ALASKA LEGISLATURE COMMITTEE FILES 1983-1984 8672
2797 SRES PLACER MINING - RESOURCES PLANNING ACT (USFS) 2797

PLACER MINING

TESTIMONY OF RONALD A. KREIZENBECK
DIRECTOR, ALASKA OPERATIONS OFFICE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE SENATE RESOURCES HEARING
ON STATE AGENCY ACTIVITIES IN
PLACER MINING RESEARCH AND STUDIES
SEPTEMBER 28, 1984, FAIRBANKS

Good Morning. My name is Ron Kreizenbeck, Director of the Alaska Operations Office, EPA Region X. I have been asked by Senator Fahrenkamp to report on EPA activities in Placer Mining and also to describe the purpose and scope of use attainablility analysis.

Let me begin with our permitting and field activites. Four hundred and forty seven National Pollutant Discharge Elimination System (NPDES) Permits were issued by EPA this past season. We have approximately one hundred additional applications which we expect to issue permits by the end of December 1984.

EPA Region 10 1984 Field Activites

- For this first time, Region 10 established a liason office in Fairbanks to work with the mining industry. The success of this office is due in part to the co-operation which was received by all State agencies and the officers of the Alaska Mining Association.

- Region 10 sent two field teams to interior Alaska in 1984;
  (1) A Compliance team and (2) A Trend Analysis Team.

- The compliance team performed 46 site inspections; 37 sampling, 9 non-sampling. Samples were not collected at the 9 sites due to the non-operational status of the mine or to other factors which preclude the team from taking samples.

- The trend analysis team sampled seven mines in diverse locations for 3-4 days each.

- The mines were geographically located as follows:
  - 2 - Livingood area
  - 1 - Central area
  - 2 - outside Fox off the Steese Highway
  - 2 - Fairbanks Creek area

- The trend analysis team collected samples for Settleable Solids, Total Suspended Solids, Arsenic, and Turbidity over a 3-4 period at seven mines.

- Both teams found that the Settleable Solids effluent limitations were, in the majority of cases, in compliance. Turbidity, on the other hand, was in most cases not in compliance.

- Both teams found the attitude of the mining community to be cooperative, helpful, and increasingly aware of its responsibilities under the permit.

- At present, the samples collected by each team have not been fully analyzed. When this is complete, copies of our findings will be provided to appropriate regulatory, mining, and environmental representatives.

In addition, the National Effluent Guidelines Division sampled 10 miners to test various treatment systems. A preliminary report from the contractor is herein submitted to the committee.

Now let me briefly describe the purpose and scope of use attainability analysis.

The basic purpose of use attainability analysis is to determine whether or not the goal of the Clean Water Act, protection and propogation of fish, shellfish, and wildlife, and recreation in and on the water, is achievable on a given stream. They are also required to demonstrate that other stream uses designated for the stream but not required by The Act are not actually attainable on the stream. Federal regulations (40 cfr 131) list six reasons why the Clean Water Act goal or designated uses may not be attainable on a stream:

1. Naturally occuring pollutants

2. Insufficient flow

3. Human caused conditions

4. Hydrologic modifications

5. Physical conditions in the stream

6. Attainment of the use would cause substantial and widespread economic and social impacts.

The regulation requires a use attainability analysis be conducted whenever designated uses are to be removed from a stream or the Clean Water Act goals are not to be designated for the stream. The analysis is to document that the designated uses or the goal are not attainable on the stream for one or more of the six reasons cited above.

The scope of these analyses can vary substantially depending on the complexity of the stream system and the factors apparently precluding attainment of the Clean Water Act goal or other designated uses. The scope must be sufficient to accomplish the following:

1. Determine existing stream uses including biological uses such as fish spawning or migration routes.

2. Determine the factors precluding attainment of the Clean Water Act goal or other designated uses.

3. Determine the uses that are attainable.

As described in the guidance manual "Water Quality Standards Handbook" further analyses could be required depending on the situation. These could include economic analyses and wasteload allocations.

In conclusion, we at EPA, the state agencies and the mining community have made a great deal of progress this past season towards the goals of meeting the requirements of the state and federal laws and maintaining a viable mining industry. We still have a considerable task before us, however, I am confident based upon the accomplishment to date that these goals are achievable.

