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#22:10

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Conference which Sharon attended for you & Steve C.

TO: ALL COUNCIL MEMBERS

FROM: SHARON LONG

DATE: APRIL 18, 1978

RE: FUTURE OF MINING IN ALASKA AND (d)(2)

On April 14, 1978 the results of an independent study of the potential impact of (d)(2) legislation on the future of a mining industry in Alaska were presented at the Anchorage Westward Hotel.

The study was conducted by the Stanford Research Institute (SRI), Menlo Park, California. Their summary is enclosed.

If we choose to use the presentation for our own purposes it will be made available and the fellow who directed the research for SRI has stated that with reasonable notice he should be able to travel with the presentation to address a group and answer questions.

I have asked our Washington representatives to contact congressmen, union leaders, etc. to see if they are interested in having the study results presented by SRI.

IMPACT OF THE WITHDRAWAL OF ALASKAN FEDERAL LANDS

A Study of the State and National Economic and Employment Potential of an Alaskan Mining Industry

March 1978

Sponsored by:

The Committee to Determine The Impact of Alaskan Land Withdrawal Legislation

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SUMMARY

IMPACT OF THE WITHDRAWAL OF ALASKAN FEDERAL LANDS

A Study of the State and National Economic and Employment Potential of an Alaskan Mining Industry

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SRI Project 7001

SUMMARY

ABOUT THE REPORT

Attached is a study recently completed by the Stanford Research Institute which evaluates the economic potential of hardrock mineral development in Alaska. Initiated to provide an independent assessment of the impact on Alaska and the nation of the proposed withdrawals of vast regions of Alaska, the study underscores the need for Congress to approve balanced Alaska wilderness legislation which permits the exploration and extraction of these resources.

The study analyzes only seven potential mines in Alaska. Oil, gas, timber and other resources in the state are not considered.

Specifically Stanford Research Institute finds these seven mines would, in the 1990's:

- provide hardrock minerals valued between $850 million and $1 billion annually in the 1977 dollars;
- create 20,000 to 40,000 jobs nationwide;
- reduce the nation's balance of payments deficit by between $700 million and $1 billion annually in 1970 dollars.

More important however, when the study information is linked with the mineralized trends presently known in the state and the developed mining industry from similiar geological formations in Canada and Siberia, it suggests vast potential in terms of resources with significant economic and employment benefits for Alaskans and the rest of the nation.

The study focused on the original Alaska wilderness withdrawal bill, H. R. 39, and its impact on the development of these seven mines. While H. R. 39, as reported from the House Interior Committee, would allow some of these mines to go into production, the fact remains the

bill as presently proposed immediately locks up 83 million acres of resource rich lands in wilderness and national park classifications and withdraws an additional 40 million acres for wilderness study. This will prevent exploration for needed resources, the development of which would use temporarily only miniscule land amounts.

The underlying message of the Stanford Research Institute study is that our knowledge of Alaska's resource potential is very limited. However, based on the geology of the state and the very positive economic, employment, and balance of trade benefits accruing from just seven hard-rock minerals mines, it is apparent that we are only assessing a small portion of its total potential. It seems clearly in the national interest to make a full appraisal of the potential, social, economic and environmental benefits of Alaska's resources before initiating the final decision to lock up so much of this mineral rich land.

COMMITTEE TO DETERMINE THE IMPACT OF
ALASKA LAND WITHDRAWAL LEGISLATION

EXECUTIVE SUMMARY

SRI International has conducted a study of the potential economic benefits to the nation and environmental impacts associated with the development of Alaska's metallic minerals and asbestos. Other resources, such as oil, gas, and uranium were not considered. The study indicates that in the absence of extensive legislative or regulatory impediments to the development of mineral resources, a mining industry could develop by the 1990s that would:

- Provide the nation with substantial quantities of nonfuel minerals, including gold, silver, copper, nickel, lead, zinc, molybdenum and asbestos, valued at between $900 million and $1 billion dollars annually (in 1977 dollars).
- Provide the nation with 20,000 to 40,000 additional jobs, representing about 0.5 percent of current unemployment.
- Reduce the nation's balance of payments deficit by between $700 million and $1 billion annually (in 1977 dollars).

The above results are based on an analysis of seven specific mineral deposits considered commercially attractive. Some of the mines could become depleted during the 1990s, but other known deposits and favorable geology indicate that new mines would be opened to maintain the industry. Further, based on the relatively low level of exploration activity in Alaska to date, and the very rich deposits discovered, it is reasonable to expect that a substantially larger industry might develop with time, assuming that areas with favorable geology were open to mineral exploration and development.

