The standard operating procedure for raw material harvesting was to place fish traps (stable structures capable of capturing a huge percentage of any given salmon run) in strategic locations, then periodically emptying the traps for production. Additionally, many of the processors maintained a fleet of boats for fishing with nets. Unlike today, internal employees manned both the boats and the traps, eliminating any competition between independent fishermen.

Largely due to the "Iron Chink", a head and gut removing machine invented in 1904, pressure on the fishery to supply adequate raw material for processors was beginning to threaten the resource by the early 1900's. Specifically, salmon was being heavily fished in South and Central Alaska, leading to a series of Congressional Acts targeted to protect the salmon fishery.

In 1912 the Organic Act established a territorial legislature with limited power, but specifically restricted that legislature from any control over fisheries resources. For some years, Alaska was considered to be a model of the superior conservation management possible with federal regulation versus local control. This was in fact merely lip service, with the reality being that the federal system of control was rife with corruption and mismanagement. The last twenty years of federal control damaged the industry so badly that the fishery in 1960 (when control was handed back to the state) was the lowest it had been since the heyday of commercial pillaging prior to enactment of the Organic Act. In fact, the condition of the fishery had significant impact on the Alaskan push for statehood.

With statehood, Alaskan legislators regained control of a depleted resource with a concurrent threat to jobs, lifestyles and tax revenues. Also, at this time a few major companies not only controlled the majority of the cannery pack (at that time the primary form for product sold), but owned most of the fishing boats as well. These large companies controlled supply with fish traps set in strategic areas, effectively barring independent fishermen from access to the resource. In other words, competition was limited and a significant amount of fishery income was moving out of state with these companies. At this time, with strong attitudes of "local hire", the state outlawed the fish trap which was central to the corporate control structure. Subsequently, the number of independent fishermen increased, creating the base for the industry structure we see today.

During the same time period, Japan was expanding its high-seas fisheries, becoming a major player in the harvesting of Alaska's salmon resources. Through 1976, Japan was supplying the majority of its huge seafood market with domestic boats fishing both domestically and internationally, with a significant portion of the Japanese international fishing occurring in the Bering Sea, off the coast of Alaska. The passage of the Magnuson Act in 1976 established a U.S. domestic fishing zone to 200 miles from shore, effectively cutting Japanese fishermen out of the Alaskan salmon fishing industry. This led to a rapid expansion of the export market to Japan which, through 1988, created an allocation market for Alaska salmon. That allocation market does not exist today.

Industry Analysis

Salmon farming is an industry whose international growth over the past 17 years has been astronomical. From 1980 when farmed fish were responsible for only one percent of the total global production (with Alaska at 41 percent) the industry has grown internationally to the point where in 1996 farmed fish comprised over 42 percent of

global production and Alaska's share had shrunk to less than 27 percent. In gross figures, between 1980 and 1996, global farmed fish production went from 7,149 metric tons to 631,574 metric tons. Estimates of future growth of salmon farming indicate a continuation of the this trend in the near term.

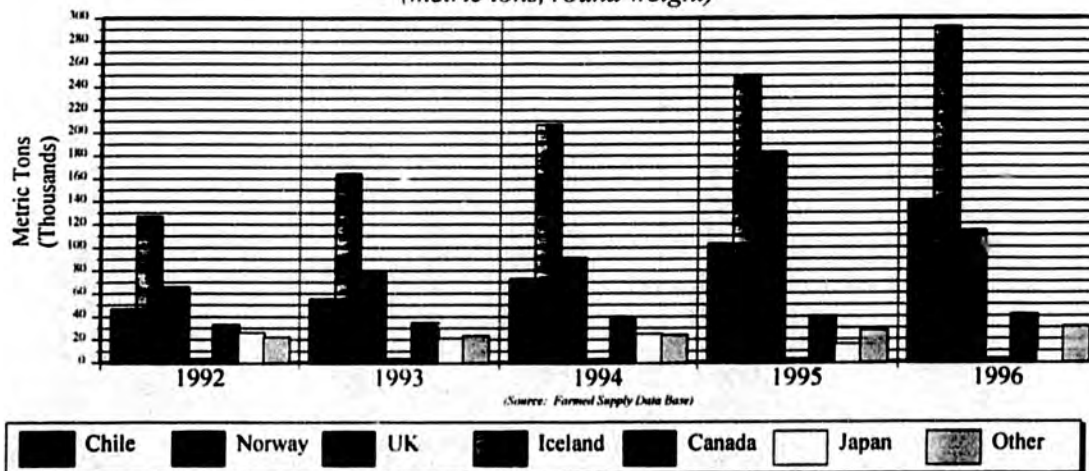
Of primary interest in the following chart are the rapid growth of Chile and Scotland who, along with Norway, can be directly tied to Alaska's loss of market share in Japan, Europe and the U.S. domestic market over the past few years.

The rapidly increasing production demonstrated here has made a tremendous impact on world-wide salmon markets. Rapid growth of global production has surpassed market demand (leading to the slight decline in production noted in 1993). This has resulted in stockpiles of inventory in large consumer countries like Japan and producing countries like Norway. Consequently, farmed fish sales are expanding to include frozen fish sales and both Norway and Chile have adopted the practice of setting minimum sale prices to decrease the effect of oversupply on revenues.

Over the past five years, Chilean farmed salmon has experienced astronomical growth over and above the industry's growth. This increase is a direct result of advanced technological improvements to farming processes and vertical integration with

World Farmed Salmon Production

(metric tons, round weight)



Japanese businesses who have control over the product from development through retail sales. This is a direct threat to Alaska's percent of market share in Japan. Even for those countries with less rapid growth in the industry, farmed fish product has a competitive edge over wild salmon in quality and timeliness.

It is unreasonable to expect that Alaskan wild or ranched salmon can compete with farmed fish products in the fresh market on a year round basis due to the seasonal nature of the Alaskan industry. Many have suggested that the successful marketing of Alaska salmon should focus on product differentiation between "wild" Alaska product and farmed fish. While this approach has been successful on a small scale, where independent fisherman have sold their product directly to restaurants or other small buyers, it is not a feasible solution industry-wide. Should a fisherman in this market become successful and expand to any significant production level, the direct sales structure is incapable of handling the supply. As soon as the fisherman enters into the forty foot container (37,500 pound) size, or multiples of same, he or she enters the

world market and must compete with the dominant pricing structure. This is a direct result of the seasonality of the Alaskan supply and an inability to store inventory.

In other words, the farmed fish industry has established a standard of 50 pound minimum orders in the "white tabletop" market where differentiation in taste and the mystique of "wild" salmon are most apt to be successful. In Alaska, with a seasonal harvest, the minimum order standard is an LD3 or 2,800 pounds. Also, farmed fish is delivered fresh within 24 hours of being pulled from the sea while Alaska salmon has been dead a minimum of three days prior to delivery. If Alaska chooses to challenge this high end, year round industry, the only way for Alaska to directly compete in this market is to establish a home-grown farmed fish industry.

It must be understood that the development of the farmed fish market was a direct result of Norwegian subsidies for industry development. During the development of the farmed fish industry, Norway subsidized approximately 65% of the development of the industry and every aspect of the system: from development of the farms, advertising, marketing, packaging, transportation and research and development. This investment was financed through excess proceeds from North Sea oil and continued for many years prior to the collapse of oil prices. By this time the stage had been set, the market had been developed, and Alaskan markets had been lost. Unless Alaska can compete with an Alaskan farmed product and meet the competition in terms of quality and shipping standards, the industry is not operating competitively in this market. There is simply no direct comparison that can be effectively made between Alaskan wild and ranched salmon and that produced by farms.

Fish farms produce large volumes of product on a year round basis with little damage to the fish in the harvesting process. To date, the intrinsic quality of raw salmon product (or those quality/taste factors inherent in the product before any harvesting effort) has been of little value in market differentiation between Alaska wild and competitive wild or farmed fish. In other words, while some argue that wild salmon tastes better than farmed, this has not proven a strong enough selling point to retain market share. Additionally, fish farms have successfully differentiated their products from Alaska seafood in extrinsic quality measures.

Extrinsic quality is a direct result of the handling a fish receives in the harvesting process. Where wild salmon are often bruised in the harvesting process, remain stored in the holds of fishing vessels for many hours prior to processing and are at varying stages of transition from salt water to fresh water adaptation, this is not true of farmed fish. Farmed fish are penned near to processing facilities and can be processed faster, with virtually no other harvesting damage issues to contend with. Additionally, fish farmers have higher quality guidelines than processors of wild fish resulting in a consistency of product the consumer can rely on. With the market acceptance of farmed salmon, the definition of a quality fish has been refined. The Alaskan industry has recognized the need to improve product quality over the past several years and have implemented better methods of handling fish from the time they are harvested to finished product as part of the effort. These steps have included paying a premium for chilled product, faster deliveries by tender vessels, and providing further training to fishermen and process workers to improve fish handling. Hatcheries and processors have also invested in developing new methodologies for improving quality such as stunning and bleeding fish early in their processing to reduce bruising of the meat. Other industry changes currently underway, that effect quality, are the HACCP training currently required for all Alaskan seafood processors, and the development of quality standards by industry organizations such as the Alaska Seafood Marketing Institute.

One of the most significant quality advantages fish farmers have over wild harvesters is an ability to grow their product to satisfy particular markets. For example, fish allocated for smoking are reared with a higher fat content. On the other hand, there are 5 species of Alaskan salmon, with many grading standards for simple dressed and frozen products. Each of these species varies in size, delicacy, oil content and optimal use. The only option for competing with the consistent product of the Norwegians or Chileans is the development of better quality fish and new value-added products that cater to the consumer's needs for convenience and ease of preparation. The effort is underway, however to be successful at this strategy will require the industry to redefine itself as a food producer rather than a fishing business and learn how to navigate new market channels than have been traditional for the industry.

While the general public has the perception that the decline in revenues in the salmon industry is tied to poor fishing or a lack of fish, harvest figures indicate that since 1986, total salmon harvest trends have in fact increased through 1995 when statewide harvest peaked at 993.7 million pounds. The last two years harvest results have been less each year with results of 887.9 million pounds in 1996, and 623.6 million pounds in 1997.

Despite these recent harvest fluctuations, the key problem does not lie in a lack of salmon resource or in harvesting effort. The critical issue for Alaska then is what to do with huge annual harvests of wild and ocean ranched stocks, much of which is millions of pounds of second and third grade quality product. This quality determination mostly has to do with levels of maturation and skin color, certainly fit for human consumption but nowhere near the quality they compete with for the white table cloth restaurant market place.

The result of Alaska's inability to compete in quality, combined with the rapid growth of farmed fish competition and additional competition from expanding production of low cost Russian and Chinese wild and ranched salmon has been a dramatic decrease in wholesale value for Alaska's product. Due to the nature of the industry, Alaska's fishermen and processors are not capable of generating profits at these lower price levels.

Unlike fish farmers, harvesters of wild and ranched salmon must bring in raw product when it is available. Only a few days or weeks of work must support a years worth of overhead. Additionally, extremely limited production periods mean that fishermen and processors must amortize the cost of capital investments for their business on a very short period of income generation. These capital investments are currently very high, too high in fact, for the level of income being generated by the industry.

For fishermen, over-capitalization has been due in part to sporadically high fish prices combined with restrictions on the fishery, leading to fast and heavy investment as fishermen looked to capitalize on a trend that did not play out and maximize their harvesting capacity. This investment has been supported by the Capital Construction Fund, a program implemented by the IRS where, during good years, fishermen could place their tax liability in trust for development and enhancement of their equipment. As a result of this program, many fishermen have over-extended (as much as \$1 million for a single purpose vessel less than 60 feet long) their financial resources. Heavy capitalization can be traced back not only to capital investments of equipment during the boom years, but to the limited entry permit system established in 1975 as well.

The purpose of the limited entry system was to restrict the number of salmon harvesters in a specific fishing area. Understanding the distribution of limited income periods to overhead, it is easy to see that any fisherman on the seas will increase their

effort to meet financial obligations. In short, limiting the number of boats could limit the overall catch on a salmon run. These permits have become a commodity unto themselves, ranging in price from \$80,000 to \$300,000 adding to the overhead burden of fishermen. Unfortunately, the fact that the limited entry permits are in large part transferable has resulted in an outflow of this resource to fishermen based outside of the state, as well as significant financial losses to permit holders whose permits have decreased in value over the past ten years.

Alaskans hold 77 percent of the available fishing permits in 1995, down 5 percent in two years, and 57 percent of which are held by rural residents whose fishing income is often the single significant source of cash in rural communities. Many of these fishermen are currently in financial trouble. The Internal Revenue Service has a large number of fishermen (an estimated 1,200, or 9 percent of permit holders) that owe money for back taxes, indicating that these people are not earning enough to stay current with their financial responsibilities. An act passed in 1994 by the State legislature concerning the commercial fishing revolving loan fund makes it possible for permit holders (or potential purchasers) to finance payment of back taxes and costs of permits and equipment. While this may help fishermen in the short term, the end result of this type of financing will continue to be over-capitalization of the industry.

Over-capitalization occurred for different reasons in the processor side of the industry. From the early 80's on, it was evident that there was a higher and better use for the product than simply placing it in a can. Considerable investment into automated dressing equipment and blast freezing equipment was the order of the day. At the same time, due to excessive inventory carrying charges (twice the norm at 17 percent) and 2 deaths due to botulism the crash of the canned salmon market gave additional incentive to capitalization.

Unfortunately, what developed were larger facilities producing the same product, both in the traditional canned and the relatively new frozen market. Sadly, bigger was not necessarily better. As mentioned earlier, the term of the season was changing dramatically. For example, in 1980 processors in the Prince William Sound had as much as 10.5 processing months over which they could spread their risk, utilizing various fisheries. By 1990, that had changed to no more than 6 months of production. In some cases, production of an entire season occurred in just a few short weeks. Deciding to make the most of what was available and expanding facilities to produce as much as possible during shorter and shorter seasons, processors were caught in a trap. Combined with dwindling margins, the financial burden of carrying heavy capitalization costs over short periods of time has stretched processors to the limits of financial stability.

Summary of Industry Concerns

Competition

Farmed salmon is here, at a reasonable price, with excellent delivery and quality. Additionally, farmed salmon embody product features that are beyond the ability of our current harvesting, processing, and distributing infrastructure in Alaska. Finally, Russia and China, with labor forces receiving extremely low wages, are increasingly willing to sell salmon at very competitive rates in the world markets and their production has increased in recent years.

The changing nature of salmon competition and resultant over-production has influenced the variability of selling price. Always a fluctuating commodity, in recent

years price fluctuations appear to have been more dramatic and harder to predict. Due to the short harvesting season, the inability to store inventory for long periods and the over-capitalization discussed above, these fluctuations are particularly difficult for the Alaskan harvester and processor to work with. Specifically, under the current system, the processor must guess at the price they will sell this year's fish, then commit to the price they will pay for fish prior to the selling season, hoping to sell at the target price. This leaves little room for error in planning if a processor is to succeed. Fish farmers on the other hand can simply wait out the fluctuation before harvesting and target their sales for higher returns.