Alaska State Legislature

BETTYE FAHRENKAMP, Chairman
ROBERT H. ZIEGLER, SR., Vice Chairman
DICK ELIASON
PAUL FISCHER
VIC FISCHER
BOB MULCAHY
ARLISS STURGULEWSKI

POUCH V
STATE CAPITAL
JUNEAU, ALASKA 99811
(907) 465-3834
(907) 465-3835

Senate

Committee on Resources

OPENING REMARKS OF SENATOR BETTYE FAHRENKAMP, CHAIRMAN
SENATE RESOURCES COMMITTEE HEARING - SEPTEMBER 28, 1984

GOOD MORNING & INTRODUCTIONS

THE PURPOSE OF TODAY'S MEETING IS TO HEAR FROM THE DEPARTMENTS OF ENVIRONMENTAL CONSERVATION, NATURAL RESOURCES, FISH AND GAME, AND THE FEDERAL ENVIRONMENTAL PROTECTION AGENCY ON PLACER MINING STUDIES CONDUCTED THIS SUMMER.

AS YOU ALL KNOW, WE ARE CONFRONTED WITH A DIFFICULT SITUATION REGARDING WATER QUALITY AND USE OF OUR STREAMS BY PLACER MINERS. THE MINERS, WHO HAVE AN ESTABLISHED HISTORY OF USE OF OUR STREAMS, ARE REGULATED BY THE THREE STATE AGENCIES, WHOSE APPLICATION AND ENFORCEMENT OF WATER QUALITY STANDARDS IS GUIDED BY THE FEDERAL CLEAN WATER ACT.

IN THE EARLY 1970'S, THE CLEAN WATER ACT REQUIRED THAT THE STATE CLASSIFY ITS STREAMS ACCORDING TO USE. LACKING THE DATA NECESSARY TO MAKE INFORMED DECISIONS, THE STATE CLASSIFIED ALL ITS STREAMS UNDER THE MOST STRINGENT CLASSIFICATION: DRINKING WATER.

STATE LAW AUTHORIZES DEC TO DETERMINE WHAT QUALITIES OF WATER INDICATE POLLUTED CONDITIONS FOR EACH CLASSIFICATION. IN THE CASE OF DRINKING WATER, THE TURBIDITY STANDARD, WHICH IS BASICALLY HOW "MURKY" THE WATER IS, IS 5 "NTU", OR 5 TURBIDITY UNITS ABOVE

NATURAL CONDITIONS. THIS IS THE STANDARD THAT HAS PROVEN IMPOSSIBLE FOR THE MINERS TO MEET, AND HAS PLACED MANY OF THEM IN VIOLATION OF STATE AND FEDERAL LAW.

THE EPA HAS GRANTED THE STATE SOME TIME TO DETERMINE IF OUR WATER QUALITY STANDARDS ARE REALISTIC, AND TO ASSIST THE MINERS IN ACHIEVING COMPLIANCE WITH THE STANDARDS THROUGH CORRECTLY CLASSIFYING OUR STREAMS OR DEVELOPING NEW TECHNOLOGIES. TOWARD THIS END, NEARLY $1 MILLION WAS APPROPRIATED IN THE FY 85 OPERATING BUDGET TO DEC, DNR, AND FISH AND GAME FOR GATHERING DATA ON OUR STREAMS AND FOR RESEARCHING EFFECTS OF THE STANDARDS. IN ADDITION, A GRANT PROGRAM THAT WILL ACTIVELY INVOLVE THE MINERS THEMSELVES IN THE RESEARCH EFFORT WAS ESTABLISHED AND FUNDED.