The potential environmental impacts of the mineral developments are difficult to quantify. However, exclusive of acoustic effects, they appear to be less, both qualitatively and quantitatively, than those associated with the Trans-Alaska pipeline, an issue given the most searching examination by many governmental agencies and finally resolved by the Congress itself.

The land area disturbed by mining would be small; with proper reclamation procedures, the effects on the land would be temporary. The total land area that would be disturbed by the seven mines analyzed in arriving at the above economic values, including all roads and other necessary infrastructure, would be about 25 square miles, or about 3½ square miles per mine. That compares with about 586,000 square miles in all of Alaska and about 180,000 square miles proposed in various bills before the Congress such as H. R. 39, S. 1500, and S. 500 for inclusion in parks, wildlife refuges, wild and scenic rivers, and wilderness areas.

If an acoustic buffer zone of 3,000 feet on either side of the transportation corridors is considered, the total area affected would be about 940 square miles--less than 0.2% of the area of the state, and less than 0.5% of the area proposed for withdrawals.

In view of the above considerations, the extent of land, and equally important, its location, that might be withdrawn from mineral exploration and development by the pending bills H. R. 39, S. 1500 and S. 500 should be carefully balanced in terms of the tradeoff between future economic influence and environmental considerations.

I INTRODUCTION

Before the Alaskan Statehood Act in 1958, virtually all of the land in the territory was owned by the Federal government. With statehood, the state received the right to take over 104 million acres of federal land for its economic base. The state's selections are to be completed by 1984.

The statehood act did not deal with the territorial claims of Alaska's natives. In 1966, the Secretary of the Interior ordered a halt to further state selections until the natives' claims could be resolved by Congress. In 1971, Congress passed the Alaska Native Claims Settlement Act (ANCSA), giving natives the right to select 44 million acres of land.

A special provision of ANCSA, Section 17(d)(2), directed the Secretary of the Interior to withhold up to 80 million acres of "national interest" lands from the state and native selections. The "d-2" lands as they were called, were to be temporarily closed to all development and studied as potential additions to the four national land conservation systems: national parks, national wildlife refuges, national forests, and wild and scenic rivers. No limit was placed on how much federal land Congress could ultimately designate as part of the four systems, but ANCSA set a December 1978 deadline for Congress' final decision on the "d-2" lands.

Several proposals are being considered by Congress for placement of federal land in the four systems, ranging from 25 million acres in S.1787 to about 116 million acres in H. R. 39. In addition, H. R. 39 would authorize the Secretary of the Interior to seek agreements with the heads of other Federal agencies and owners of lands and waters of ecological concern adjacent to withdrawn lands. The purpose would be to assure that such adjacent lands would be managed in a manner consistent with the preservation of the environmental quality of the lands that are withdrawn.

Hence, the total land area affected by H. R. 39 is not clear, but it could be substantially greater than 116 million acres.

Because Alaska is known to contain substantial mineral resources, there has been some concern that the proposals for more extensive withdrawal being considered by Congress would, if enacted into law, cause the nation to forego substantial economic benefits that would have resulted from the development of those resources. To examine that issue, SRI International was commissioned to carry out this study.

The specific objectives of the project were to assess the impact of the proposed withdrawals on:

- Employment levels in Alaska and the nation
- The output of goods and services by the domestic mining industry
- The U.S. balance of payments
- The vulnerability of the nation to economic or political blackmail by cartel suppliers of critical materials.

The study also was to examine briefly the potential environmental impacts of mining operations in Alaska.

In scope, the study team was to consider the period through the end of the century. Only metallic minerals and asbestos were examined; fuel and industrial minerals were not included.

This work was carried out during the period November 28, 1977 through March 31, 1978. Many divisions of SRI International contributed to the study, including the Minerals and Metals Center, the Center for Resources and Environmental System Studies, the Center for Economic Policy Research, the Transportation and Industrial System Center, and the Urban and Regional Studies Program.

SRI International wishes to express its sincere appreciation to the many representatives of government and industry in the lower 48 states, Canada, and the State of Alaska who contributed their time and knowledge to this effort, and to the Committee to Determine the Impact of Alaskan Land Withdrawal Legislation, whose sponsorship made this study possible.