The global supply of salmon has grown faster than the global consumption of salmon mostly as a result of the rapid growth of the farmed salmon industry during the past two decades. This basic fact has established a cap on the price paid for salmon in the wholesale markets around the world whether it be farmed or wild. In this kind of economic environment, the supplier that can reduce and control the costs of production has a key advantage over the competition. The salmon farming industry has used this fundamental advantage to increase its market share, and now farmed salmon production costs largely establishes the base for pricing. As the salmon farming industry grows, the per unit costs of production has been reduced, and this trend is likely to continue as the industry grows and new cost saving techniques and technologies are developed and adopted by the industry. In contrast to the salmon farming industry, the Alaskan wild salmon industry does not have the same capacity to control production costs without undertaking major structural and regulatory changes. This advantage and the ability to manipulate supply, gives the farm industry a key competitive advantage over the Alaskan Industry that will be difficult to overcome in the future.

Markets

In response to the limits on international fishing in Alaskan waters discussed above, and having a well established market for the salmon they had previously fished in Alaska, Japan became the largest importer of Alaskan salmon. Reaching a sales peak of nearly \$790.6 million dollars in 1988, this single market represented 85 percent of Alaska's total salmon export sales. Since 1988, with increased competition from farmed fish, the United States share of the Japanese import market has dropped from 85 to 21 percent in 1997. For Alaska, this drop in market share, in conjunction with reduced prices, resulted in a total revenue from this market of \$260 million dollars in 1997, or a difference of \$530.6 million within 10 years.. The shift of supply sources for salmon away from Alaskan sources by Japanese markets continues as shown by the increased market share of Chilean farmed salmon. In 1997, Chilean farmed salmon and trout increased its market share to 23 percent of the market. This marks the first time that Chile provided more salmon than did Alaska to this important market. With current Japanese investment in Chilean salmon farms, there does not appear to be much hope for Alaska salmon to regain market position in Japan.

Domestically, Americans are consuming more salmon (up to 2.5 pounds per year from 0.5), but that demand is being filled by farmed fish mostly from Canada and Norway. Canned salmon, the traditional value added product Alaska produces for the domestic market, is experiencing a decline that is not expected to recover. The market demographic for this product defines the average consumer as a single woman 50 -55 years of age with limited income. Clearly, this is not a high growth market. Alaska has lost the domestic "white tablecloth" market to the higher quality farmed salmon and, with the exception of the ability of a few individual fishermen to market directly to restaurants, this is not expected to change. As prices have declined and market share

For traditional salmon products have declined, there has been increased interest in new value-added products that cater to new trends for easy conveniently prepared meals by industry members. These value-added items include a broad range of products from smoked salmon snacks, salmon burgers, hot dogs, seafood pockets, flaked salmon in retort pouches, to individually packaged microwavable boneless fillets in a sauce. In addition to finished products, the processing industry has also developed a new intermediate product, frozen blocks, that are a useful base manufacturing new seafood products by food reprocessors. Many of the Alaskan processors have already redefined their businesses from fishing to food businesses, a key change for the Alaskan industry for future success. These companies are learning how to compete and succeed in this new world. This includes such topics as developing the capacity for new product development, learning about new channels for selling the new products, and the new realities of competing in this new market realm. The cost of developing new products and their high failure rates in the market place, along with high marketing costs such as paying retailers for shelf space are challenging hurdles to be overcome by those involved. Although it is too early to know what the total impact of value-added will be, it has great promise to move significant volumes of salmon and improve margins for the Alaskan industry. In the case of turkey, per capita consumption was doubled in a ten year term largely by introducing new and value-added products. If this could be replicated in the salmon industry, it would mean the consumption of over 630 million pounds, edible weight. This would equate to approximately 1.6 billion pounds of round weight of salmon by the year 2004 based on 1994 estimated domestic salmon consumption. In addition to learning the market side of value-added, the industry has also recognized the need to improve production efficiency to reduce costs and improve quality as an important aspect of succeeding in these areas. Pin bone removal, bleeding prior to processing, And new methods for producing new products are examples of work undertaken to enhance production efficiencies in the industry.

Quality

Processors have not always utilized universal high quality guidelines to assure consistent high quality product in the market however this is changing in Alaska prompted by the increased global competition for salmon markets. With the market acceptance of the farmed salmon, the definition of a #1 fish has changed upward and Alaskan processors have lost market share as they have been slow to recognize the need to change fish handling and improve quality. Alaskan processors have not kept in step with the change of quality standards occurring with the increase in farmed fish production. It is a major challenge for the Alaskan industry to change the way wild salmon is harvested in order for it to favorably compete with the harvesting procedures farmed salmon. While programs developed by the Alaska Seafood Marketing Institute are available for setting quality standards, the costs inherent in this type of plan are steep. To overhaul the industry to high-grade wild salmon is a challenging task and may be cost prohibitive in today's industry.

Seasonality

The nature of the Alaska salmon industry is one of seasonality. While fish farmers can afford to hold off on harvesting their product, this is not an option for Alaska. In short, while there is less overhead associated with harvesting raw product for wild or ranched salmon (if not over-capitalized), there is less control over how, when and where to sell Wild salmon runs fluctuate from year to year, even where the wild stocks have been enhanced with hatchery raised and ocean ranched, and the seasonal short window of availability increases risk (will there be any fish to catch?), and the cost of doing

business at every level. for this industry, placing it at a distinct disadvantage in the marketplace. This facet also reduces the ability to control cost of production and limits options for matching product supply to market demand in order to support price levels.

Cooperation

Alaskan fishermen are an independent group and form a strong lobby. In 1988, this group successfully promoted the rejection of fish farm legislation. In the past they have been politically active in all issues that effect their business and they are expected to remain so in the future. This influence has slowed efforts in Alaska to make fundamental changes needed to stay competitive on the world market with "high quality" fresh salmon products.

While the canneries have long provided funds for industry infrastructure, the relationships between fishermen and processors have traditionally been non-cooperative. This attitude has carried over to regulatory agencies as well. The relationship between federal and state agencies has been soured through historical mismanagement of the fisheries by federal agencies, which fisheries were then passed on to the state. The independent fisherman has been treated badly by the canneries in that they were effectively restricted from the industry for years and, finally, the canneries have been affected by regulations removing fish traps and limiting competition among suppliers, affecting their margins and acquisition structure. In short, we have created a working environment of moderate mistrust between the key players; fishermen, processors and government. This makes coming to consensus, creating a plan, and taking action more difficult than it might otherwise be.

Industry Structure

Currently the processor has little control of either the raw material they receive from the fisherman, or the markets where their products are sold. With virtually no vertical integration in the industry, the seafood processor is caught in the middle of significant price pressures. As the market reduces the prices paid for salmon, the processor sector is under pressure to reduce the price paid to the fishermen in order to protect their margins. This squeeze exacerbates the financial difficulties occurring at the harvester level of the Alaskan industry with no easy solutions in sight. This squeeze has reached the point that the weaker participants viability to continue in business is in doubt and some failures of processors and harvesters are likely in 1998. These failures will in turn have an adverse effect on the performance of industry lenders and their willingness to make new loans in the current environment.

In order for the industry to compete in new market conditions, significant investments must be made in the development of processing technology and quality standards. Unfortunately, these major investment requirements are not supported by sound risk/reward evaluations. Each step of the salmon harvesting/ processing process is risky and, while in the past this risk was off-set by the potential for high profits the margin potential is not there today. The processing sector of the industry has reluctantly recognized the need to make changes and new investments are underway that address the needs for new processes, new techniques & methods to improve product quality, develop new products, and learn and understand the new consumers wants and needs and the market channels to access them. The outcome of these efforts is not known since they are ongoing, however, relationships between the processors and the harvesters will require adjustments that will be painful for both sectors.

Conclusions

The Alaskan salmon industry is undergoing major change in response to the greatly expanded global supply of salmon and the farmed salmon industry's aggressive takeover of market share in most of the world's markets. Farmed salmon producers have been able to accomplish this takeover in just two decades by being more responsive to consumer desire for better quality seafood products at competitive prices. As the farmed industry grew it gained economies of scale, and developed new techniques and technology that improved efficiencies and reduced production costs without sacrificing product quality. The structure of the farmed industry has allowed for the ability to control costs and cater to market demands for specific products and time of delivery especially with the vertical integration of production with market channels that has developed in many farm operations, especially in Chile and Norway. Although these changes have been ongoing for years, the Alaskan industry has been slow to take the challenge seriously, and make the needed changes to respond to the challenge and protect market share and profit margins. Unfortunately, the pain has become severe enough in the processing and harvesting sectors of the industry, that denial has been overcome with a general recognition that business as usual is not a viable option. All sectors of the industry are feeling enough pain that there is a willingness to at least discuss their version of what changes are necessary?

The major themes for change include improved quality of salmon products, improved efficiencies of harvesting and processing, new product developments to cater to consumer wants and needs, and new innovative methods of accessing new and existing markets for seafood products. The regulatory and management changes that address these themes will effect many different areas of the industry and will require participation and cooperation by all facets of the industry to decide on specific changes and how implementation should take place. The changes supporting these themes that take place within individual companies are underway to varying degrees and will require encouragement and financial support to facilitate implementation as rapidly as is feasible. All major economic changes brings distress to some caught up in its tides, and this is present today in the Alaskan industry at all levels in some degree. Although most certainly there is more distress and upset to come before the Alaskan salmon industry has adapted, a new course has been set by redefining the industry's business to one of food supplier meeting the wants and needs of dynamic markets from a fishing business focused on producing traditional products. The challenge is to help the changeover happen quickly and mitigate the pain and distress in the process.

Alaska Science and Technology Foundation (ASTF) has been an important source of support and funding for the innovative changes taking place in the industry. Since its start in late 1989 through October 1997, ASTF has funded more than 63 projects for a total of \$6.65 million, almost 23% of the total amount expended for projects by the Foundation. In addition to committing its own funds, ASTF has also acted as a catalyst to focus on specific problems, assemble an appropriate team, and attract other funds to support the identified projects. Organizations with which ASTF has formed working relationships for these purposes include: Alaska Fisheries Development Foundation (AFDF), the University of Alaska Fisheries Industrial Technology Center (FITC), and the National Marine Fisheries Service (NMFS). These projects have included new products development such as the chunked, flaked pink salmon in a retort pouch and salmon hams and microwavable salmon pockets. Projects aimed at improving the processing of salmon have included stunning and bleeding salmon, pin bone removal and total bone removal of salmon, and salmon block development. Other funded projects have addressed improving resource recovery during processing to developing innovative organizational structure for marketing value-added salmon products in domestic markets. The need for ASTF participation will continue to be important for this industry in the immediate future when the industry continues to evolve and change to its new environment and industry funding sources are stretched for business survival. Other sources of funds may be necessary to help fund the business changes, new equipment and

infrastructure development that will be needed by the industry. These funding sources could include tax credits, as well as direct sources of funds available to the industry in the form of loans and perhaps buybacks of permits and vessels if that is a strategy adopted as a response.

Alaska Groundfish

The sole constant in an analysis of the Alaska groundfish industry is that there are no constants. This is, quite simply, an industry in flux. For Alaska this is a young industry attempting to fill a void where older, more traditional fisheries have failed. Primary factors in Alaska's ability to find its niche in this market are international competition, industry structure and the regulatory climate.

Modern History of Alaska Groundfish

Development of the modern groundfish (pollock, halibut, cod etc.) industry in Alaska is relatively new, dating back to 1976, when the federal government passed the Magnuson Act restricting access to the fish resources within 200 miles of the nation's shores. As the industry converted from foreign to domestic ownership, growth was propelled by the crash of the crab fishery in the early 1980's; as crab populations declined, crab fishermen switched gear to pursue groundfish. Additionally, declining worldwide cod resources have increased demand for Alaska's groundfish.

The collapse of the traditional cod fishing grounds of the Northeastern U.S. and Canada has boosted demand for Alaskan cod and alternative products. The Alaskan cod fishery is, in fact, unable to supply the demand for whitefish fillets. This has created an opportunity for pollock which is now being utilized as an alternative to cod in many applications. Of particular importance to this fishery is the production of surimi which utilizes as much as two thirds of the Alaska pollock catch; unlike more traditional Alaskan fisheries, primary processed (headed and gutted) pollock and cod are typically low in value per pound; profits are made through volume conversion to secondary processed product.

Given the structure of industry profits, boat owners and processors in the industry (often with assistance from foreign joint ventures and investments) have built larger boats to maximize the return on harvests. As a result, the fleet has seen astronomical growth. In 1980 there were no domestic factory trawlers and virtually no pollock harvest, whereas today there are over 60 U.S. factory trawlers today with an annual domestic catch of approximately 4.5 billion pounds. Presently, Alaska produces 20% of the world's processed groundfish with pollock representing over 70 percent of this production. In 1992, pollock contributed 2.9 billion pounds to the total groundfish catch with an ex-vessel value of 324 million dollars. In short, over the past ten years the pollock industry in Alaska has become a significant factor in the overall picture of Alaska's seafood industry.

Although it doesn't compete in volume, the halibut fishery in Alaska generated over 68.7 million dollars in ex-vessel value in 1995 making it a significant contributor to the state economy. Also, unlike the pollock industry, the halibut industry is primarily shore-based, directly impacting Alaskan employment. Over the last few years increased fishing effort on the quota has forced this industry to operate under derby fishing conditions, with scheduled twenty-four hour openings during which fishermen have no quantity limits on their catch. This system was changed in 1995 with the implementation of an Individual Fishing Quota system (see below).

The existing system has been an incentive for fishermen to catch fish as fast as possible, postponing cleaning and icing of the product until the fishery is closed, lowering the quality and value of the fish delivered to the dock. Unlike pollock, most halibut is frozen and sold to markets as primary processed frozen product and diminished quality has a direct effect on ex-vessel value of the product. In this industry, the bulk of production goes to domestic markets with small amounts being shipped to Japan although very little of the product exported is direct from Alaska. The majority of halibut exports then are indirect, indicating that Seattle shippers and cold storage facilities are processing this Alaskan product.

Industry Analysis

As prices rose for pollock and cod in the early 1990's, a variety of nations rushed to fill the market demand for inexpensive raw material sources for the production of surimi and other secondary processed products. Internationally then, New Zealand, Thailand, China, Poland and the Newly Independent States (NIS) have increased production levels of competitive products. While many of these countries cannot compete directly with pollock and cod, they have found a niche in lower cost, lower quality alternative raw material products like hoki from New Zealand and threadfin bream from Thailand. The heavily capitalized Alaskan fishery is having difficulty competing in this aggressive market.