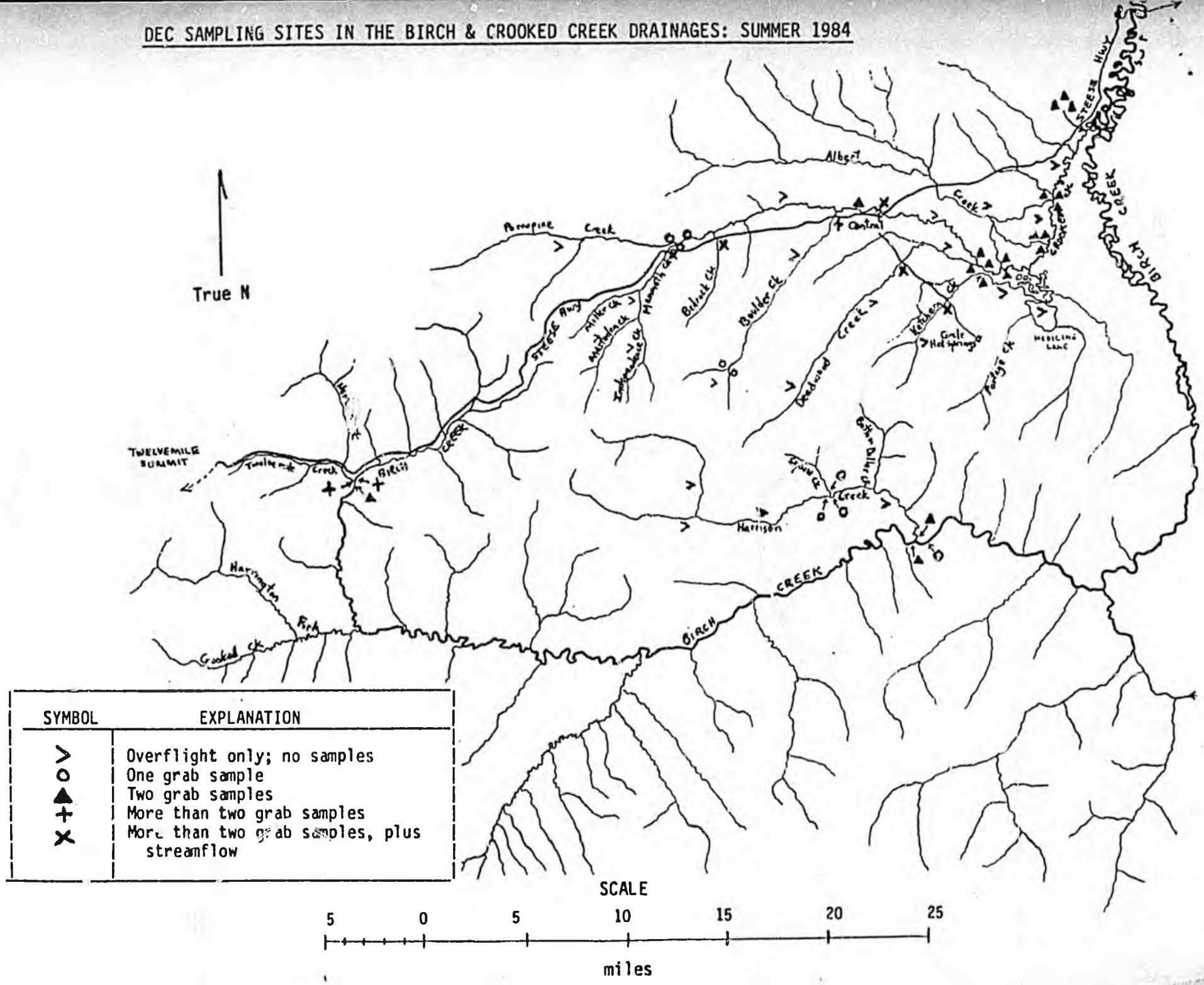
I'VE ASKED THE AGENCIES FOR A SUMMARY OF THIS SUMMER'S ACTIVITIES, A RUNDOWN OF THE GRANT PROGRAM, AND TO DISCUSS WHERE WE GO FROM HERE. EPA, WHO ALSO HAD SCIENTISTS IN THE FIELD THIS SUMMER, HAS BEEN ASKED TO MAKE A SIMILAR PRESENTATION.

I HAVE GENERALLY BEEN PLEASED WITH THE DILIGENCE OF OUR STATE AGENCIES THIS SEASON, AND LOOK FORWARD TO NOT ONLY AN INFORMATIVE PRESENTATION BUT TO AN OPEN DISCUSSION OF WHERE WE'RE HEADING AND WHAT WE HAVE FOR OPTIONS.

COMMISSIONER NEVE ...

(HE'LL MAKE OPENING STATEMENT ON STATE'S BEHALF, AND INTRODUCE THE OTHER PARTICIPANTS.)