II SUMMARY

Introduction

There has been some concern that the more extensive proposals now being considered by Congress to create national parks, wildlife refuges, wild and scenic river preserves, and wilderness areas on federal lands in Alaska would withdraw so much of the state's land from the possibility of mineral development that the state and the nation would be foregoing substantial economic benefits. To investigate this issue, SRI International, under contract to members of the Committee to Determine the Impact of Alaskan Land Withdrawal Legislation, undertook a study to examine the economic benefits that might reasonably be expected from mineral developments in Alaska through the end of the century. The study did not include fuel minerals; only metallic minerals and asbestos were considered.

The methodology employed was to select from known mineral occurrances those considered most likely to go into development through the early 1990s, and to consider other known deposits and favorable geological provinces to judge whether additional mineral developments of like magnitude could be expected in the last decade of the century. It should be emphasized that SRI is not predicting that such developments would occur. Rather, SRI is stating only that, given the nature of the deposits and the national and worldwide supply/demand situation for the minerals in question, it is not unreasonable to expect such developments to take place, assuming there were no unusual impediments involved in working in Alaska (other than those imposed by climate and topography), and assuming the necessary infrastructure is available.

Potential Mineral Developments

Seven deposits were selected for analysis, as follows:

- Greens Creek--A lead, zinc, copper deposit on Admiralty Island in southeastern Alaska.

- Quartz Hill--A molybdenum deposit near the southern tip of Alaska.

- Eagle Asbestos--An asbestos deposit located about 42 miles west and south of Eagle, Alaska.

- Bohemia Basin--A nickel and copper deposit on Chichagof Island, approximately 80 miles west of Juneau.

- Arctic--A copper, lead, zinc, silver, and gold deposit on the southern flank of the Brooks Mountain range, about 160 miles east of Kotzebue.

- Picnic Creek--A deposit close to, and similar to, Arctic.

- Lik--A lead, zinc, and silver deposit on the west flank of the Brooks Mountain range, about 80 miles north of Kotzebue and 50 miles from the Chukchi Sea.

The approximate locations of the deposits are shown in Figure 1. If mine development and the construction of infrastructure proceed unimpeded, the first mines could go into production in 1982. All could be in production by 1991. Beginning in 1992, production from the seven mines would begin to drop off as some mines closed down, assuming no additional reserves were defined. However, based on other known deposits of merit, as well as favorable geology, it is expected that other mines will be placed in operation and state production could continue through the 1990s at the average of 1991-92 levels or higher.

Transportation is a major consideration in analyzing Alaskan mineral operations, particularly for deposits far removed from existing infrastructure, such as the Arctic, Picnic Creek, and Lik deposits. In this study, it is assumed that a railroad will be built from Nenana to the coast of the Chukchi Sea at no cost to the mines, and that the rail line will pass close to the Arctic, Picnic Creek, and Lik deposits. For the other mines, it is assumed that roads, paid for by the mines, will be built either to existing roads or to tidewater. (Other transportation systems that might be considered include roads in place of the railroad and river barge.)

Preliminary economic analyses were carried out using the following commodity prices (note that three different prices were assumed for