Expansion of the factory trawler fleet has impacted the Alaskan pollock fishery to such a great extent the catch limit is now being reached in 70 days or less instead of the 300 days of fishing financial planners based their assumptions on. With an average capital investment of approximately 40 million dollars, servicing debt over such a short working period is extremely difficult. Some financial experts estimate that over half the factory trawler fleet is in danger of bankruptcy and, in fact, it may be true that until the fleet is reduced by half this fishery will not be profitable for any of these floating processors. This year noted the first foreclosure on one of these massive fishing vessels, perhaps only an indication of a coming trend in the industry. Presumably, shore based processors are in a stronger position to withstand this competition with a lower level of over-capitalization and a 35 percent allocation of the 1.3 million ton pollock quota.

The North Pacific Fisheries Management Council (NPFMC) is responsible for managing the groundfish resource in Alaska. In 1992 the Council introduced Community Development Quota's (CDQ'S) in an effort to use the pollock fishery as a tool in support of rural communities in Alaska. The CDQ program allocates 7.5% of the total allowable catch of pollock harvested in the Aleutian Island/ Bering Sea District to 55 communities organized into six regional corporations. Each of the regional corporations is utilizing the income from this allocation in the implementation of a targeted Community Development Plan (CDP).

Since the implementation of the CDQ program in 1992, it has generated total revenues exceeding \$108 million for the six CDQ Organizations to fund economic development in western Alaska. The program has created over 5,425 jobs and enrolled over 2800 people in various training programs. Some of the regional corporations have also reached agreements with established processors to purchase their quota of groundfish in programs that support more traditional industry development for their region. All of the corporations have developed working partnerships with catcher/processors in the industry and are investing in capital improvements for their respective communities. For example the Aleutian Pribilof Island Community Development Association (APICDA, one of the six CDQ corporations) has completed construction of improvements to the Zapadni Bay Harbor on St George Island, designed and built a dock and gear storage building in Nelson Lagoon, and extended sewer and water service for the City of False Pass dock. In short, Each CDQ Organization has undertaken implementing an approved development plan for their member communities that are designed to increase local employment while adding and improving the

local economic infrastructure of western Alaska. The CDQ program is too new to reach any definitive conclusions, however, it can be stated that it has been successful in establishing a funding mechanism and a focus on improving the economic status of large rural areas of western Alaska that did not exist before 1992. For this reason, as well as the results from the first four years provides cause for cautious optimism for the future.

The NPMFC has also recently initiated an allocation program for the halibut and Sablefish fisheries. In response to increasing numbers of fishermen utilizing these resources, 1995 was the first year when Individual Fishing Quotas (IF's) were used to allocate access to the resources. Boat owners with a provable history in each of the fisheries were allotted a permanent claim against all future total allowable catches in the halibut and Sablefish fisheries. What was a 24 hour derby fishery, with every boat landing as many fish as possible in a short period of time, will now be a fishery open only to IF permit holders on a longer seasonal basis. The incentive to postpone cleaning and icing the fish will be removed, resulting in a higher quality catch and, as fishermen will no longer be forced to fish in dangerous weather conditions, industry safety will be improved and resource market value enhanced.

Based on a similar Canadian model implemented several years earlier, the IFQ program has significantly improved the halibut and Sablefish industries. While there are several advantages for the industry in an individual quota system, the bottom line is that this type of program results in a safer industry producing consistent, high quality product. The market will bear a higher price for a premium product both fresh and frozen and the net result is the dollar value of the fishery will increase without having to increase the catch size. Additionally, the opportunity for secondary processing is increased, because the supply of fresh product will be more consistent, allowing processors to plan and manage production over a longer production cycle. These positive changes have come at cost to those industry participants that did not receive IFQs and no longer have access to these fisheries. Many residents of remote Alaskan fishing communities had historically fished for these species to supplement their salmon fishing efforts when results were poor. The lack of access has eliminated this strategy and narrowed their opportunities unless they have access to capital to purchase IFQs. In short, the long-term effects of both the CDQ's and IF's are expected to result in increased shore-based employment in the Alaskan fishing industry.

Summary of Industry Concerns

Markets

Of primary concern to the groundfish industry is the fact that there is only a single major market for all of the world's production of surimi; that market is Japan. The Japanese consume over 15 pounds of surimi products per capita, down from 18 pounds a few years ago. This decline in per capita consumption is not expected to reverse itself any time in the near future, posing a threat to the health of this industry. Recently, markets for blocks and fillets made from pollock and other groundfish been developed in Europe and the U.S. providing an alternative to the Japanese market. These different products and markets for Alaskan groundfish need to be expanded allow healthy growth for the industry.

Regulatory Environment

The regulatory environment in the groundfish industry is changing at such a rapid pace (attempting to catch up to the industry itself) that it is hard to quantify with any clarity. Indications are that the regulatory body responsible for the fishery is working very hard to

help stabilize the industry, but flexibility will be key as the industry goes through those fluctuations common to an emerging market.

The Community Development Quota program has been extended two times, with a current term through 2000 and beyond since the CDQ program was included in the renewal of the Magnuson-Stevens Fishery Conservation and Management Act in 1997. This legislation, that governs the Bering Sea fisheries, also expanded the CDQ organizations fish quotas to include a percentage of the allowed catch of other groundfish species and opilio crab. These new quotas are to be implemented over the next three years, beginning with 3 percent of the opilio crab allocation starting in 1998 and eventually totaling 7.5 percent of each species allowable catch beginning in the year 2000. These regulatory changes have provided the CDQ organizations greater permanence and an expanded economic base that should make them bigger engines for economic development for their communities.

Industry Structure

The industry is over-capitalized, with production capability far out-distancing groundfish quota allowances. This is expected to result in the failure of many of the factory trawlers in use today, presenting an uncertain future for the industry as unprofitable operators are shaken out of the system. This huge fleet is primarily based in Seattle, with most of the factory trawler crews coming from outside Alaska. The majority of production from these ships will either be off-loaded at sea or shipped to Seattle for storage and reshipment to the next customer in the distribution chain. In contrast, shore-based operators tend to hire Alaskan employees to staff their facilities contributing more to the state economy than the offshore operators. It is unknown whether the shore-based processors will be able to remain competitive as the industry goes through expected changes.

Resource Availability

One result of the trawler fleet expansion is the increased pressure this huge production capacity places on the resource. It is undecided if the resource can survive at its current level of health with the added pressure from the expanded factory trawl fleet. The exact impact of the fishing effort on the biomass is a point of contention among various interest groups. The fishermen need to expand production to support their debts; the government needs the resource to continue generating tax revenue; and environmental groups are of the opinion we are harvesting more than the resource can sustain. Proposed legislation was introduced in 1997 in the U.S. Senate that is intended to "Americanize" the ownership and management of the Bering Sea trawl fleet. If it passes in its current form, it will reduce the number of vessels qualified to participate in the fisheries. This will reduce the fleet's production capacity for the near term and easing the pressure on the resource.

Competition

Those fishing countries that successfully introduced alternative raw materials for surimi production when pollock was selling very high have shown no inclination to cease production as pollock prices have leveled off. The industry is changing with processors looking at new more efficient methods for surimi production that will reduce costs resulting in improved economics for the manufacturers, however, the continued dependence on the troubled Japanese markets will destabilize this fishery as the consumption of surimi based products continues to level off or decrease. The industry is developing alternative products and markets for surimi that will eventually address this over reliance on one market, but this will take time to achieve this diversification.

The other major species of groundfish harvested in Alaskan waters include halibut, sablefish, and Pacific cod. The stocks of each of these species remain healthy and the catch quotas have been increased in recent years. The increase harvests allowed may serve to reduce harvest values for these species, however this moderation of value will not eliminate impact of larger harvests for those fishing for these species. Some halibut fisheries that are located near areas frequented by visitors, are facing very vocal competition from sport fishermen desiring a larger share of the harvest quotas. As Alaska's tourism industry grows in strength this is expected to become an even more controversial issue.

Summary of Industry Concerns

The harvesting and processing capacity in the Alaskan groundfish industry is capable of handling three times the total allowable catch. The industry is also young, with resource sustainability and bycatch issues that are currently being addressed largely by the North Pacific Fisheries Management Council. The excessive production capacity and concerns over maintaining a sustainable resources combined with a large global supply and flat or diminishing traditional markets for groundfish products result in an industry with an uncertain future.

Conclusions

The groundfish industry has grown in importance in recent years with Pollock now being the highest valued fishery in Alaskan waters. The major issues for the sector are safekeeping valuable resources from over harvesting and developing new products and markets for groundfish products especially pollock surimi, and attracting more Alaskan based harvesting and processing of groundfish. The North Pacific Management Council is currently working on establishing sustainable levels of harvesting and addressing bycatch issues which also impacts the health of the resource, and new Federal legislation has been introduced which will address the excess production capacity. These activities adequately address the safekeeping of the resource. Over 80% of Alaskan surimi production continues to be sold to Japanese markets even as its market value softens. The Alaskan producers have started taking steps to develop alternative markets for pollock surimi as well as develop different products from pollock such as blocks from fillets for food manufacturers use a base ingredient for various products. These efforts need to be increased, since the Japanese market for surimi is expected to continue to soften as other protein sources such as poultry, pork and beef gain market share and the weak economy continues. Markets for halibut, sablefish, and Pacific cod from Alaskan waters appear solid, especially with the extended seasons established with the implementation of Individual Fishing Quotas for halibut and sablefish. The last major concern regarding attracting more Alaskan based processing is also being addressed by the North Pacific Fisheries Management Council in their review of the allocation of the pollock harvest quota between the floating processors and onshore based plants. Currently, this quota is split on a 65-35 percentage with the majority being allocated to the trawl fleet. This allocation is under review at this time and a determination is expected at the June meeting. It is anticipated that any change in allocation would be in favor of the shore based processors which is anticipated to generate additional economic activity for the State's fisheries communities.

Although the dominant issues for the groundfish fishery are regulatory and management in nature, ASTF has become involved in the area by funding several projects under the guidance of AFDF and NMFS aimed at solving problems that have hindered the commercialization of Arrowtooth flounder. This species is a major component of the biomass residing in the Gulf of Alaska. Arrowtooth has not been commercially exploited until recently due to its flesh becoming an unappetizing mush during processing caused by an

endogenous protease. Work performed in ASTF funded projects was able to overcome this characteristic and open new possibilities for new products made from Arrowtooth flounder. These solutions presents the opportunity for a new commercial fishery one day to be based on targeting this specie once bycatch concerns are addressed. work on commercializing Arrowtooth is Ongoing that builds on the earlier ASTF supported projects that should create a new fishery for the Gulf of Alaska in the future.

Another example of ASTF involvement in the groundfish sector was a recently completed project organized by a NMFS scientist to demonstrate the advantages of using highly sophisticated decanters to produce surimi rather than the traditional screw presses. The results of this Kodiak project were sufficiently impressive that several major surimi manufacturers chose to install decanter technology to upgrade their production plants to capture systems the improved resource utilization, lower operating costs, use of less plant space while producing the same or better quality product. This project results has most likely changed the production methodology used to manufacture surimi in Alaska and perhaps worldwide.

Alaska Shellfish

A once hearty fishery, the Alaska shellfish industry has passed through its peak and has stabilized at reduced levels of production. Through the history of this industry, Alaska has sold shellfish in only three forms; fresh, frozen, and canned. Virtually no value added work has been successful with these products and, realistically, it does not appear as though additional value added research will change this fact. In combination with increasing competition from low cost producers, indications are that the industry has leveled off and can expect little in the way of significant future growth.

Modern History of the Alaska Shellfish Industry

Alaska utilizes several varieties of shellfish with shrimp, oysters and crab currently generating significant commercial activity. This section of our report will focus primarily on the crab industry. Clams, mussels, scallops, abalone, sea urchin, and snail all have small commercial interests directly impacting rural communities. While these new and developing industries are of interest, their present economic impact is isolated and is not specifically addressed in this report.

The shrimp industry reached its peak in 1976 with 125 million pounds harvested. Due to a combination of foreign competition and over-fishing the industry crashed. For the past several years an average of only two million pounds of shrimp has been harvested annually and there is no indication that any significant growth in the industry will occur. The harvest for 1995 was 4.9 million pounds and Alaskan shrimp harvesters have not had any major difficulty marketing their product. This industry is currently at a stable level and this Southeast based fishery is being closed to new entrants by the State's Commercial Fisheries Entry Commission to maintain this equilibrium. Unless and until there is some major change in the raw material resource, the industry is not expected to undergo any dramatic changes.

Oysters are a farmed commodity and are raised primarily on the southeast coast of the state. There are 56 permitted farms in Alaska and 99 percent of their production is oyster, generating \$306,000 in sales in 1995. This represents fewer farms in operation and a slight increase in sales from 1993. This is an industry in its infancy with obstacles differing significantly from the traditional harvesting industries addressed in this report. However, the

farming of oysters, mussels, and clams in Alaska has the potential to grow into a major part of the Alaskan industry due to the State's pristine and nutrient rich coastal waters. The construction of a mariculture hatchery and technical center in Seward that is scheduled to begin operation in the spring of 1998, and a shellfish nursery facility currently being field tested in Kachemak Bay will provide the needed infrastructure for growth and improved performance from this sector. Also, the regulatory environment for shellfish mariculture has been changed providing longer term leases of farm sites that makes the farm business more attractive for further capital investments. These developments provide the base for this sector to grow and reach its considerable potential to generate revenues and employment for rural areas of the state.

The three primary crab species harvested in Alaska are King, Tanner (bairdi and opilio) and Dungeness. Of these, King crab has traditionally been the premium product, with the strongest market demand and the highest sale price of any shellfish species harvested in the state. The year 1948 marked the first large scale U.S. effort to catch and process crab and, with consistently high demand the industry boomed through 1980.

From a peak harvest of 185 million pounds in 1980, the King crab harvest crashed, declining steadily through 1985 when only 15 million pounds were harvested. The collapse in the crab industry had a ripple effect on the groundfish industry. Boats that were previously geared for crab refitted their boats to pursue groundfish, contributing dramatically to the rapid expansion of that industry. Subsequent to the crash, fishermen also worked to develop expanded markets for Dungeness and Tanner crab and began marketing a fourth species, Korean Hair crab. The Korean Hair crab industry is now in the early stages of development with these shellfish being sold as premium products live to Japan..

Industry Analysis

Although the development of fisheries based on these other species have not completely made up for revenues lost with the crash of the Alaskan King crab fishery, the industry has rebounded somewhat since the crash. In 1992, harvest of the three primary species of crab generated 375 million pounds of product for market, generating \$310 million in ex-vessel revenues. In 1996 the fishery produced only 16.11 million pounds with an ex-vessel value of \$52.48 million. Of the three primary crab species fished, Tanner crab now provides the largest harvest. In 1996, the harvest for Tanner was 69.76 million pounds, with King crab at 16.11 million and Dungeness harvests totaling only 6.01 million pounds. The reduced harvest levels during the 1990s graphically demonstrates the on-going fluctuations in the Alaskan shellfish resource which has caused major purchasers to develop other sources of supply.