DEC SAMPLING SITES IN THE BIRCH & CROOKED CREEK DRAINAGES: SUMMER 1984



SYMBOL	EXPLANATION
>	Overflight only; no samples
o	One grab sample
▲	Two grab samples
+	More than two grab samples
X	More than two grab samples, plus streamflow

NOTE: NO TAPE LOG WAS KEPT

Alaska State Legislature

POUCH V
STATE CAPITAL
JUNEAU, ALASKA 99811
(907) 465-3834
(907) 465-3835

Senate

Committee on Resources

MINUTES

September 28, 1984
9:00 a.m.

Noel Wien Library
Fairbanks North Star
Borough

MEMBERS PRESENT

Senator Fahrenkamp, Chairman
Senator Ziegler, Vice Chairman
Senator Eliason
Senator Sturgulewski

CALENDAR

Overview of placer mining studies by the Department of Environmental Conservation, Department of Natural Resources, and Department of Fish and Game.

Senator Fahrenkamp stated the purpose of the hearing as a review of placer mining studies conducted this summer by the Departments of Environmental Conservation, Natural Resources, and Fish and Game.

Commissioner Neve, Department of Environmental Conservation, commended the work of the three agencies this summer. He noted that although much data has been collected, an analysis of the data has not yet occurred.

Randy Bayliss, Chief of Water Quality Management, Department of Environmental Conservation, provided background on the federal Clean Water Act, discussing the Environmental Protection Agency's responsibility in establishing effluent discharge controls, and the 1973 provision of the Act that required the state to classify its streams. Bayliss explained the "basin approach" to water quality management and the nature of the Central drainages selected by the three agencies as the study area.

Pedro Denton, Director, Division of Mining, Department of Natural Resources, outlined his agency's role as that of assisting the miners in implementing new approaches that may result from the research now being conducted.

Glenn Miller, Division of Mining, Department of Natural Resources, outlined the Division's tasks this summer as a study and evaluation of present and past mining practices, recordation of current stream conditions, research on mining technologies elsewhere, and research on similar technologies in other industries. He noted that geographic conditions hamper a comparison of Alaska's placer operations with those of other states, and emphasized the suitability of technology transfer with the Yukon Territory.

Bill Long, Chief, Water Resources Section, Division of Geological and Geophysical Survey, Department of Natural Resources, provided information on the Division's ongoing hydrologic studies.

Steve Mack, Division of Geological and Geophysical Survey, Department of Natural Resources, outlined the Division's studies this summer on stream flow, turbidity, and trace metals.

John Clark, Director, Division of Habitat, Department of Fish and Game, stated that the Division studied ten mined streams and six control streams in the study area, and recorded data on key habitat, stream channels, riparian vegetation, benthic invertebrates, sediment deposits, and fish distribution.

Bayliss discussed two requests for proposal, a use attainability analysis and a review of the State's water quality standards, being prepared by the Department of Environmental Conservation.

Ron Kreizenbeck, Director, Alaska Operations Office, U.S. Environmental Protection Agency, explained EPA's work this summer. A compliance team conducted sampling inspections, and a trend analysis team collected samples for settleable solids, total suspended solids, arsenic, and turbidity. Both teams found that the settleable solids limitations were generally being met, but that turbidity limitations were not. In addition, the National Effluent Guidelines Division sampled mines to test various treatment systems. Kreizenbeck outlined the purpose and scope of a use attainability analysis.

Bayliss provided a status report on the Innovative Gold Recovery and Pollution Control demonstration grant program, stating that permanent regulations should be in place by the end of December 1984.

Senator Sturgulewski emphasized the importance of agency budget requests to allow continuation of the placer mining studies.

Joe Vogler and Don Stein, Fairbanks-area miners, made statements of concern over the turbidity standard.

The meeting was adjourned at 1:20 p.m.

QUARTZ HILL

fact sheet

ued by the public relations department
3075 Wilshire s Angeles, California 90010 · 381-5311

U.S.BORAX

November 4, 1982

QUARTZ HILL MOLYBDENUM PROJECT
INITIAL PLAN OF OPERATIONS

(SUMMARY)

On November 4, 1982, the United States Borax & Chemical Corporation (U.S.Borax), on behalf of the Pacific Coast Molybdenum Company, filed an Initial Plan of Operations for development of its Quartz Hill mining claims, located 45 miles east of Ketchikan, Alaska. The Initial Plan of Operations, which covers all reasonably foreseeable activities required to develop the mining claims, must be evaluated and approved by the U.S. Forest Service before these development/operational activities may commence. The Forest Service will begin its review of the Initial Plan in the near future by identifying issues to be included in an Environmental Impact Statement. The contents of the U.S.Borax Initial Plan of Operations is briefly summarized below.