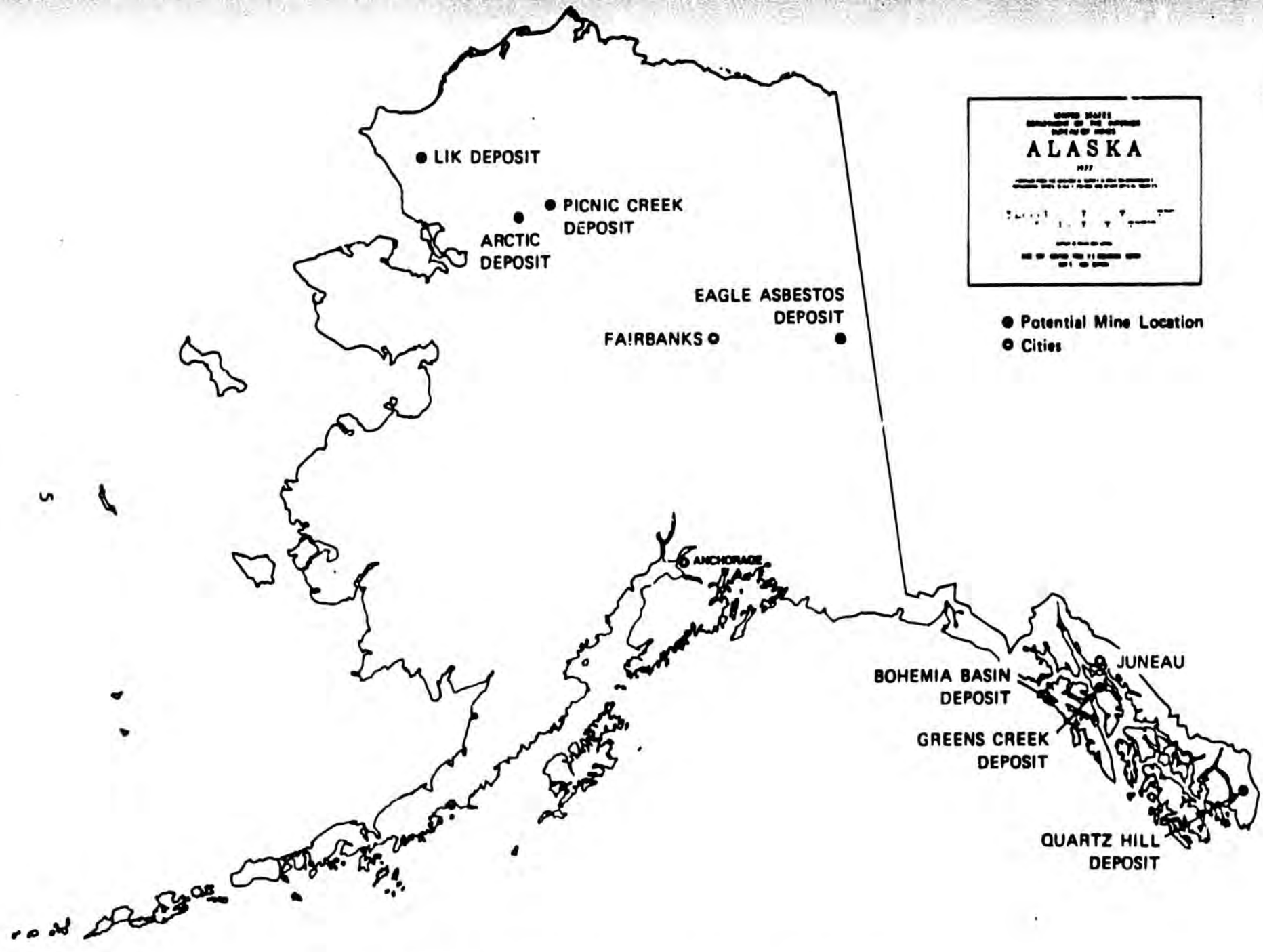

FIGURE 1 MINERAL DEPOSITS SELECTED FOR ANALYSIS

copper): copper, 60¢, 75¢ and 90¢ per pound; zinc, 31¢ per pound; lead, 35¢ per pound; silver, $4.85 per ounce; gold, $162 per ounce; molybdenum, $4.01 per pound of contained molybdenum in MoS_2; nickel, $2.06 per pound; and asbestos, $491 per ton. The mineral production and gross and net smelter returns through 1992 are shown in Tables 1 and 2. Gross smelter returns* peak in 1991 at $903 million to $1,044 million, depending on the assumed copper price.

The seven mines range in size from small to large. The annual gross smelter returns for the seven, assuming a copper price of 75¢ per pound, are, in millions of 1977 dollars:

Greens Creek	$ 21
Quartz Hill	79
Bohemia Basin	23
Eagle Asbestos	50
Arctic	300
Picnic	300
Lik	201.

All of the deposits are affected to some extent by proposed withdrawals of Alaskan lands, either because they fall within or close to lands proposed for withdrawal, or because access to the deposit is curtailed by the proposed withdrawals, or both. While more detailed study would be needed to fully determine the impact of the proposed withdrawals, it seems questionable whether any of the seven deposits could be developed if the more extensive proposals for withdrawal were enacted into law. Of perhaps even greater significance for the long term, the proposed withdrawals would likely have a severe effect on the possibilities for additional discoveries of rich deposits, such as the ones studied, because much of the area graded favorable or highly favorable by the Bureau of Mines for metallic minerals is included in the proposed withdrawals. That is illustrated in Figure 2.

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*Gross smelter return is the amount of metal or mineral produced by the smelter times the selling price.