Summary of Industry Concerns

Competition

Competition in this industry comes principally from the Newly Independent States (the NIS) that were parts of the former Soviet Union. With the crash of the Alaska King crab industry in 1981, the NIS became the world's largest supplier of King crab. In 1992 almost two thirds of the king crab consumed in U.S. markets came from NIS waters, but it was sold with a 'Product of U.S.A.' label. As many Alaskan crabbers have looked to develop joint venture relationships with NIS fishermen, they can fish in NIS waters and legally label their product as a U.S. commodity.

Raw Material Availability

As noted above, this fishery is particularly vulnerable to seasonal harvest fluctuations. As it is impossible to develop stable working relationships with customers if one cannot accurately predict product availability, sales of available product are difficult to rely on. Additionally, as there is no conclusive evidence detailing the cause of the resource collapse in 1980, it is difficult to predict when and if the resource population will crash again. The final consequence of this uncertainty is that investment in the crab fisheries is fraught with high risk that does not attract new funds until the resource availability is more predictable.

Conclusion

The shellfish fisheries future are tied to the health of the stocks and their availability for harvest. The health of both the crab and shrimp fisheries are tied to maintaining robust populations and establishing harvest levels that can be sustained over time. Both industries have global competition that set market prices for product made from these species. New management plans have been implemented, or are in the process of being implemented which are designed to protect and enhance stocks of these species. If these steps prove effective, Alaska may become a reliable source of crab and shrimp once again. Until then, the crab product from the Russian Far East will continue to take market share.

The mariculture of oysters and other bivalves such as little neck clams, mussels, and geoducks is a promising area for the industry. The needed infrastructure for shellfish mariculture to grow and reach its considerable potential are underway in the form of the hatchery facility under construction in Seward and the nursery being field tested in Kachemak Bay. Once these facilities are in production mode, the farms will have access to a reliable in-state source of dynamic spat(seed) that can be profitably grown to a marketable size out in the individual farms located around the State. This infrastructure development and the improved State's regulatory environment for existing farms as well as new ones sets the stage for new investments and growth in this sector. This growth trend will be encouraged by the continuing degradation of the environment for healthy mariculture in the lower 48 states. ASTF has supported this sector by providing funding for several projects including the shellfish nursery construction and testing and by funding research for farming geoducks and depuration of shellfish for PSP. An important industry partner for ASTF has been the Marine Advisory Program based in the University's School of Fisheries and Ocean Sciences. This area has great promise for the future and should be supported as appropriate opportunities are identified.

Summary

Clearly, Alaska's seafood industry is experiencing major challenges that need to be addressed if the industry is continue to play a key role in the State's economy. Of the three major categories discussed in this report, the salmon industry presents the most acute need for analysis and change since it employs the most persons for harvesting and processing and is the backbone of the economy in most of the rural coastal communities. Growing supplies of farmed salmon and other factors have depressed prices of Alaska's wild and ocean ranched salmon. Foreign-produced farmed salmon and wild-run salmon is being substituted for our salmon in Alaska's domestic and export markets. Unanticipated low run returns in some of Alaska's major salmon fisheries for several years in a row has further depressed income to both processors and harvesters further exacerbating already strained finances. An ongoing recession in Japan and more recently economic turmoil in other Asian markets important as buyers of Alaskan salmon and other seafood, has further contributed to drops in prices paid for salmon exports and other species. Finally, ongoing class action price fixing

litigation between harvesters and major Japanese buyers in the bell weather Bristol Bay has strained loyalties and relationships between Alaska fishers and their primary export market. This at time when global competition for salmon markets is increasing.

Recovery in the Alaska salmon industry will require a recognition that continuing to do "business as usual" is no longer a viable option. The industry will depend on the development of new products, increased emphasis on quality, and renewed efforts to expand domestic and new export markets, as well as a careful and thoughtful review of the structure of the industry with a willingness to make bold and innovative changes to "the system." This proposed review should include all aspects of the structure such as, the management plans, the limited entry system, and regulations governing vessel size and gear usage. All members of the industry should participate in this review for it to be effective and the State government is the logical choice to take a leadership role if this review and strategic change is to take place. The new course has been established by industry leaders and now a general consensus must be achieved to agree on and make the necessary changes to adapt to the new economic environment.

The management changes for the groundfish fisheries are underway with the implementation of different resource management systems. Individual fishing quotas (IFQs) for halibut and Sablefish was initiated in 1995 and has led to longer, safer seasons for a smaller fleet. This has led to generally higher quality products that have garnered higher ex-vessel values in the marketplace. However, this privatization of these two fish resources has also had the negative effects of reducing the number of Alaskans participating in the fisheries due to non-qualifying for the initial IFQs distribution and due to the reduced crew positions available because of the fishery consolidation.

The inclusion of the Community Development Quotas Program into law in 1997 has solidified this management vehicle since it was introduced in 1992. This program has also been expanded to include all fisheries species harvested in the Bering Sea. The North Pacific Fisheries Management Council that oversees most groundfish and crab fisheries in Alaskan waters is in the process of making other management changes such as the harvest allocation of pollock between the trawl fleet and the onshore processors, limiting access to crab and other species to address overcapitalization issues, as well as such issues as resource protection and utilization. With regard to the issues concerning the over reliance on Japanese markets for pollock surimi and other groundfish, steps are being taken to develop other markets and new products that cater to alternative markets at the this time. These steps will help diversify markets for surimi, although the Japanese seafood consumption is so great that this market will play a major role for the foreseeable future. New technology has recently been developed that will reduce production cost of surimi which will improve the economics as the new technology is implemented.

Crab stocks including Dungeness continue to fluctuate from year to year and need additional protection to restock until a sustainable population may be established. New management plans have either been implemented or are in the planning process which are designed to enhance the stocks by both the North Pacific Management Council for King and Tanner crab and by the Alaska Commercial Fisheries Entry Commission with regard to Dungeness crab. If these steps prove effective, Alaska may become a stable supplier of these species once again. Until then, the foreign suppliers will continue to take market share and establish market prices.

While this report has identified many issues and challenges facing the Alaska seafood industry, the flip side of these are many exciting opportunities that are present for savvy industry participants in the future that may far surpass what the industry has accomplished in its past. It is an exciting time to be involved in the seafood industry, especially with the ability to assist in making the changes underway.

Chapter IV

Mining

1997, the centennial year of the Klondike Gold Rush, is an appropriate time to examine what the mining industry has meant to Alaska's past, the current status of the industry, and what it might contribute to Alaska's future. The history of Alaska's settlement since 1850 is, in many ways, a history of Alaska's mining industry. In the late 1800s and early in this century, the AJ and Treadwell gold mines in Juneau and Douglas were impressive operations, producing over six million ounces of gold over the mine lives. The Klondike Rush extended focus through Southeast Alaska to the interior regions of Canada. From the Klondike, prospectors traveled the Yukon River, establishing mining camps at Fairbanks, Circle and near interior rivers. The Nome mining district opened soon thereafter. In the Copper River basin, the Kennecott copper mine and active coal and oil prospecting brought roads and railroads to Southcentral Alaska. Copper, zinc, silver, platinum, lead, and other strategic metals have been and continue to be important in the economic and political chronicle of the State. Development and sustenance of many towns, roads, airfields, communication systems and even the Alaska Railroad continues to be attributable to the presence of the mining industry.

Opportunities for successful mining in Alaska continue, as the recent openings of several new mines and announcement of major discoveries attest. The challenges facing the industry are many. Subsequent to locating mineral resources, mining companies, as investors and developers, must weigh probability of success against a global portfolio of competing properties. Intrinsic to this investigation is evaluation of time and expenditure required from inception through capitalization to development, wherein factors such as the status, stability, and stipulations of the regulatory environment weigh as heavily as operating plans and equipment procurement.

A. Structure of the Metals Mining Industry Today

Precious and base metal mines are developed in stages from exploration, assessment, mine planning and development, permitting, and construction, and finally, production and marketing. Frequently, mineral discoveries are identified and subsequently claimed by individuals or small companies, then leased to "juniors"—small capitalization mining companies. The juniors will evaluate the prospect, and, based on their findings seek further exploration or development capital through alignment with one or more "major" (large capitalization, often multinational) mining companies. In Alaska, the complex land and mineral-estate title often introduces another participant in mine development. Through the Alaska Native Claims Settlement Act, (1971) Native Corporations have selected large land areas with high mineral potential, with the intent of pursuing development with the assistance of a "major." Recently, singular and collaborative exploration and development capitalization processes such as these have led to the opening of several world-class mines, notably, Red Dog, Fort Knox, Illinois Creek, Greens Creek and Nixon Fork Mines.

Advanced exploration or feasibility stage lode gold deposits, such as True North, located northeast of Fairbanks, Pogo, located east of Delta Junction, Donlin Creek, located in the central Kuskokwim, and Kensington, located near Juneau, are being vigorously explored and appear to be of size and tenure requisite for commercial development. Outstanding base

metal prospects and new reserves at existing mines are also being delineated. When coupled with current exploration expenditures and industrial minerals activity, it is possible that Alaska could have a new mine go into production every two years for the next eight to ten years. It must be noted, however, that, as with any commodity-driven primary industry, price sensitivity exposure is present. The following table shows recent price behavior for commodities important to Alaska.

Table 1. Spot Commodity Prices (Wholesale - US Dollars)		
Commodity	01May96	01May97
Antimony, American per lb.	\$2.45	\$1.60
Copper, Cathode full plate	\$1.28	\$1.17
Gold, troy oz. Handy & Harman	\$392.40	\$339.25
Silver, troy oz. Handy & Harman	\$5.34	\$4.73
Lead, lb.	\$0.48	\$0.48
Platinum NY Merc spot per troy oz.	\$407.80	\$374.10
Mercury, 76 lb flask NY	\$265.00	\$230.00
Zinc, lb.	\$0.50	\$0.62

Protracted gold price depression continues to cause concern in gold mining camps. As the decline extends, metal hedging and forward sales strategies may contribute less to operating margin while simultaneously becoming riskier. If the decline continues, future gold mine openings may be delayed. As gold price received approaches individual capital threshold, operating mines will extract higher tenure portions of their resource reserve, and consequently shorten mine life. Mines may also choose to delay scheduled development, equipment modernization, or forgo other capital intensive activities to maintain production profitability. Mergers and acquisitions, such as the recently announced Kinross Gold Corp./Amax Gold, Inc. merger, sustain economic viability by taking advantage of synergistic capital and operating capability.

B. Status of the Mining Industry in Alaska

Foreign Competition

Alaska competes with the rest of the world when attracting mining and development capital. Alaska offers a commercially competitive environment with a large land base open for exploration (approximately 300,000 square miles or 50% of the state), permissive geology, excellent infrastructure or marine accessibility, and sanctity and tenure of title through a stable political environment. To maintain competitive advantage over geologically prospective countries, when viewed from the prospective of multinational mining companies, Alaska must continue the "Open For Business" atmosphere promulgated during recent administrations. Even with the noted competitive advantages, more exploration money is spent in South America than any other continent, largely due to aggressive regulatory reforms adopted by Chile, Peru, Bolivia, and Argentina combined with recent discoveries of sizeable ore deposits. Interestingly, these reforms consist mainly of a systematic reduction in the bottlenecks and unnecessary delays in permitting exploration, development, and production activities, not in reduction of safety or environmental standards.

Table 2. Location of Corporate Headquarters for Selected Mining Companies Active in Alaska		
Company	Parent Company	Headquarters Location
Kennecott Exploration	RTZ	London
Cominco Alaska	Cominco Ltd.	Vancouver, B. C.
American Copper & Nickel	INCO Limited	Toronto, ON
Placer Dome US, Inc.	Placer Dome Inc.	Vancouver, B. C.
BHP Minerals	Broken Hill Proprietary Company	Melbourne, Australia
Alaska Gold Company	Mueller Industries Inc.	Wichita, Kansas
Fairbanks Gold Mining, Inc.	Amax Gold Inc.	Golden, Colorado
Nevada Goldfields Inc.	Consolidated Nevada Goldfields	Denver, Colorado
Hecla Mining Company	n/a	Coeur d' Alene, Idaho
Coeur Alaska	Coeur D' Alene Mining Company	Coeur d' Alene, Idaho

Value To State

In 1997 the total expenditures for exploration (\$58 million), development (\$153 million) and production topped \$1 billion for the second year running. The following chart shows the mining industry's value to Alaska since 1982.

Table 3. Total value of the mineral industry in Alaska by year. (in millions of dollars)				
Year	Exploration (expenditure)	Development (expenditure)	Production (value)	Total
1983	\$34.10	\$27.80	\$232.40	\$294.30
1984	\$22.80	\$53.60	\$199.40	\$275.80
1985	\$9.20	\$34.10	\$226.60	\$269.90
1986	\$8.90	\$24.30	\$198.50	\$231.70
1987	\$15.70	\$100.30	\$202.40	\$318.40
1988	\$45.50	\$275.00	\$232.20	\$552.70
1989	\$47.80	\$134.30	\$277.00	\$459.10
1990	\$63.30	\$14.30	\$533.00	\$610.60
1991	\$39.90	\$25.60	\$546.50	\$612.00
1992	\$30.20	\$30.00	\$560.80	\$621.00
1993	\$30.30	\$27.70	\$448.70	\$506.70
1994	\$31.10	\$44.90	\$507.50	\$583.50
1995	\$34.30	\$148.60	\$537.20	\$720.10
1996	\$44.60	\$394.00	\$590.40	\$1,029.00
1997	\$57.30	\$167.40	\$901.60	\$1,126.30
Total	\$515.00	\$1,601.90	\$6,194.20	\$8,211.10

From—Swainbank, Bundtzen, Clough, Henning, "Alaska's Mineral Industry, 1996)*
1997 estimates from Alaska Dept. of Commerce, DTD.

If exploration expenditures continue to successfully lead to new property developments such as noted above (POGO, Kensington, True North, Donlin Creek and others), there will be a

steady increase in the mining industry's contribution to the economy of the State. At present, initial higher grades, prudent marketing strategies, and price sensitivity elasticity have allowed the larger operating gold mines in Alaska to continue operations through the current depressed gold market conditions.

A further enhancement to the State economy could be realized with in-state processing of mine concentrates in smelters and refineries. For example, vertical integration accomplished through down-stream, value-added production is not uncommon in the U.S. Southwest, where copper ore is processed near the mines, and ore processing and refining jobs benefit the local economy. Finding alternatives to offshore ore treatment may be especially beneficial to the State, as the mining industry is growing when oil production, and revenues, are declining.

Tax Payments

As the mineral industry increases its presence in Alaska, there will be increases in the mining industry's contribution to the economy of the State. Last year, the State realized revenues from corporate income taxes paid by mining companies, plus approximately \$400,000 in mining license fees. Payments at the borough/municipality level are in (excess of \$5,000,000—finish this number) for property tax, plus other benefits, including lease payments to land trusts and Native Corporations and an electrical rate reduction in Fairbanks North Star Borough. Corporate contributions to charitable causes are a significant and reliable portion of non-profit funding. Taxation of mineral wealth is evolving, with debate focussed on two issues: (1) property tax valuations based on replacement cost or income produced, and, (2) State corporate tax derived from a percentage of metal concentrate produced, or taxation of net revenues. On both issues, one alternative allows the State or municipality to realize gains correlative to metal prices and mine performance, while the opposing alternative allows the taxing entity an income stream based on quantity of metal extracted. Clarification of these issues will assist mineral industry analysis and quantification of development costs in Alaska.