Project Background

United States Borax & Chemical Corporation (U.S.Borax) initiated a geochemical exploration program in Tongass National Forest, Southeast Alaska, which resulted in discovery and acquisition in 1974 of a molybdenum deposit by location of mining claims. This mineral deposit and area has been designated Quartz Hill, (Figure 1). The special language of Sections 503, 504, and 505 of ANILCA recognized the Quartz Hill mineral deposit and the mining claims located to acquire it, and mandated development of the deposit under specific conditions.

A Final Concepts Analysis Document (CAD), dated September 2, 1981, a Draft EIS on Road Access and Bulk Sampling dated December 1981, a supplemental Draft EIS dated April 1982, a Final EIS issued July 1982, and a special Use Permit for a surface access road for bulk sampling issued August 23, 1982, fulfill the statutory requirements placed on the access road by ANILCA. The Initial Plan of Operations presents the general plans for the mine development, its associated plants and ancillary facilities, as presently viewed by U.S.Borax.

Guidelines for Development

Based on evaluations to date, it is U.S.Borax's current view that mine development should proceed according to the following guidelines:

- The ore body to be mined by an open pit. This mining method is mandated by the mineral occurrence (near the surface) and will permit maximum recovery of the mineral resource at the lowest cost. The mine is fixed by the location of the mineralization.

- o The surface access road from tidewater for long term operation will be by the Blossom Route, the same route as determined by the Record of Decision of R. Max Peterson, Chief, United States Department of Agriculture, Forest Service, July 15, 1982.

- o The processing facilities, ancillary facilities, and townsite will be on the "Blossom side", to assure that the long-term operational road access to the mine area is limited only to the Blossom Route.

- o Tailings disposal will be to the Boca de Quadra fjord, in accordance with the July 15, 1982 Record of Decision.

Proposed Development Concept

The proposed initial development plan, currently preferred by U.S.Borax, includes the following features (see Figure 2):

- Mine initially producing approximately 40,000 tons per day (tpd) of ore, expanded to approximately 60,000 tpd of ore after several years of operation, with possible further expansions in the future.

- A mill located in Tunnel Creek Basin and connected to the mine by a tunnel for conveyance of ore. The conveyor belt that will transport ore will be on a minus grade and will generate electrical power.

- Processing facilities at Tunnel Creek to include coarse ore storage, grinding mills, ball mills, flotation, concentrate filtering and shipping, and ancillary facilities (e.g. reagent handling, utilities, administration, etc.).

- Tailings transported through a tunnel, by pipeline or other means, connecting mill site at Tunnel Creek to Boca de Quadra. Tailings will be discharged at depth to the inner basin where they will flow to the fjord bottom.

- Primary water supply to be developed at mill site. Supplemental water will be pumped from gravel beds adjacent to the Wilson River, downstream from the confluence of the Wilson and Blossom Rivers.

- Power plant located at Tunnel Creek, with an initially installed capacity of approximately 75 Megawatts (MW), to be expanded to approximately 100MW after several years of operation.

- Townsite located at Bakewell Arm, to be expanded to a full service community during the 5 or 6 year period following plant startup.

- Mine access road, about 28 feet wide with 4 foot shoulders, generally following the bulk sampling access road alignment; and road connecting townsite with project wharf facilities.

Project development is currently scheduled to begin in mid-1984, with the first phase of construction to be completed by 1987. Production of molybdenum concentrate would begin in mid-1987 and assuming an ore production rate of 60,000 tpd, could continue for more than 70 years.