Table 1

STATE MINERAL PRODUCTION

	Zinc (tons/yr)	Lead (tons/yr)	Copper (tons/yr)	Silver (oz/yr)	Gold (oz/yr)	Molybdenum (lbs. contained Mo/yr)	Nickel (tons/yr)	Asbestos (tons fiber/yr)
1982	11,008	3,583	432	1,593,900	19,602			
1983	11,008	3,583	3,645	1,593,900	19,602		4,641	
1984	11,008	3,583	3,645	1,593,900	19,602		4,641	
1985	11,008	3,583	3,645	1,593,900	19,602	19,631,000	4,641	
1986	11,008	3,583	3,645	1,593,900	19,602	19,631,000	4,641	100,000
1987	11,008	3,583	3,645	1,593,900	19,602	19,631,000	4,641	100,000
1988	152,380	22,861	119,313	5,224,590	64,584	19,631,000	4,641	100,000
1989	152,380	22,861	119,313	5,224,590	64,584	19,631,000	4,641	100,000
1990	362,028	91,137	119,313	10,044,090	64,584	19,631,000	4,641	100,000
1991	503,400	110,415	234,981	13,674,780	109,566	19,631,000	4,641	100,000
1992	492,392	106,832	234,549	12,080,880	89,964	19,631,000	4,641	100,000

Source: SRI International

Table 2

STATE TOTALS

GROSS AND NET SMELTER RETURN
(Millions of 1977 Dollars)

Year	Gross Smelter Return Copper at: 60¢/lb	75¢/lb	90¢/lb	Net Smelter Return Copper at: 60¢/lb	75¢/lb	90¢/lb
1982	$ 21	$ 21	$ 21	$ 16	$ 16	$ 16
1983	43	44	45	33	34	35
1984	43	44	45	33	34	35
1985	122	123	124	111	113	114
1986	172	173	174	153	154	156
1987	172	173	174	153	154	156
1988	437	473	509	288	324	360
1989	437	473	509	288	324	360
1990	638	674	710	377	413	449
1991	903	974	1,044	512	583	653
1992	882	953	1,023	497	567	637