Jobs

In August 1996 there were 283,000 people employed in nonagricultural jobs in Alaska.² That year, the mining industry provided an estimated 3,760 full-time equivalent jobs in Alaska, up 10% from the previous year and representing 1.33% of the total nonagricultural jobs. The wages of the average miner were \$5,158 per month, second only to the oil industry. In addition to direct jobs, the economic multiplier effect of the mining industry expenditures is significant. For example, the Fort Knox gold mine near Fairbanks will spend about \$76 million on payroll, purchases, and taxes in Alaska in 1997. The current housing construction boom in Fairbanks is due mainly to the economic impact of the new mine, but construction work at the Healy Clean Coal Project, and Alyeska Pipeline operations cannot be discounted. Exploration also brings a lot of new money (\$58 million in 1997) and jobs into the State. This largely seasonal expenditure is spread more evenly throughout the State as local air charter operators, suppliers and labor benefit from geographically diverse operations. In contrast, large mining operations can create job site concentration in remote areas where employment opportunities were previously rare to nonexistent. The Red Dog, Nixon Fork and Greens Creek mines all offer rural residents jobs and the opportunity to develop and use marketable skills while earning a better living than otherwise possible. Secondly, training coupled with quality incomes allows small community entrepreneurship not realizable under pre-mine economic conditions.

At both Red Dog and Greens Creek, approximately 80% of mine employees are local residents, at Red Dog, approximately 50% of the mine employees are NANA Regional Corporation shareholders. These percentages are comparable to other large mines in the state. Greens Creek contributes approximately \$21 million in local payroll and purchased \$15 million in materials and supplies from Southeast Alaskan distributors during 1997. Mining companies in general have found that hiring locally is mutually beneficial; employees and their communities have a stake in the performance and profitability of the mine and the mine has an opportunity to exercise good citizenship within its community.

Land Availability—Access to Land for Mineral Development

Alaska has approximately 300,000 square miles (192 million acres) of land available for mineral entry, comprised of 53.3 million acres of Federal land and 95.4 million acres of State land open for claim location, and 44 million acres of Native Corporation land, available by negotiation. As can be noted from Table 4., below, almost half the land in Alaska is closed to mineral entry. Federal closures include National Parks and Preserves, National Monuments, Wild and Scenic Rivers, National Recreation and Conservation Areas, National Wildlife Refuges, Petroleum Reserves, etc. Large areas of National Forests, while not withdrawn from mineral entry, are restrictive. Notwithstanding the "No More" clause in the Alaska National Interest Lands Conservation Act (ANILCA), the Department of the Interior continues to advocate further major land withdrawals. Proposed and *de facto* "buffer zones" surrounding conservation units further enlarge the areas where development is prohibited.

Table 4. Land Status in Alaska				
CATEGORY		Total Acres (million acres)	Open to Mining (million acres)	Closed to Mineral Entry (million acres)
Federal Lands				
	National Park Service	52.0	0.0	52.0
	Fish and Wildlife Service	77.1	0.0	77.1
	US Forest Service	22.2	16.4	5.8
	Bureau of Land Management			
	National Petroleum Reserve	23.0	0.0	23.0
	Other lands	39.0	36.9	2.4
	Department of Defense	2.1	0.0	2.1
	Subtotal	215.4	53.3	162.4
State Lands				
	Division of Lands	80.8	75.7	5.1
	Div. of Parks...	3.0	0.0	3.0
	Division of Forestry	2.0	2.0	0.0
	Dept. of Fish & Game	1.8	0.0	1.8
	Not TA'd Selected/Conveyed	17.7	17.7	0.0
	Subtotal	105.3	95.4	9.9
Private Lands				
	Native Corporations	44.0	44.0	0.0
	Other Private	0.5	0.5	0.0
	Subtotal	44.5	44.5	0.0
	Total	365.2	193.2	172.3

Withdrawals of lands from mineral entry have an adverse impact on the economy of the state since closure prohibits discovery of valuable oil, gas and mineral deposits and corresponding revenues from development. Three of the most exciting mineral deposits in southeast Alaska (Quartz Hill, Greens Creek, and the Brady Glacier Copper-Nickel deposit) are in or are

surrounded by land with restrictive land classification that hinders or denies exploration and/or development.

The Permitting Process

In 1994, Governor Knowles named the Alaska Department of Natural Resources (DNR) as the lead agency for mine permitting. This is captured in AS 27.050.010(b), the Statute granting this authority. In part it reads:

"The department is the lead agency for all matters relating to the exploration, development, and management of mining, and, in its capacity as lead agency, shall coordinate all regulatory matters concerning mineral resource exploration, development, mining, and associated activities. Before a state agency takes action that may directly or indirectly affect the exploration, development, or management of mineral resources, the agency shall consult with and draw upon the mining expertise of the department."

Large hard-rock mines are multifaceted industrial complexes, and as such, the process for identifying and obtaining the variety of permits required to develop and then operate a mine is extraordinary. As the lead agency, DNR has developed a six-step process to coordinate the permitting of projects and mitigate conflicting requirements of the various permitting agencies. DNR does not supercede the responsibilities of any agency, but is responsible to the public process. Applicants are charged a fee for DNR coordination.

John Shively, head of the NANA Development Corporation during commissioning of the Red Dog Mine, is currently Commissioner of the DNR. In a talk to the Resource Development Council on September 18, 1997, he briefly described attempts by his Department to clarify and streamline the permitting process for project development. He noted that while as many as 84 permits may be considered for development of projects, not limited to mines, 56 are currently considered. By designating 'lead agency' status with DNR, both permit acquisition time and process complexity have been reduced. Further time reductions are anticipated as DNR encourages other agencies (DEC, DFG, etc.) to enter the permitting process at initiation. It is reported that Fort Knox, which is partly on federal land, invested over \$350 million in development during an eight-year period and required and obtained 41 permits. Echo Bay Mines, seeking to reopen the A-J mine near Juneau, spent eight years and \$10 million in permitting costs before the project was suspended. Since the DNR designation, the Illinois Creek mine, located on State land, completed the permitting process in 15 months, and the Kensington project is progressing through permitting more rapidly than would have been previously expected. Illinois Creek and Fort Knox, both on State land, required the following state permits:

Table 5. Type and Source for State Permits for Large Hard Rock Mines

From DNR	From DEC	From DF&G
Mining Lease	Consolidated Waste Disposal Permit	Fish Habitat Permits
Mill Site Permit	Air Quality Permit	Permit to Alter Stream Flow
Water Rights		
Reclamation Plan		
Plan of Operations		
Dam Safety		
Road Right-of-way		

In addition, wetland permits may be required from the Army of Corps of Engineers. On Federal lands, Environmental Protection Agency, US Dept of Transportation, US Forest Service, and US Coast Guard permits may be required as well. Permits for placer mines are varied and are significantly different than for hard rock mines.

C. Industry Snapshot

Red Dog

The Red Dog zinc-lead-silver mine, located in northwest Alaska, commenced production in 1989, and clearly illustrates the accomplishment achieved by a Native Corporation/multinational mining company/State agency (AIDA) partnership. At Red Dog, land selection and acquisition by NANA Regional Corporation, evaluation and development through production by Cominco Alaska, and port and road financing assistance by Alaska Industrial Development Authority, coupled with continued successful exploration has led to 10% of the world's zinc being exported from Northern Alaska. The Red Dog mine was the world's largest zinc mine in 1995, 1996 and 1997. The open-pit mine and ancillary port facility employ about 470 people. Currently another 300 employees are involved in upgrade and expansion projects; water treatment facilities, accommodation, concentrate storage, load out and dock facility, and tank construction are near or at completion. Permanent employment following expansion is expected to increase by 100 people and mine output will increase by about 35% from current levels of 373,000 tons of zinc in concentrate and 70,000 tons of lead in concentrate. The mine has a projected fifty year life.

Fort Knox

The Fort Knox open cast gold mine is located about 25 miles northeast of Fairbanks and reached via the Steese Highway and a short mine road. Amax Gold Inc. expended just short of \$400 million developing the mine for production. Ore grade averages 0.026 ounces of gold per ton of ore, and, by design, economy of scale is necessary for profitability. Design capacity of the mine is 36,500 tons of ore mined and processed each day, producing about 1,000 ounces of gold per day. During 1997, the first full year of production, Fort Knox produced 45,701 ounces prior to commercial production and an additional 320,233 ounces

of gold when fully commissioned. The mine has current reported reserves of 4.1 million ounces of gold, indicating an eleven year mine life. There are 246 permanent, Fairbanks based mine employees commuting by road to the mine. Because of the large electrical consumption by the mine, the Fairbanks electric utility subscribers experienced a 7% rate reduction, a singular but highly visible benefit from the mine. The recently announced merger agreement entered into between Amax Gold Inc. and Kinross Gold Corporation reduces debt currently carried by Fort Knox, presumably increasing tolerance to depressed gold prices.

Greens Creek

The Greens Creek Mine on northern Admiralty Island is within the U.S. Forest Service managed lands of the Admiralty Island National Monument. The underground silver-lead-zinc mine is owned by Hecla Mining Company (29%), and Kennecott Greens Creek Mining Company (71%), an RTZ subsidiary. After a several year closure, the mine resumed full production in 1996 following mill, concentrate storage and handling facility expansion and upgrade, and redesign of water treatment and underground facilities. According to plan, 1,320 tons of ore are trucked to surface and pass through the mill per day. Annual production will be about 62,000 ounces of gold, 11 million ounces of silver (20% of U.S. silver production), 79 million pounds of zinc, and 40 million pounds of lead. At present production and reported reserves, mine life will be about 17 years.

Nixon Fork

The Nixon Fork underground gold mine became the first hard rock gold mine to go into production in Alaska since World War II when it commenced production on October 6, 1995. Daily production of 150 tons of ore averages about 2.5 ounces of gold per ton plus copper. In 1997, the underground mine produced 40,000 ounces of gold and also shipped copper concentrate. The mine employs 65 people, with 40 workers on site and 25 out on rotation during normal shifting. The mine, located about 30 miles northeast of McGrath, is owned by Consolidated Nevada Goldfields Corporation.

Placer Gold Mining

Based on permit applications, about 140 placer gold mines reported production of about 90,000 ounces of gold worth approximately \$30 million in Alaska in 1997. These mines, concentrated in drainages and on alluvial terraces throughout the State, employed a total of about 850 people during the 1997 mining season.

Coal Mining

Briefly, Alaska has 60% of the U.S. coal reserves. Large deposits of low sulfur coal are known, including a world class deposit on the northern slope of the Brooks Range. Infrastructure requisite for North Slope coal exploitation has been proposed but remains primitive to non-existent, precluding large scale development of the resource. Coal fields along the Gulf of Alaska, Cook Inlet and in the Susitna Valley have yet to meet economic hurdles. Usibelli Coal Mine, near Healy, is the only operating coal mine in Alaska.

Usibelli Coal

In 1997 Usibelli Coal Mine produced approximately 1.5 million short tons of ultra-low sulfur, high ash product using state-of-the-art mining and reclamation methods. Usibelli is a family owned business which has supplied coal to meet Alaska energy needs for over 50 years. The mine employs about 120 people, some of whom are second and third generation employees. Mine-mouth electrical generation produces power for the Fairbanks market and a second plant is under construction. The new plant, called the Healy Clean Coal Project, will be a 50MW power generation plant using a new coal combustion technology. Commercial operation is expected in 1999.

Low Rank Coal Water Fuel

The Alaska Science and Technology Foundation recently joined with University of Alaska, US Department of Energy and Usibelli Coal Mine in demonstrating feasibility of power production in converted boilers and diesel engines using low rank coal-water fuel slurries (LRCWF). There is increasing interest in development of the Beluga Coal Fields on the west side of Cook Inlet as export coal, or as a source for LRCWF.

Prospective Geology

The geology of Alaska is complicated and diverse, containing Pacific Rim and continental geologic suites of marine to terrigenous rocks ranging in age from lower Paleozoic or preCambrian to recent, from flat lying to complexly folded and intruded, of varied metamorphic grade, and barren to highly mineralized or carbon bearing. As global exploration sophistication and mineral extraction technology advances, Alaskan mineral resources become better understood and more competently located and developed.

Deposits of the size and tenor requisite for attracting the attention of major mining companies are in production (Red Dog) or are currently being evaluated for development (Donlin Creek, Pogo, Ambler Copper belt) in Alaska. Other prospective mineral occurrences await infrastructure maturation or regulatory change. For instance, at the Red Dog mine, production is derived from lead-zinc mineralization hosted in a distinctive group of rocks known as the Lizburne Suite. This belt of rocks can be traced to the northeast and east for hundreds of miles, along which there are numerous areas of lead-zinc mineralization similar to Red Dog. Unfortunately, most of the Lizburne is in National Petroleum Reserve-Alaska and is withdrawn from mineral entry. Other similar lead-zinc deposits are known in the southern part of the Arctic National Wildlife Refuge. North of the upper Kobuk valley, numerous copper-zinc deposits are hosted in a belt of marine volcanogenic rocks. Requisite infrastructure development commensurate to mine development currently makes these deposits uneconomic. In all of Alaska, over 6,200 mineral deposits are known. With new exploration techniques and mineral deposit models, many more deposits will be found. However, as noted earlier, even with land closures and areas of prohibitively expensive infrastructure development, mineral properties continue to be located and evaluated for development at an exhilarating speed.

D. Does Alaska Want a Mining Industry?

In certain areas of the state, such as Nome and Fairbanks, mining has always been a mainstay of the local economy and a significant part of the local culture. Local support for the Fort Knox mine accelerated the permitting process as people seeking mine employment

encouraged process completion. Contrarily, intense stakeholder involvement can negatively impact the permitting process, and unquantified testimony often appears to have more influence than mining company or scientific documentation. For instance, as noted above, Echo Bay Mines, Ltd. spent in excess of \$100 million and 10 years while attempting to acquire permits to reopen the AJ mine, and, in the face of continued opposition from local residents, relinquished the property prior to permit process completion. In Alaska, the largest industrial sectors capitalize on natural resources, such as commercial fishing, oil and gas, mining, recreation and tourism. Diversification of Alaska's industries is a common prescription given to guarantee a stable and healthy economy, and diversification as well as vertical integration, and in-State sourcing of material and supplies have become increasingly important revenue as oil receipts decline. A positive consequence of a healthy economy is stable real estate price appreciation. As on the global horizon, stable economics engender increased political stability; in Alaska's case, increased regulatory stability and, optimistically, efficiency.