Alternatives Still Under Consideration

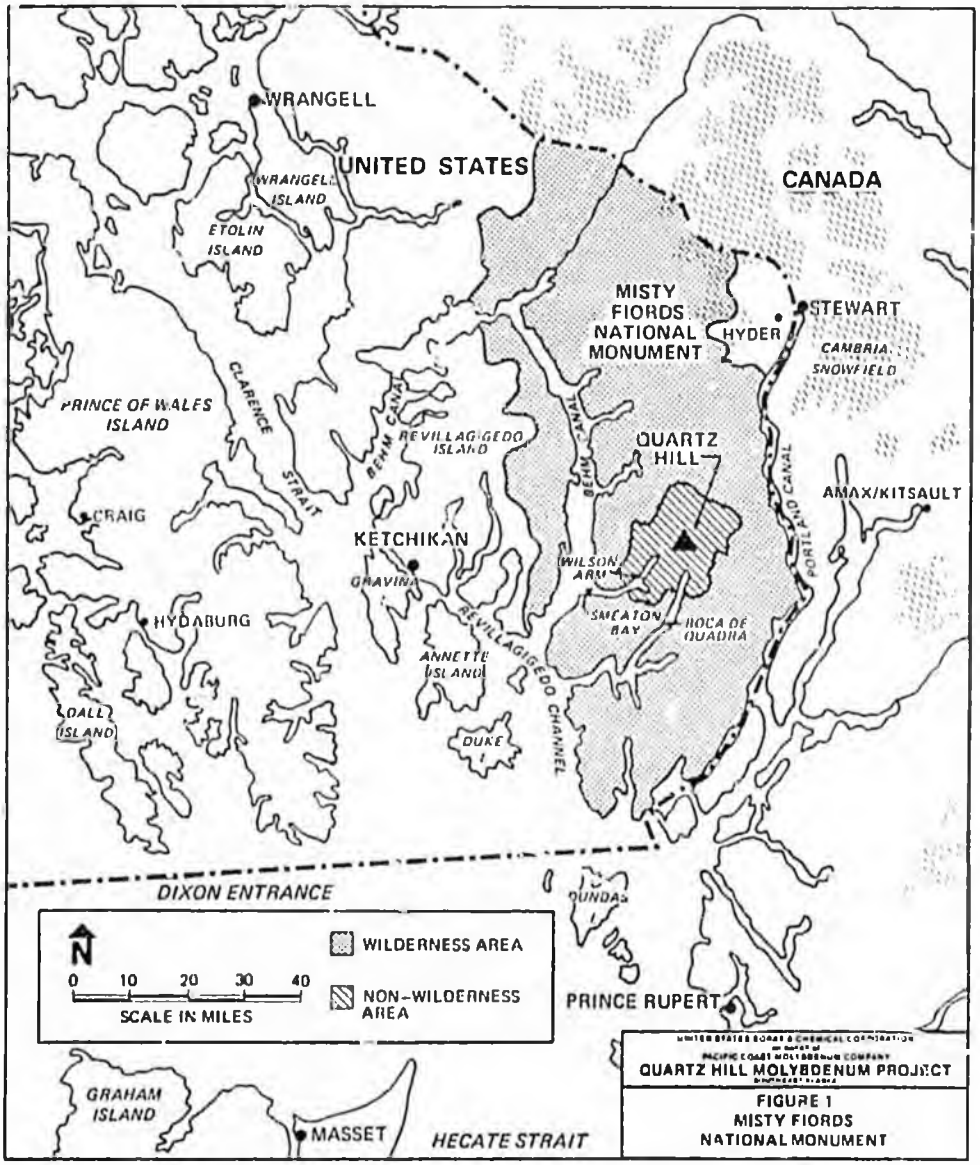
The preferred concept differs in several aspects from the alternatives described in the CAD; these differences reflect the administrative and regulatory decisions itemized in the Final EIS and the July 15, 1982 Record of Decision. However, several alternatives are still under consideration:

- Production rates, and related concentrator capacities of:
  - Approximately 40,000 tpd, no expansion provided for, a "minimum cost" facility.
  - Approximately 40,000 tpd initially, with provision for expansion to approximately 60,000 tpd after a few years of operation, subject to market conditions.
  - Approximately 60,000 tpd, with some provision for eventual expansion to higher production rates.
- Concentrator location at:
  - Beaver Creek
  - Tunnel Creek
- Tailings disposal:
  - On land in impoundments
  - In Wilson Arm/Smeaton Bay (eliminated by Record of Decision, July 15, 1982; however, must be addressed in Final EIS.)
  - In Boca de Quadra
- Townsite development:
  - Full community at Bakewell site
  - Full community at Wilson site
  - Camp with Ketchikan commute