Source: SRI International

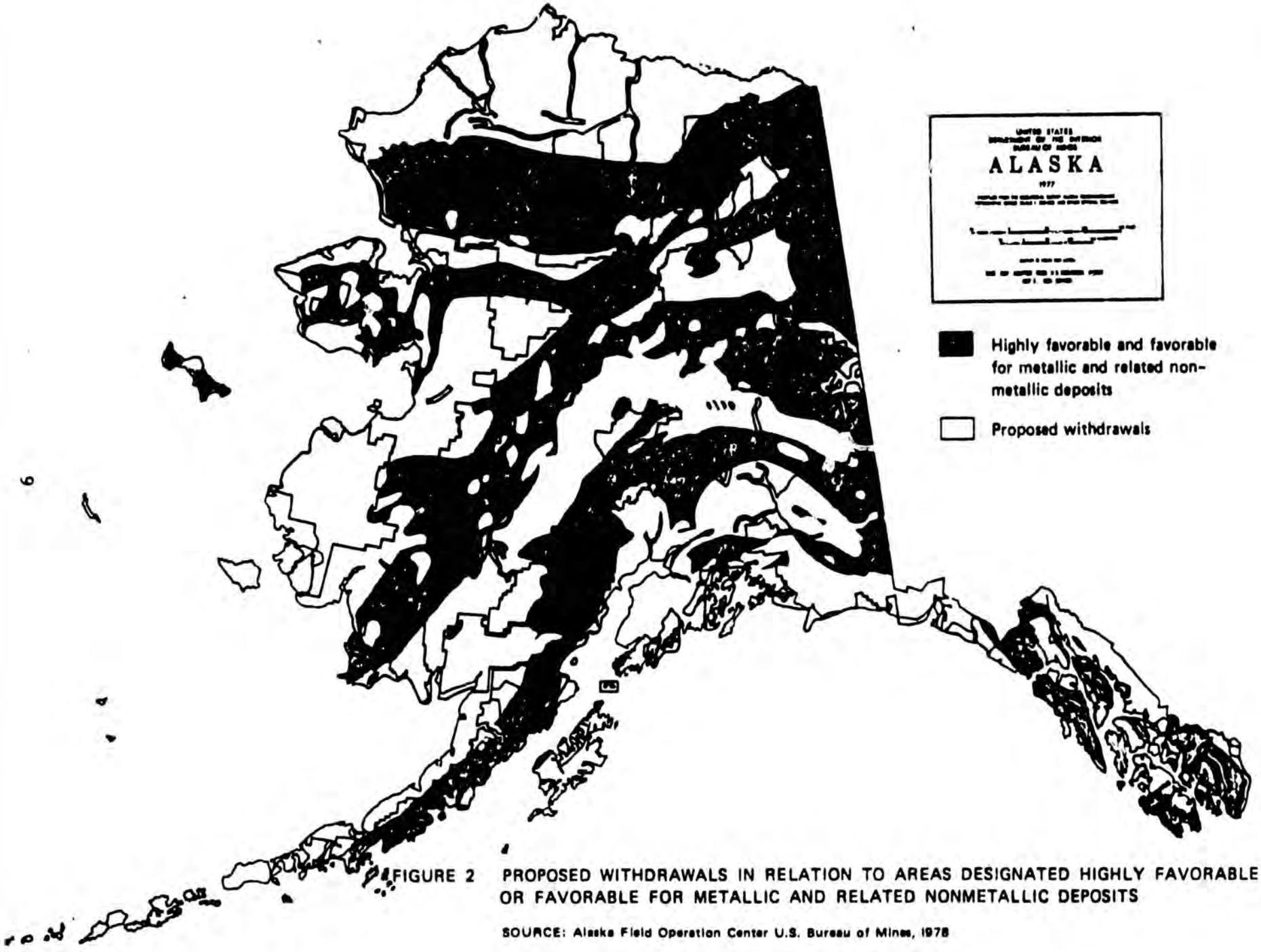

FIGURE 2 PROPOSED WITHDRAWALS IN RELATION TO AREAS DESIGNATED HIGHLY FAVORABLE OR FAVORABLE FOR METALLIC AND RELATED NONMETALLIC DEPOSITS

SOURCE: Alaska Field Operation Center U.S. Bureau of Mines, 1978

Environmental Impact

Development of Alaska's mineral resources will have environmental consequences, even though regulations concerning emissions, ambient quality, and concern for environmental values in the planning process would ensure that only unavoidable impacts would result. The need for balancing various national goals, including that of environmental quality, has been faced before in developing Alaskan resources, particularly in the case of the Trans-Alaska pipeline.

If the pipeline decision is considered a precedent in trading off environmental goals with other national objectives, then a comparison of relative environmental consequences between the pipeline and the development of mineral resources would provide one anchor point in assessing environmental consequences versus economic benefits. A problem in making the comparison is the dissimilar consequences of the pipeline and the development of mineral resources. A multiple-attribute method of comparing such dissimilar consequences would be used if agreement could be obtained on the relative weights to assign to the different consequences. As a rough approximation, the area of land disturbed is taken as the proportional measure of environmental consequence. The land disturbed in the development of mineral resources is taken to be the land needed for the mines themselves, plus an allowance for a mining camp and the airstrip usually associated with remote Alaskan operations. Added to that is the land disturbed by the transportation system needed to serve the mines. The area disturbed for the seven mines then totals about 22 square miles, approximately one-half of the right-of-way of the Trans-Alaskan pipeline. A closer examination of comparative effects does not change the conclusion that the environmental consequences of an Alaskan minerals production program is significantly less than that of the pipeline.

This comparison does not consider the possibly more severe acoustic effects associated with the transportation of minerals as compared to pumping oil through the pipeline. However, offsetting that are the hundreds of square miles committed to oil production facilities on the north slope. According to guidelines published by the Department of

Housing and Urban Development,* a corridor of 3,000 feet on either side of the transportation corridors should provide an adequate acoustic buffer zone. Including such a buffer zone, the amount of land affected by minerals development would be about 940 square miles--less than 0.2% of the state's area. That is contrasted with the approximately 180,000 square miles proposed for withdrawal by inclusion in the four conservation systems (parks, wild and scenic rivers, wildlife refuges, and national forests).

Impacts of Alaskan Mineral Development on the Economy of the State and the Nation

Two principal assumptions were made in the analysis of the impact of Alaskan nonfuel mineral production on the state and on the rest of the nation. The first assumption was that Alaskan production will be "small" relative to world consumption, so that any effects on the world price of the minerals under study could be ignored. The second assumption was somewhat more subtle, and related to the period of analysis--in excess of twenty-five years. That period is sufficiently long for structural change to occur in the economies of Alaska and the lower 48 states. However, for the purposes of this analysis, it was assumed that such structural changes did not occur.

The analysis was based on the notion of the "multiplier," a concept that rests on the idea that incomes are respent rather than hoarded. For example, people buy goods and services with their incomes, and their spending becomes business gross receipts. Businesses in turn buy raw and semi-finished materials and capital equipment, as well as hire labor with funds from gross receipts. The income and business receipts produced in the process in turn generate further spending.