As noted above, control of the resource base is integral to resource development. Alaskan Native Corporations received 44 million acres of land when Congress enacted the Alaska Native Claims Settlement Act of 1971. The selection process allowed Native Corporations to select lands based upon individually defined merits, such as subsistence value, real estate value, coal, oil and gas, and mineral resources, *etc.* Since much of the land was selected for mineral potential, increase of mining revenues from Native lands is probable. From the mining industry perspective, joint venture or lease agreements with Native Corporations have advantages over claim staking on Federal or State lands, notably, political support for development and accessibility. One of the many positive repercussions of the Red Dog Mine is that it has demonstrated the positive economic role that mining can play, and that mining can coexist with other traditional uses of Native resources.

E. Characteristics of a Viable Alaskan Mining Industry

A viable mining industry must consist of risk-averse companies with economically efficient production. Members of the industry must strive to meet or exceed environmental standards, and employ the latest and best technology to improve product quality, quantity and cost, safety and viability of workforce and the environment, and investor and stakeholder relations

Responsible Mining Companies

Mining gives rise to environmental change with variable impact. Either above or underground, rock is moved, crushed, processed, and stored. In the not too distant past, extractive technology was rudimentary, understanding of mining impacts was minimal; and acid mine drainage and acid rain were problematic during mining and smelting ventures. Economic, strategic and military survival forced initiation and continuation of many practices that are now deemed primitive. Mining companies are the first to acknowledge that the times have changed. Mining company survival now depends on recognition, utilization or development of technologies that minimize impact. During the intense scrutiny that constitutes the State and Federal permitting process, regulators focus on all impacts of the proposed activities. The final mine plan becomes a collaborative effort, ensuring that best practices are achieved in every aspect of the proposed activity, from discovery to reclamation. Equally with the industrial impacts, extraneous impacts, such as the character and population change in the mining community, educational benefits, and closure issues are entertained and addressed. Continued compliance to permitted activities and stipulations is monitored by permitting agencies, and not infrequently by stakeholders unassociated with the mine through agency or employment. Many contingencies are in the regulations, and the penalties for infractions can be severe.

Workplace safety is crucial to efficient operations, community relations and mine survival. Alaska is proud to acknowledge the safety record maintained at hard-rock mines within the State. For example, during 1997, Greens Creek Mine was proposed for the prestigious Sentinels of Safety award, given in recognition of lost-time accident free operation. Red Dog reported and a rate of two accidents per 200,000 hours worked. Mine working conditions, workplace equipment and appropriate skill-levels are continuously monitored. Job and skill levels are enhanced through training and experience; qualified safety, mine rescue and medical personnel rigorously reviewed, and sophisticated air, water and rock monitoring systems consistently employed. Safe operations are not an accident—they require planning, initiation and commitment from all employees.

Today's mine employees enjoy benefit packages that reflect the positive economics of retaining and rewarding employees and reducing "turn-over". Wages are among the highest in the State, reflecting the skill levels required. In addition, mining companies routinely support education programs with cash or equipment donations, matching funds, scholarships, research grants, *etc.* to increase the talent pool from which to draw employees.

The Economic Feasibility of Medium and Large Scale Mines

Alaskan mine ownership and operation ranges in scale from "mom and pop" to those run by Fortune-500 classed companies. Thirty years ago, gold mining was characterized by family-owned and operated placer gold mines scattered around the State. The mine owner was, by necessity, accountant, surveyor, equipment operator, and marketing manager. Occasionally, value-added products were derived by making jewelry or other retail items from a portion of the summer's production. Today, the family mine is rapidly becoming a thing of the past. Increased equipment, operation, and compliance costs have forced consolidation and reduced the number of operations throughout the state. Partnerships and small corporations are more typical now. Placer mines tend to have lower capitalization costs than lode mines. The Valdez Creek Mine, operated by Cambior, was the largest placer mine in North America and had production levels (80,000 oz./year) comparable to a lode mine before exhausting reserves in 1995.

Alaska is now in the era of mines operated by medium-sized and large corporations. Capital requirements to commence production are high, mining technology must be state-of-the-art, ore tenure together with economies of scale drive the bottom line, and global competitive position must be considered. The Red Dog and Fort Knox Mines typify this new era. In 1995 and 1996, the Red Dog Mine produced more zinc than any other mine in the world despite an Arctic climate, a three month shipping season, and at a cost that allowed a profit to be made in spite of marginal prices for zinc, lead, and silver.

Commodity prices are determined by global market conditions; Alaskan mines must be globally competitive because these are the markets they produce for. The mine revenue or margin, or the return received by investors is the portion of revenues in excess of the value of recovered gold less cost of location, physical extraction, processing, taxation, debt service, and waste disposal and reclamation. High-risk projects, such as Fort Knox, survive margin analysis during feasibility studies by demonstrating that survival through commodity price fluctuations is probable. The average grade of the ore at Fort Knox is 0.026 ounces of gold per ton, with a gold-in-ore value of \$7.80 per ton (at \$300/ounce). All costs and processes plus an investor return must be less than \$7.80 for each ton of rock moved, thus illustrating that economy of scale is imperative. Risk abatement practices, such as forward selling and conservative reserve analysis coupled with margin normalizing and debt restructuring flexibility can increase the probability for maintaining economic viability during depressed metal markets. The inescapable fact is that the tenure of the resource ultimately drives the

economics of the mine, and the even best management and development schemes cannot overcome feasibility models that do not allow for sustained profitability.

The management systems, equipment, and technology used by Alaska's larger mining operations rival the competition around the world. As with comparable industrial processes, equipment is selected to optimize profitability while maintaining safe and environmentally acceptable operating conditions. The entire operation is continually scrutinized to decrease in overall costs. A modern mine is like a Swiss watch—every piece is working precisely with every other piece.

State-of-the-Art Technology

New technology has brought about lucrative opportunities in mining, creating opportunities to mine ores that were previously uneconomic. For example, industry utilizes recent technical advances to achieve profitability with previously uneconomic lower grade or metallurgically complex ores. "Technology" encompasses many disciplines. Process technology, process control technology, component monitoring, remote sensing and remote control mining, combined with state of the art environmental technology and materials handling procedures economize operations and enable environmental compatibility. Computer assisted applications are integrated into every aspect of mining, including maintenance scheduling, modeling optimum mining sequence of the ore deposit, monitoring processes in the mill, GPS tracking of vehicles, and just-in-time materials procurement. Larger scale heavy equipment has also enabled unprecedented economy of scale in some operations, but the days of "bigger is better" have been replaced by "smarter is better."

Educated and Capable Workforce

New process technology has placed new demands on the Alaskan workforce and opened opportunities in existing sectors. For years, the University of Alaska graduated mining engineers who faced limited degree-specific job opportunities in Alaska. The development and commissioning of new mines has changed this. Technology assisted operations take varying degrees of training, and mining-related preparation is receiving increasing demand at the University of Alaska. Heavy equipment operation and maintenance, though integral, is not as specific to mining, and displaced forest industry workers are having success in mining jobs. Construction of the Trans-Alaska Pipeline and the very high standards required for pipeline welders has also contributed to the Alaskan workforce skill base. Skilled and industry-ready accountants, analysts, personnel, safety and public relations staff are available in Alaska. Skilled underground miners are internationally sought after, and consequently, frequently amongst the highest paid mine employees.

F. Obstacles To Overcome

A decision to proceed is made at each step of the exploration, evaluation, feasibility and operation assessment of a potential ore-body. The outcome of each decision is dictated by risk determination and financing availability. A negative determination results in mineral property sale or title relinquishment. Each positive advancement decision results in increasingly in-depth and precise cost determination for each stage of development, coupled with exponentially increasing evaluation or development costs. Initially this process moves a mineral location to the property acquisition (claim or lease) stage. Quantitative processes, such as remote sensing and drilling follow acquisition of title. If merited, feasibility and permitting is initiated. Infrastructure and mine design are evaluated, and acquisition of requisite permission from regulatory agencies is undertaken. Interestingly, the two factors

with the most unpredictable outcomes occur independently at the beginning and near end of the process. Prospecting has long been characterized as a profession for the speculative. Likewise, from a time and dollar investment perspective, the large-mine permitting process is difficult to quantify.

Baseline Knowledge—Maps & Geophysical Data

Although Alaska has significant mineral potential, publicly funded mapping of the state, particularly with respect to geologic features is incomplete. It is estimated that only 5% of Alaska has been explored using modern techniques.

A State-funded airborne geophysical mapping effort was begun in 1992 to encourage mineral location and development within the State. The Alaska Business Monthly (1/98) reports that, to date, 2.3 million acres of State lands have been surveyed, at a cost of \$2.6 million. The DGGs, as program manager, has targeted areas with known mineral potential and industry has followed, expending millions of dollars in the recently surveyed areas. The survey employs airborne sensors to measure variations in the earth's magnetic field, and identify areas with anomalous electrical conductors in the subsurface. Survey data can be purchased unfiltered, or as color-contoured maps that show the magnetic and conductive properties of the area. To date, airborne geophysical surveys have been flown in thirteen target areas: Circle, Fairbanks, Nome, Nyc, Valdez Creek, Richardson, Rampart-Manley, Chulitna, Petersburg, Stikine, Ruby, Iron Creek and Koyukuk.

Satellite and remote sensing data are becoming increasingly available. The University of Alaska Fairbanks' Geophysical Institute is establishing a facility to gather SAR (Synthetic Aperture Radar) data for creation of a digital elevation and surface mapping database. Initial study areas will evaluate sites that demonstrate high mineral potential, have transportation access, and are already covered by a DGGs airborne survey. Maps derived from combined data will give new insight into the mineral potential of large areas.

Publicly funded mapping of Alaskan bedrock geology remains largely uncompleted, even though it can be an important management tool for identifying extractable construction resources such as gravel and rock, or geologic hazards, such as fault or landslide zones. In comparison, much of Alaska is yet to be mapped at a scale of 1:250,000 while most of the lower 48 has been mapped at 1:63,360 or 1:25,000. Geologic mapping initiated by the private sector is more complete, targeted toward locatable minerals, privately held, and largely unavailable because of industry competitiveness and the high cost of origination.

Permitting Issues

Among the most enigmatic of the multiple permitting issues required for industrial development in Alaska are air and water quality permits. Alaska's large climactic range, variable topography and preponderance of streams and drainages make it difficult to gather and have available the reliable and consistent water quality data needed to effectively develop a new mining property. Frequently, data depicting background levels of metals and metal-speciation in streams is not available, let alone effects of seasonal stream flow variation. Methodical mineral development schemes include collection of background data prior to invasive mineral activity so that water discharge or other impacts can be measured against background rather than artificial standards.

To sanctify this process, an initiative has been undertaken by the Alaska Producers Council with the cooperation of the Alaska Department of Environmental Conservation. The Initiative proposes a State and privately funded program to establish baseline water quality data for

high priority drainages in Alaska so that background quality can be agreed upon prior to disturbance.

House Bill No. 128, introduced in the 20th (1997) Session of the State Legislature is "An Act...directing the Department of Environmental Conservation to conduct water quality research" and "establishing the Water Science Oversight Board". The intent of this Act is to direct the DEC to develop a water quality information base that can be used to develop valid water quality standards. The Water quality oversight Board will participate in the DEC's water quality research, and formulation of ensuing regulations. The bill is currently in committee (1998 Session) and, if passed, could provide outcome-based water quality standards.

History—Permitting Quartz Hill & Alaska-Juneau

In 1974 U.S. Borax discovered the Quartz Hill molybdenum deposit about 40 miles east of Ketchikan. A large scale exploration program was initiated, and as the massive size of the deposit became apparent, hopes were high for a mine to be in production by 1988. The reserve estimate of 1.5 billion tons of ore averaging 0.136 percent molybdenum indicates that Quartz Hill contains at least 10% of the western world's molybdenum.

In December 1978 the Department of the Interior established the Misty Fjords National Monument, which surrounded the prospect. In 1980, ANILCA was passed, which excluded 100,000 acres of the deposit from the National Monument. Nevertheless, permitting became difficult as U.S. Borax, the Forest Service and the Environmental Protection Agency tried to work out an agreement for the disposal of the mine tailings. Submarine disposal of the tailings, an environmentally sound procedure used at Island Copper on Vancouver Island, was the disposal method preferred by U. S. Borax. A strong environmental and fishing industry lobbying effort disputed the viability of this method.

After spending over \$100 million, 25% of which was for permitting, U. S. Borax terminated all work on the development of the mine and eventually sold the property for a rumored amount that was less than 10% of the amount they had spent. The proposed mine would have employed at least 7-800 people over a mine life estimated at seventy years.

The Alaska-Juneau mine was a large gold mine active from the turn of the century until World War II, and the mining town of Juneau became the capital of Territorial Alaska because of it's presence. Echo Bay Mines began a systematic evaluation and exploration program of the Alaska-Juneau mine in 1985, and over the next twelve years spent \$110 million on exploration, rehabilitation and permitting. During the permitting process the proposed mine reopening drew the attention of, and strong opposition from, a local citizens group. As part of the operation permitting process, Echo Bay Mines' initial Environmental Impact Statement (EIS) proposed submarine disposal of mine tailings, but were instructed by EPA that this method was not permissible. After considerable time and expense, Echo Bay produced a supplemental EIS with a redesigned mine plan. They were then denied on-shore disposal and instructed to reconsider underwater disposal. Echo Bay terminated all efforts to develop the mine in early 1997 before a final ruling on submarine disposal was made.

The AJ and Quartz Hill examples illustrate differing Federal, State and Municipal involvement in the permitting process, and difficulties present when attempting to get large mines into production. The negative impacts of the timely review of operating and discharge permits, change in land status, and a process that allowed non-financial participants to control the permitting process are often cited by companies who are considering involvement in minerals exploration and development in the State. Legislative oversight is beginning to change agency mandate, and defining agency roll in the permitting process. Early involvement

between public and private sectors increases the potential for a predictable and workable regulatory process. Recognition of non-industry stakeholders early in the permitting process often brings issues to the attention of industry within a timeframe reasonable for resolution.

Factors Unique to Alaska

Location

Alaska is the "air cross roads of the world"; Anchorage International Airport ranks number one in the nation in handling cargo tonnage. From a mining perspective, Alaska is a long distance from the smelters and finished-metal markets for metal concentrates. In the past, the exploration effort often targeted gold proximal to historical mining camps and their access routes, both because of reduced shipping costs associated with shipping a high value to weight product, and because of the probability of locating lode gold following placer location. Other metals, notably lead, zinc and silver are becoming increasingly important as both primary and bi-product metals, however, concentrate shipping costs and smelter obligations do add an extra tier of expense to mine economics. Accepting smelter services are located throughout the Pacific Rim; concentrate shipments from Alaska have become common.

Climate

Although a significant portion of Alaska experiences a seasonal exploration window, there are no parts of Alaska that have climate prohibitive to mineral development. In fact, parts of Alaska have temperate climate (SE and SW) or dry to arid climates (interior). Further, industrialization of northern climes is a global phenomenon, and a great deal of research and technical innovation has been accomplished to overcome obstacles. University of Alaska engineering disciplines distinguish themselves as "cold weather experts" with expertise in engineering problems facing developers in arctic regions.