Impact on the Alaskan State Economy

An expanded mining industry would have a beneficial effect on the Alaskan economy, with most sectors of the economy experiencing some

* "Noise Assessment Guidelines," U.S. Dept. of Housing and Urban Development, Washington, D.C. 20410, BBM Report No. 2176, August 1971. (Currently undergoing revision.)

positive impact. Outside of the directly affected construction, mining, and transportation sectors, the four sectors of trade, services, communications, and utilities would enjoy the most growth. They are the sectors that support the local population and labor directly associated with mining. Associated industrial development in Alaska would be small, most likely concentrated in the wood products, cement, or similar construction supplies areas.

Table 3 presents summary estimates of impacts on Alaska of the three major phases of mine development: construction, mining and transportation. Direct expenditures shown in the table are those costs paid by the mine operators to build, to operate, or to ship minerals from, the mines. Value added or gross state product is the state equivalent of gross national product: the value of goods and services produced within the state. Employee compensation includes the wages, salaries, and fringe benefits paid to workers. Employment estimates show the full-time equivalent of new jobs created in Alaska.

Construction impacts on the state that are shown in the table are the average for the 1980 to 1989 period. Estimated increases in employment and gross state product equal between 0.5 and 1.0% of the totals for Alaska during that period.* The approximately 1,500 jobs would be transitory in nature and would likely draw some construction labor from the lower 48 states for temporary employment. Some of the jobs would be filled by the permanent Alaskan construction labor force.

Mining and transportation of the minerals are estimated to have a combined impact on Alaska's gross state product and employment of about 5% and 2.5%, respectively, by the early 1990s.† The impact on gross state product is higher than for employment because the use of labor in

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* Value added or gross state product and employment estimates are derived from forecasts given in David T. Kresge, "Alaska's Growth to 1990," Alaska Review of Business and Economics, January 1976. Updated projections for most variables are contained in Oliver S. Goldsmith, "Alaska Electric Power Requirements, a Review and Projection," Alaska Review of Business and Economic Conditions, June 1977. These projections are very close to those in the January 1976 article.

† Ibid.

Table 3

ESTIMATED AVERAGE ANNUAL IMPACTS ON
ALASKA OF PROPOSED MINING DEVELOPMENT

	Construction*	Mining†	Transportation†
	(Millions of 1977 dollars)		
Direct expenditures	$ 76.4	$ 504.4	$ 72.5
Value added (Gross State Product)‡	63.5	556.5	90.4
Employee compensation‡	51.6	218.8	58.5
	(Full-time equivalent jobs)		
Employment‡	1538	7501	2010

*Average annual expenditures and impacts for years 1980 to 1989.

†Average annual expenditures and impacts for years 1991 and 1992.

‡Includes direct, indirect, and induced impacts.

Source: SRI International

mining and smelting is low relative to the return on capital in those operations. Approximately 9,500 new jobs (full-time equivalent) generating $275 million (1977 dollars) of employee compensation would result from those operations. Gross state product will increase by about $650 million (1977 dollars). (The increase in gross state product is less than gross smelter returns because non-Alaskan transportation and smelting of concentrates is assumed to take place in the lower 48 states.)

Impact on the National Economy

Conceptually, two approaches were followed in estimating the impact of Alaskan nonfuel mineral development on the lower 48 states. In one, the impact of development on the nation was estimated as a whole, and then the impact estimated to accrue to Alaska was subtracted. In the other, the impact on the lower 48 states was estimated directly. The two approaches yielded similar results, adding confidence and credibility to the findings.

In both approaches, the 1967 input-output model of the U.S. economy developed by the Bureau of Economic Analysis was applied. First, the model was applied to projections of mine construction expenditures, mine output (net smelter return), transportation, and refining, in order to estimate the impact on the entire U.S. economy. Gross outputs estimated in that manner are not directly commensurate with GNP, but can be converted. Second, to estimate the impact directly on the lower 48 states, items that were assumed to be purchased from the lower 48 for use in Alaska were treated as additions to final demand, the impact from which was presumed to accrue to the lower 48.