Poor Infrastructure

Alaska competes poorly with developed nations for instate transportation infrastructure. Although the current infrastructure portfolio is not substantially lower than lesser-developed countries, it is more expensive to build roads, airports, and railways in Alaska. However, sophisticated communications systems, state of the art medical services, energy supply, education and research facilities plus a thriving business climate enhance Alaska's global competitive position.

The State of Alaska continues to support development through State budget discipline and agency partnership. The Alaska Industrial Development and Export Authority (AIDEA) was employed to relieve certain infrastructure costs by providing project-specific bridge or construction loans. This approach to infrastructure development is beneficial because it can remove a significant capital component from the overall cost of developing a mine. AIDEA financed and built the Red Dog road and port site and is currently expanding those facilities. Cominco Alaska Inc., the operator of the Red Dog Mine, maintains the road and pays a monthly use fee, which is presumed to refund the investment plus provides additional capital for other AIDEA projects.

G. Strategy For Growth and Development

The Alaskan mining industry is still in its infancy. The global mining industry generally views Alaska as a favorable place to invest exploration dollars, which means it is a good place in which to have producing mines. It is a fact, however, that for a deposit to be economic to mine in Alaska, it must be higher grade than anywhere else in the U.S., or of significantly large size to recover exploration and development costs.

Alaska needs a healthy and viable mining industry. Sustained growth and progress for the industry requires initiative by the private sector in conjunction with strong cooperative efforts on the part of the state government. The following are components of an overall strategy to meet those goals with identified key participants.

Establish Background Data Bases

- ◆ Develop new or unique mapping techniques in collaboration with the UAF Geophysical Institute incorporating SAR data into conventional mapping (ASTF, UAF, and Industry).
- ◆ Continue/expand the geophysical data collection for additional mining districts (DNR, Industry, and Legislature).
- ◆ Conduct joint field research to establish background metal concentration levels in important watersheds (DNR, DEC, ASTF, Industry, Legislature).

Standards and Permitting

- ◆ Develop a jointly supported water chemistry project to conduct the scientific research to define the appropriate water quality standards affecting coal, placer, and hard rock mines (DEC, ASTF, Industry, Legislature).

Research

- ◆ Define and conduct R&D on innovative exploration, processing, or refining techniques specifically aimed at development of Alaskan ore bodies (UA, ASTF, Industry, BLM, US DOE, etc.).
- ◆ Continue/enhance work on alternate products from low rank coals (UA, ASTF, US DOE, Industry)

Infrastructure

- ◆ Infrastructure development should be continued cooperatively by industry and the State using the Red Dog Mine as an example (AIDEA, Industry).
- ◆ Define and address institutional and/or technical issues which impede Alaska mining companies and support industries to enhance Alaska's international competitiveness. (ACED, DNR, AIDEA, Industry)

- ◆ Continue the review of legislation affecting the industry, support proactive legislation. (State agencies, Legislature, Industry)

Education

- ◆ Ensure that mineral resource curricula (mining engineering, geology, petroleum engineering, etc.) remain viable at the University of Alaska (UAF, Industry, Legislature)
- ◆ Develop and include a balance and scientifically based natural resource curricula within the state's school system (Department of Education, Industry, Legislature, UAA, and UAF).

Several organizations are assuming issue specific leadership roles in the Alaskan mining community. As the industry continues to mature, significant progress in key technical and regulatory areas will enable the industry to grow steadily, thereby making an increasingly substantial contribution to the economy of the state and the well-being of its residents. To balance the investment, the industry needs a measure of certainty in content of regulatory requirements and increased predictability of mine development and permitting to assure that the risks are known before mining projects are undertaken. Alaska is "Open For Business" and, in the words of Governor Knowles, Alaska welcomes industry that hires Alaskans, uses Alaskan businesses and develops resources while protecting air, water and wildlife habitat.

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Chapter V

Non-Oil Energy

Overview

Why is the State of Alaska in the energy business? How does the state actively and positively stimulate growth and development of Alaska's energy sector, and how does the state exit from components of the energy business that are better served by energy producers and resellers?

In the past, the state has attempted to marshal available resources from the public and private sectors in strategic plans where programs and resources are identified. However, these strategic plans did not enable any entity to coordinate the resources available to carry out the goals of the strategic plans. As a result, the strategic plans of the state have tended to be little more than self-serving defenses of existing programs and projects.

This Energy Sector Analysis is intended to present a historical reference for considering the existing and future energy needs of Alaska, a brief review of energy programs that have been in place in Alaska over the years, and a set of considerations to address these issues. As such, this analysis is intended to provide information for further discussion by vertically integrated user/provider councils representing the strategic energy interests of the people of Alaska. This analysis is divided into a discussion of Alaska's energy resources and infrastructure, and Alaska's electric utility industry.

Alaska's Energy Resources and Infrastructure

Alaska contains several of North America's most significant energy resources. Yet, these resources remain undeveloped due to the costs of producing the resource (exploration and transportation), access difficulties, lack of identified markets, or other legal impediments to resource development.

Coal Energy

The coal resources of the state have faced many of the same limiting forces as Alaska's other natural resources. Location is not a strategic advantage for Alaska's coal resources. Neither is price or supply. Alaska has more than 5 trillion tons of coal reserves, representing more than 50 percent of the total reserves of the United States. Of Alaska's coal reserves, nearly half are high-grade bituminous coals located in the Arctic. The other half are low-grade (sub-bituminous) coals located close to Cook Inlet or in interior Alaska, locations easily accessible to ice-free ports. How much of these reserves can be extracted and developed, due to the engineering and economic challenges, remains to be determined.

Alaska's sub-bituminous coal will be sought by world markets only when it can be delivered to those world markets in a form competitive with world oil supplies at competitive prices with firm delivery commitments. This requires that the sub-bituminous coal resources of Alaska be demonstrated to be competitive substitutes for oil products, and that supply can be guaranteed in order to secure long-term purchase contracts.

To demonstrate that Alaska's sub-bituminous coal is a competitive substitute for oil products means that the per dollar energy output of Alaskan coal is equivalent or better than the per dollar energy output of other available oil products or coal resources. However, the low-sulfur (low-rank) content of Alaska's coal is an important advantage in a world that is increasingly concerned about the environment. Alaska's low-rank sub-bituminous coal will be strategically competitive in markets where long-term purchase commitments can be secured which allow the capital investments in technologies necessary to operate energy generating facilities on Alaskan coals, and which are forced to switch from their use of high-sulfur coals due to environmental requirements or lack of firm suppliers.

The bituminous coal reserves of the Arctic are six miles east of tidewater (the Chukchi Sea), and existing exploration plans call for underground mining operations. However, the tidewater is not ice-free, and year-round operations would require that coal produced during the winter be stockpiled during the winter for transport during the summer. The advantage bituminous coals have over sub-bituminous coals is that market demand is well established.

The enormous costs of developing Alaska's coal resources and the limited size of Alaska's energy markets have both contributed to decisions by coal deposit owners to look outside of Alaska for markets for their coal. This is not a strategy imposed from outside interests, as both Alaskans and interests located outside the state own the coal in Alaska.

Alternative Energy Technologies

Alternative energy technologies have received considerable attention in Alaska. These have included geothermal, wind, solar, batteries, bioenergy, hydro, and hybrids which combine systems to take advantage of intermittent opportunities for energy production from renewable resources. In the past, the question of financing the long-term capital costs of alternative energy technology development was posed in terms of the state looking to its own best interests over the long-term. It may be that the best approach is for the state to share funding of the development risk, namely financing technology development, leaving the market and management risk to firms operating in the private sector. The advantages of this approach are that local users can choose from an array of available technologies; the state participates only in the technology development; there will likely be markets for the technology outside of Alaska (resulting in export income to the state's economy); and by appropriate incentives, production can be done in Alaska, further expanding the economic base of the state.

The principal aim of alternative energy technologies is to displace diesel fuel as an energy source. Diesel fired generators have several principal disadvantages:

- 1) the cost of energy is tied to world oil prices and is typically a substantial component of the cost of power in small communities;
- 2) storing diesel fuels in remote Alaskan communities has resulted in environmental contamination which will be expensive to cleanup, and will require significant repair costs to bring the storage tank facilities up to regulatory requirements;
- 3) diesels are relatively inefficient and have a short economic life, typically 10 to 15 years; and
- 4) diesel fuel can only be brought into many Alaska villages once or twice a year, thus necessitating large capacity on-site fuel storage facilities. It should be noted that diesel fired generators offer advantages as well:
 - a. they are relatively simple to operate and maintain when compared to most other commercially available small generator options;
 - b. they have a proven track record in rural Alaska;

- c. diesel is a nonvolatile fuel which is relatively safe to handle; and
- d. the initial installed capital cost is low in comparison to existing alternatives.

Gas Energy Resources

Alaska's natural gas resources are suspected to be plentiful and dispersed around the state. Proven reserves include the North Slope and Cook Inlet. The Anchorage area enjoys low-cost natural gas provided from the Beluga and Cook Inlet fields. The North Slope of Alaska contains significant undeveloped gas reserves, and interest in building a Trans-Alaska Gas (TAGS) System has been increasing in recent years. However, to date, oil producers on the North Slope have been content to re-inject the gas to bolster declining oil production through gas lift.

Natural gas reserves are also thought to exist throughout the state in small quantities that might prove to be economical for regional energy production.

Alaska's Electric Energy Industry

It is ironic that Alaska possesses the largest energy reserves of North America, and yet faces a near-term energy and fuel storage crisis in many of its communities. Electric energy construction and consumption has been heavily subsidized in most of Alaska's communities (urban and rural). It is now foreseeable that those subsidies will be reduced or eliminated due to declining oil revenues, with a substantial impact on the economic health of those communities.

The Need for Electric Energy in Alaska & the Role of Government

Electric energy is essential to Alaska's people and economy. Nearly every community in Alaska is served by a centralized power system, providing power to residential, commercial and institutional customers. Public services such as water, sewer, and telecommunications rely on electric energy, as do public facilities and institutions such as schools, churches, clinics, city halls, community centers, airports and docks. Businesses such as stores, restaurants, hotels, processing plants, sawmills and mines need electric energy to operate.

The economic viability of a community is dependent on the availability of reliable and affordable electric energy. To avert disaster, or when disaster strikes, the state has stepped forward with money and personnel. It is for these two reasons: economic development and disaster prevention and response, that the state is in the energy business.

In some parts of rural Alaska, residents face conditions usually seen only in third-world countries. Basic utility services are often nonexistent. The only exception has been the provision of reliable and affordable electric energy to all Alaskans. What is the commitment of the state? Does Alaska want to remain in the energy business by: providing operating or capital subsidies; providing assistance to small utilities that cannot achieve economies of scale; or providing the technical and professional resources to operate effectively and efficiently?

If state government is going to stay in the energy business, then one of the first questions that must be answered concerns the level of participation by the state in energy production and development, and whether the long-term commitment of the state to supply energy needs can be guaranteed. If the state continues to provide resources to replace aging or

destroyed diesel powerhouses, should it also collect revenues from those communities to cover the cost of replacement and replenish sinking funds intended to provide replacement of capital assets?

If government is going to get out of the energy business, then the planning and implementation of that goal needs to begin now in order to meet the long-lead times traditionally associated with the electric energy industry. The changing role of government in Alaska should also be addressed as the future of energy supply begins to change due to the introduction of independent power producers (IPP's) who are able to supply electric energy on relatively short notice (eighteen months).

A Brief History of Electrification in Alaska

Federal Investment

The federal government recognized the importance of electricity to economic development, and realized that the initial capital cost of electrification was too high to be borne at the outset by the individual consumer. Therefore, the costs and benefits of electrification were borne by all members of society through the use of government funding of infrastructure.

By the time Alaska was ready for a substantial share of its electric energy infrastructure development, most of the federal funding for energy projects had disappeared. The exceptions in the state of Alaska are the Eklutna and Snettisham hydroelectric projects and low interest loan programs under the Rural Electrification Administration (REA). One of the principal mechanisms for reducing the cost of electric energy: building transmission systems to create large, efficient, interconnected systems, will only work in limited regions of Alaska, such as the railbelt region or where villages are tightly clustered together. For most of Alaska, communities are too far apart or are separated by terrain that is not well suited for the construction of transmission lines.

Legislation recently passed by Congress (the Rural Electrification Loan Restructuring Act of 1993) will increase the cost of financing for most of Alaska's nonprofit electric cooperatives, but it will also provide better access to that financing for electric system improvements in rural areas. Now, federal funds can be used to improve electric service in rural areas of Alaska that had previously been considered ineligible for the REA program simply because they already had some form of central service.

State Investment

The state of Alaska has invested heavily in its electric energy infrastructure. By some estimates, the total is between \$1.4 billion and \$2.0 billion over the past twenty years. Of this, according to the recently released Alaska Energy Strategy (April 1994), the state invested over \$370 million in rural area projects and programs (approximately 30%), and over \$730 million in large-scale transmission and hydro projects in the railbelt and around the state (approximately 70%). These infrastructure investments continue to provide returns to Alaska, but the operation and maintenance of electric energy systems requires a cash flow which is difficult for small isolated electric utilities to sustain in communities where a substantial portion of the economy is based upon a subsistence economy.

Through 1994, nearly \$217 million has been spent on Power Cost Equalization (PCE) and its predecessor programs. PCE paid a share of the cost of electricity, rather than investing

to provide electric energy at lower cost. Today, many of the tiny independent village systems (approximately 80 utilities) that serve less than 200 customers still:

- ◆ do not employ trained and qualified utility managers and plant operators;
- ◆ do not have a sinking fund for equipment renewals and replacements;
- ◆ do not purchase insurance on utility facilities;
- ◆ do not have an effective preventative maintenance program; and
- ◆ do not pay the true cost of environmental cleanup due to fuel spills.

State-funded schools are often the largest customer for small utilities, and so it becomes profitable to move rates to their highest levels and thereby maximize revenue collection from the school (the state), and from the PCE program (the state). Small utility systems in Alaska have had few incentives to cover all of their costs through revenue generation because the state has stepped forward to pay for:

- ◆ training for plant operators;
- ◆ technical and maintenance assistance;
- ◆ system renewals, replacements and upgrades; and
- ◆ emergency and disaster response.

It should be made clear, however, that there are several utilities (who serve the majority of Alaska's population) that are of viable size and are not wards of the state. For example, Alaska village Electric cooperative (AVEC) serves 50 communities, is self-sufficient, and other than PCE, is not dependent on the state for anything. AVEC's capital structure is \$29 million in debt from REA and \$22 million in equity. PCE comprises about one third of AVEC's operating revenue.

PCE is critically important to all the utilities serving villages. Even with PCE, the cost of power in the villages is double the cost in urban areas. Without PCE these very low income communities cannot afford electricity nor the things that electricity makes possible, such as water and sewer service, and telecommunications.

The Alaska Power Authority was created in the late 1970's with a broad mandate to identify and construct large scale energy projects in the state. As the need and economic viability of large-scale projects became questionable, the Power Authority changed its name and sought to redefine its role in Alaska's energy industry. Finally, in 1994, the agency became the Division of Energy and has focused on providing services.

As originally created, the Alaska Power Authority was governed by a five-member Board of Directors, with four members selected from the private sector, and one public employee. Day-to-day operations were managed by an Executive Director. However, as the stakes grew higher, the Board was altered to include three Commissioners, and two private sector members. Though such an arrangement provides an Administration the opportunity to have more oversight of agency decisions, it also tends to overemphasize the political side of decision making, at the expense of decisions based upon technical or financial merit.

Alaska's Electric Utility Industry

Alaska has nearly 120 independent utilities that serve a population of less than 600,000. The states of Washington, Montana, Idaho and Oregon combined have a fewer number of independent utilities. The large number of independent utilities can be attributed to equal parts geography and the quest for self-determination. In fact, approximately 80 of these independent utilities serve populations of less than 200 people.

Every utility in Alaska, including the small utilities, is responsible for the following: its own management and administrative services, such as billing and accounting, collections, PCE program filings, insurance coverage, financial and power supply planning, legal matters, and office facilities. Each utility is also responsible for providing technical and professional services such as engineering; operation and maintenance of generation, distribution, and fuel delivery and storage systems; renewal and replacement of those systems; and system upgrades and expansions. Small utilities are generally unable to achieve economies of scale.

Due to the lack of an implemented strategic plan, state technical and financial assistance has not been consistently applied to encourage the development of regional and locally owned and operated utilities.

Electric utility managers and policy planners have struggled to develop a plan which will incorporate small rural utilities into larger utility systems. One of the principal concerns has been: whether the capital costs of bringing existing village systems up to REA standards will be borne by the state, the users of the small systems, or the members of the larger electric cooperatives. Until these smaller systems are brought together into professionally managed organizations with access to sufficient pools of capital to allow the financing of upgrades or equipment replacement, the state will continue to serve as the insurer for these systems, called upon when disaster strikes.

Diesel Generation

Perhaps one fact that is often overlooked is that living in rural Alaska is expensive. Transportation costs and the lack of economies of scale both contribute to the higher prices faced by rural residents. Cast within this discussion is the awareness that diesel-fired generators may be the simplest and one of the safest sources of electric energy in rural Alaska. This affords us the opportunity to ask if improvements in diesel generation can be implemented which reduce fuel consumption or which otherwise reduce the cost of electric service to rural consumers.

This differs slightly from the discussion of alternative energy technologies in that the aim is not displacement of diesels, but using diesel-fired generators more wisely. Tactics to be employed may include: a) battery storage systems to take advantage of the light loading at night; b) higher efficiency diesels; c) waste heat recovery systems; and d) conservation systems.

Electric Energy Consumption Subsidies

The state has provided subsidies to both rural and urban consumers of electric energy. In fact, the state has provided nearly twice as many dollars to urban areas as to rural areas. The difference is largely that subsidies to urban areas have funded the design and construction of capital facilities, while the subsidies to rural areas have funded operating expenses, of which one of the principal components is fuel cost. In many cases, portions of the capital subsidies provided by the state will be repaid through the revenues from bond proceeds or wheeling charges (electric energy transmission revenues). However, the operating subsidies will never be repaid.

During the development of major state-owned energy projects, as a mechanism for achieving energy cost parity, electric rate subsidies were established that afforded rural residents the right to purchase electric energy at a rate approximately equal to that available in communities along the railbelt (Anchorage, Fairbanks, Palmer, Wasilla, Kenai Peninsula).

Recent legislation, which was tied to the dismantling of the Alaska Energy Authority and the establishment of the Division of Energy, called for 20 years of electric energy subsidies through the PCE program, yet provided funding for less than six years of the program. At present, there is funding for only five more years of the PCE program.

Where does the PCE money go? It is worth considering data from the following two communities, Chauthbaluk and Atmautluak, to illustrate the electric energy industry in rural Alaska. Chauthbaluk is located within the service area of the Middle Kuskokwim Electric Cooperative, approximately 110 miles northeast of Bethel on the Kuskokwim river. Atmautluak is located approximately 25 miles southwest of Bethel, and requires overland transport to reach the community.

1992 (Most Recent Data)	Chauthbaluk	Atmautluak
Population	97	254
Residential Customers	30	52
Commercial & Industrial	4	5
Residential Subsidy (kWh/month)	180 kWh/month	335 kWh/month
Average Annual Subsidy	\$863/customer	\$747/customer
Cost Per kWh (\$/kWh)	\$0.583/kWh	\$0.468/kWh
Total Kwh Sold	165,000 kWh	373,000 kWh
kWh Eligible for PCE	111,000 kWh	242,000 kWh
PCE Subsidy (\$/kWh)	\$0.288/kWh	\$0.147/kWh
Diesel Fuel Consumed	23,500 gallons	44,000 gallons
Diesel Cost Per Gallons	\$1.38/gallon	\$1.46/gallon
Total cost of Diesel	\$32,500	\$64,200
PCE Paid to Community	\$31,900	\$42,600
Generator Efficiency	7 kWh/gallon	8.5 kWh/gallon

When reviewing these annual subsidy totals for the two communities, keep in mind that the average annual household income for residents of rural Alaska is \$14,300. The cost of heating alone (not counting electrical energy) using fuel oil for a household can consume as much as 20% of the family's income (for a family of 5, annual heating fuel consumption of 400 gallons per capita, at \$1.46 per gallon).

The PCE subsidy pays for most or all of the cost of diesel fuel used by the community to generate electric energy. When PCE subsidies are reduced or eliminated, these communities can be expected to react by reducing consumption. Reduced consumption will ultimately mean smaller annual bulk fuel purchases, and subsequently increased per unit fuel costs as economies of scale are lost in those bulk fuel purchases.

A possible solution to recapturing economies of scale is to encourage the formation of bulk fuel cooperatives which represent several utilities or which have available bulk fuel storage facilities which can handle the fuel requirements of member villages. Another possible solution is to encourage independent utilities such as Atmautluak to join electric cooperatives, or for MKEC (the electric cooperative serving Chauthbaluk) to expand its service to other independent utilities or to merge with a larger regional electric utility, thus taking advantage of the cooperative's buying power.

Note that there is an additional reaction to subsidies. Subsidies shift consumption patterns away from traditional and locally available fuels toward fuels that must be imported.

Utility Consolidation Efforts

Utility consolidation refers to either or both of two concepts: the incorporation of independent electric utilities into large electric utilities (either nonprofit cooperatives or privately held entities), and the joint operation or ownership of infrastructure utilities such as electric energy, sewer, water, and possibly telecommunications by one entity in a given community.

The arguments for consolidation go something like this: Consolidation will increase economies of scale, allowing the consolidated utility to spread fixed costs over a larger customer base and ensuring a financially viable operation. Thus, rather than maintaining separate utility management offices, a single centralized office will reduce administrative costs. And with consolidation, fewer administrative employees are needed to manage the member utilities and to serve the customer base.

Consolidated utilities are expected to have greater leverage in dealing with suppliers, and to be able to obtain umbrella insurance coverage on facilities at an affordable cost, whereas a stand-alone utility might not be able to get insurance at all. Additionally, consolidated utilities can afford full-time positions, are better positioned to deal with regulatory authorities, may qualify for low-interest loans, and are better positioned to effectively implement energy conservation and load management programs to increase end-use efficiencies.

However, small utilities are often reluctant to surrender control or autonomy. Also, sewer and water utilities may have similar technical and management considerations, but they are very different from the electric utility business or the telecommunications business.

Another substantial problem with consolidation is how assets will be transferred from one entity to another. Even though the assets may serve the same small community, the management systems may be different, and in the case of telecommunication utilities, private ownership interests may not favor consolidation, either because divestiture of their assets is not in their best interests, or because they do not have an interest in moving outside the business of providing telecommunications services.

Utility consolidations have taken place in recent years, with nonprofit cooperatives such as Alaska Village Electric Cooperative (AVEC) incorporating two to three new communities into their system each year. A critical component of the process is upgrading substandard systems to REA standards prior to their acceptance by the larger REA cooperative. As an example of how deals can be structured, in the community of Brevig Mission, on the Seward peninsula, the community owned assets were turned over to AVEC, which then received approximately \$500,000 in funding from both the Alaska Energy Authority and the Rural Electrification Administration and invested that money in rebuilding the powerhouse and the community's distribution system in order to bring the system up to REA standards. AVEC now owns and operates the system.

Energy Sector Analysis Considerations

Evaluate programs and program changes on the basis of their impact on the long-term strategic needs of the state. Apply resources based upon a strategic plan, rather than the requirements of existing programs.

Develop coordinated policies that encourage further oil and gas exploration and production efforts. Demonstrate that the state is "open for business". Possible options include tax and/or royalty incentives for local production, the promise of stability, one-stop shopping for permits, and the use of technology to enhance recovery.

Get in, or get out. Agree on a clear and consistent policy regarding the continued involvement by the state in the energy systems business, including generator replacement, providing subsidized energy consumption, providing system maintenance, operator training support, and development efforts toward applications of new technology.

Determine how the inevitable reduction in subsidies (PCE and capital expenditures) will be distributed among rural utilities. Design and implement an effective energy strategy to allow all of Alaska's communities to maintain the integrity of their electric energy systems.

Determine strategic goals and methods for utility consolidation, weighing desire for independent utility operation with the reduced administrative costs gained through consolidation. Independent utilities must evaluate this decision within the context of providing least-cost and long-term reliable energy to their consumers.

If the state is going to stay in the energy business, create a mechanism to collect revenues for services provided.

Create an advisory board or board of directors empowered to oversee development and implementation of a comprehensive energy strategy for the state, and provide this board with the resources to implement the plan. Include in the strategic plan an exit strategy for the state. Put representatives from independent and cooperative electric utilities, local and state officials and elected representatives, and technical experts on the board.

Include development opportunities for the formation of bulk fuel cooperatives that can reduce the cost of diesel fuel to rural communities. Pass the savings on to consumers. (There is at least one bulk fuel cooperative functioning at present.)

Alternative technology opportunities and conservation program opportunities exist which deserve further exploration and commercial development, principally technologies aimed at displacing the use of diesel fuels in rural Alaska communities.

Coal resources exist in Alaska that have so far proved difficult to develop for in-state electric energy production. Direct continued efforts toward small-scale clean coal projects that are economical alternatives to diesel-fired generation.

Continue technology development of clean coal energy production facilities that can utilize Alaska's sub-bituminous coals.

Identify the organizational structures in place in Alaska (i.e.: cities, village governments, cooperatives, schools, privately held firms, village and regional corporations, etc.) and allow and encourage these entities to interact and implement utility consolidation where least-cost operations can be achieved.

Chapter VI

Alaskan Coal Industry—Sector Analysis

Abstract

For all practical purposes the coal resources of Alaska are sufficient for centuries of production under any conceivable use scenarios, whereas those for oil are not. As we are becoming painfully aware, production of North Slope oil has begun to decrease steadily and, without new discoveries, will tail off dramatically early in the next century. However, an expanded coal industry can provide long term stable employment and serve as a partial buffer to the boom and bust cycles associated with oil. For example Usibelli Coal Mine, Inc. (UCM) has been in operation for over 50 years and today provides employment for around 120 people at the mine and another two dozen who are associated with transportation at the Alaska Railroad (ARR) and the Suneel Alaska Coal Terminal. Alaskans must realize that, regardless of how successful the coal industry in Alaska becomes, it will never provide the state with the revenues that the oil industry has.

There is an opportunity for significantly more Alaskan coal to be sold on the international steam coal market. But the mere abundance of Alaskan coals, their low sulfur (S) content and proximity to the major steam coal importers are not enough to guarantee Alaska's participation into this rapidly expanding market. Most of the Alaskan coal that is near year-round open tidewater is low-rank coal (LRC) which most Pacific Rim coal importers consider inferior to traditional high-rank (bituminous) coal. Potential consumers will require thousands of tonnes (t) of the new fuel for testing in their facilities before they will commit to long-term purchase agreements. Therefore, potential Alaskan coal suppliers will have to provide test coal at prices below those in the prevailing market and which may be substantially below production costs. This will require investments of millions of dollars just to begin to develop market acceptance for the new coals.

The window of opportunity in the steam-coal market has occurred because the tremendous growth in Pacific Rim energy requirements has finally caused demand for steam coal to exceed production capacity for the first time in about a decade. Despite the apparent elasticity in coal supplies, the high capital requirements and length of time required to bring new mines into production, a sellers market should continue well into the next century. Obviously the first mines that are brought on-stream will have the best opportunity to ensure sales for their coal.

Costs for a new open pit coal mine in the Beluga field and a new port near the mine are estimated to be upwards of a \$100,000,000 (MM) and \$40 MM, respectively. These costs when coupled with generally low steam coal prices and requirements of investing millions of dollars just to attempt to get market acceptance so far have proven to be a major obstacle for investors. If the state and coal industry are unable to adopt a unified coal policy that clearly demonstrates to investors support for growth in the coal industry about the best that could be hoped for would be a doubling of the amount of coal currently mined.

International Coal Market

Growth

In the early 1950s, a world glut of cheap oil displaced coal as the primary source of energy.

The oil crises of the 1970s precipitated by OPEC had dramatic impacts on power generating practices and on the international steam coal market. In 1973 the seaborne trade in coal amounted to about 106MM tonnes and steam or thermal coal accounted for only 19 MM tonnes with the balance being coking or metallurgical coal. Due to lower, less volatile prices and secure supplies offered by a number of coal exporting nations, coal rapidly began to replace oil as the primary fuel for new power generation and older units originally designed for coal that had been converted to oil switched back to coal. During the next 22 years the amount of coking coal traded doubled, but the amount of seaborne steam coal traded grew by over an order of magnitude to 276 MM and is now the predominate coal traded internationally.

Coal has had a poor image in many industrial nations and has been regarded as a dirty fuel, one that is used only in remote locations or as a last resort. This image arose from mining practices that made little effort to reclaim mined land and little or no emission controls when burning coal. However, a new public awareness of the need to protect the environment has led to strict reclamation, water and air quality laws. Industries in developed nations, aided by governmental support have responded and the 1980s and 1990s may well be known as the clean coal era due to the development of numerous clean coal technologies that have demonstrated that coal could be mined and used in an environmentally responsible manner to generate low-cost power. These efforts have begun to change the image of coal as a dirty fuel and have contributed to the re-emergence of coal as the preferred utility fuel.

While the oil crises caused economic shocks in all nations, they had the most impact on those that had few indigenous energy resources like, Japan, Korea and Taiwan. After the first oil embargo most Pacific Rim nations began a crash program to reduce their dependence on imported oil and seek the price and supply security that coal offered. As shown in Fig. 1, the switch to coal by the leading Pacific Rim importers is projected to continue growing well into the next century. Steam coal imports for 1995 for Japan, Korea and Taiwan alone were over 100 MM t and are projected to grow by as much as 50% in the next decade to over 150 MM tonnes per year (tpy).