The impact of the development of Alaska's nonfuel minerals industry on the rest of the nation depends upon assumptions made about the use of such minerals; i.e., do they substitute for U.S. imports or do they replace mineral production in the lower 48 states? In the former case, the impact on the lower 48 states is additive to current activity; in the latter case, there is a transfer of employment, income, and economic activity to Alaska from elsewhere in the nation. Accordingly, two cases

were studied, the base case assumed that no mine output other than molybdenum replaced lower-48 production. For molybdenum, it was assumed that 80% of production replaced lower-48 production. The alternate case assumed that 80% of molybdenum, 70% of lead, and 30% of zinc replaced production that otherwise would have taken place in the lower 48 states.

The results of the analysis for the two cases for the two methods of approach, and the effect on employment (based on the 1977 ratio of $23,000 of GNP per employee and 1967 gross output of 1.79 times GNP) are shown in Tables 4 and 5. As in the case of state impacts, the construction-period impacts are based on the average for the period 1980 through 1989, the operational impacts on the average of 1991-92. Construction-period impacts (gross output) range from $6.1 to $66.4 million, operational-period impacts from $372.2 million to $866.1 million (also gross output). The number of jobs in the construction period ranges from 148 to 1,614, and in the operational period, from 9,044 to 21,046. Those figures do not include induced impacts. If they were considered, the estimate of jobs created would, very conservatively, increase by perhaps a third, or to about 200 to 2,200 in the construction period and 12,000 to 28,000 in the operational period.

When those impacts are added to those shown previously for Alaska, the total number of jobs created in the entire United States, including Alaska, ranges from about 1,500 to 3,500 in the construction phase and 22,000 to 38,000 in the operational phase. During the 1990s, when both construction and operation will be going on concurrently, the total would be the sum of the two phases or on the order of 20,000 to 40,000 jobs. While that total is not large relative to the total U.S. work force, it represents about 0.5 percent of the current unemployment level.

Impact on Supply of Critical Imported Materials

Even though the production of minerals from the seven Alaskan mines is substantial, it is unlikely that it would have any significant beneficial effect on the nation's supply of critical imported materials. That is because, for the minerals produced by the seven mines, it is unlikely that the United States would be exposed to economic or political

Table 4

ANALYSIS OF OVERALL EFFECTS ON U.S. ECONOMY, LESS ALASKA

	Base Case	Alternate Case
Construction-Period Impacts		
Gross output (millions of 1977 dollars)	$ 30.8	$ 6.1
Value added (gross national product) (millions of 1977 dollars)	$ 17.2	$ 3.4
Employment (full-time equivalent jobs)	748	148
Operational-Period Impacts		
Gross Output	$ 673.0	$ 372.2
Value added (gross national product)	376.0	207.9
Employment	16,354	9,044

Table 5

DIRECT ESTIMATE OF EFFECTS

	Base Case	Alternate Case
Construction-Period Impacts		
Gross output	$ 66.4	$ 57.7
Value added (gross national product)	$ 37.1	$ 32.2
Employment	1,614	1,402
Operational-Period Impacts		
Gross output	$ 866.1	$ 703.4
Value added (gross national product)	$ 483.9	$ 392.0
Employment	21,046	17,093

blackmail by cartel suppliers whether or not there were any Alaskan production. Of course, it is possible that additional exploration may reveal deposits of other minerals in Alaska for which that is not the case.

Impact on the Balance of Payments

The Alaskan mineral production would, however, have a substantial beneficial impact on the nation's balance of payments. The precise impact is uncertain because, as noted in the discussion of impacts on the national economy, it is not clear what percentage of the Alaskan production would go to reduce net imports and what percentage would simply displace production that would otherwise occur in the lower 48. Considering the base case and alternative case described previously for the reduction of imports versus the displacement of lower-48 production, and a range of copper prices from 60¢/lb to 90¢/lb, it appears that the Alaskan mineral production would have a beneficial impact on the balance of payments of between $700 million and $1 billion (in 1977 dollars) per year throughout the 1990s.

Comparison with Other Arctic Regions with Similar Geology

As a check on the reasonableness of the assumed development of the mineral industry in Alaska, SRI defined areas in Siberia and Canada with similar geology and climatic conditions and examined the extent of mineral production there. In both cases, it was found that more mines were operating than the seven assumed for Alaska, even though the comparable areas are smaller. That seems to support the reasonableness of the assumed Alaskan developments. That is, once the uncertainty surrounding the ownership and status of land is removed, the example of the comparable regions indicates that a healthy mining industry will evolve, even though the area is remote and has a severe climate. The value of production from the seven Alaskan mines was found to be much higher than the value of production in the comparable regions, even though fewer mines were involved.