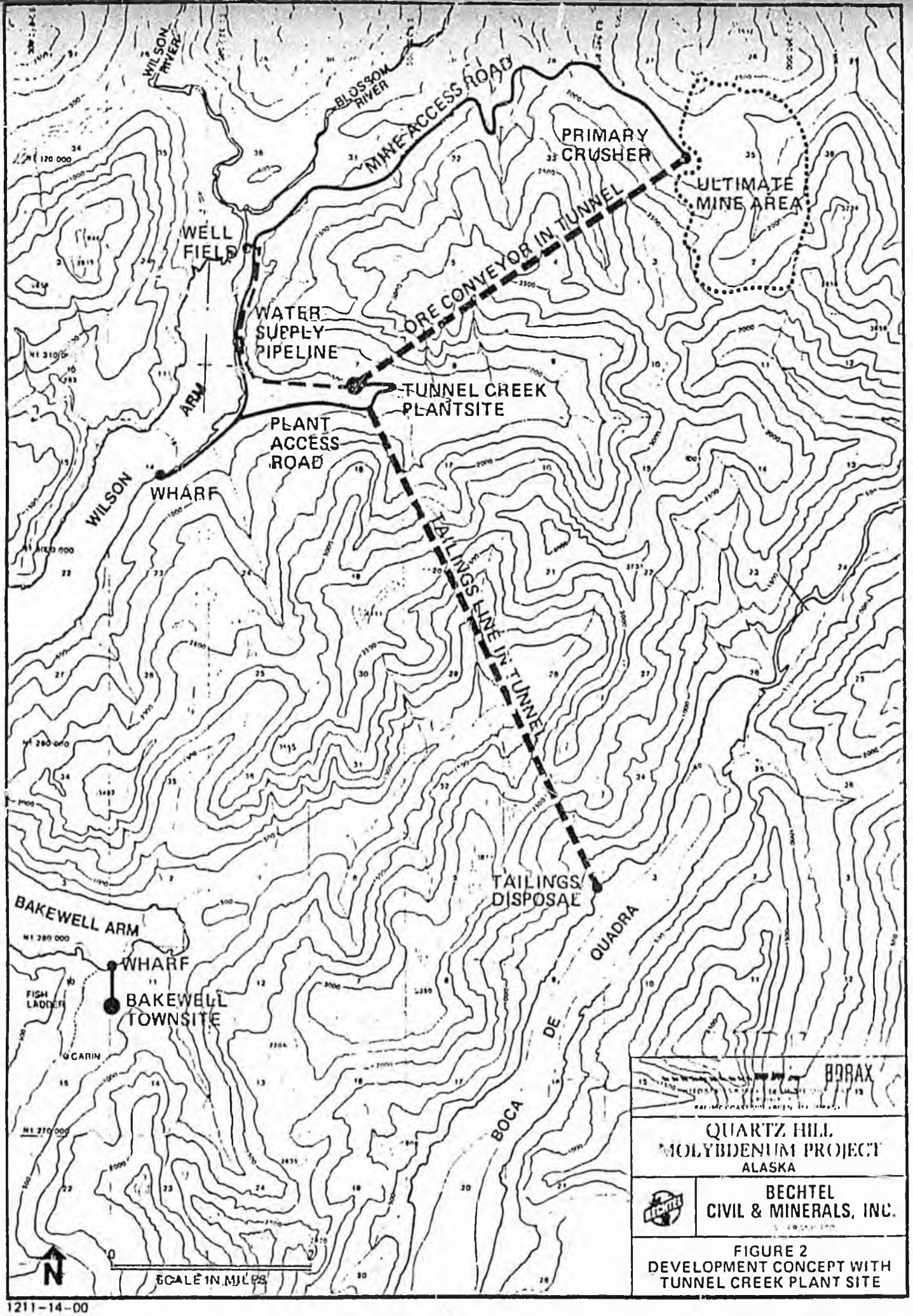
The final development concept will be determined by a number of variables, such as permitting, environmental constraints, engineering and economic feasibility, constructability, capital availability, and molybdenum market conditions. The final development concept will also be affected by results from field engineering evaluation programs, environmental analyses and bulk sample analyses yet to be completed. All of these factors will influence U.S.Borax's decision-making on how best to develop the Quartz Hill claims.

Environmental Considerations and Mitigation Measures

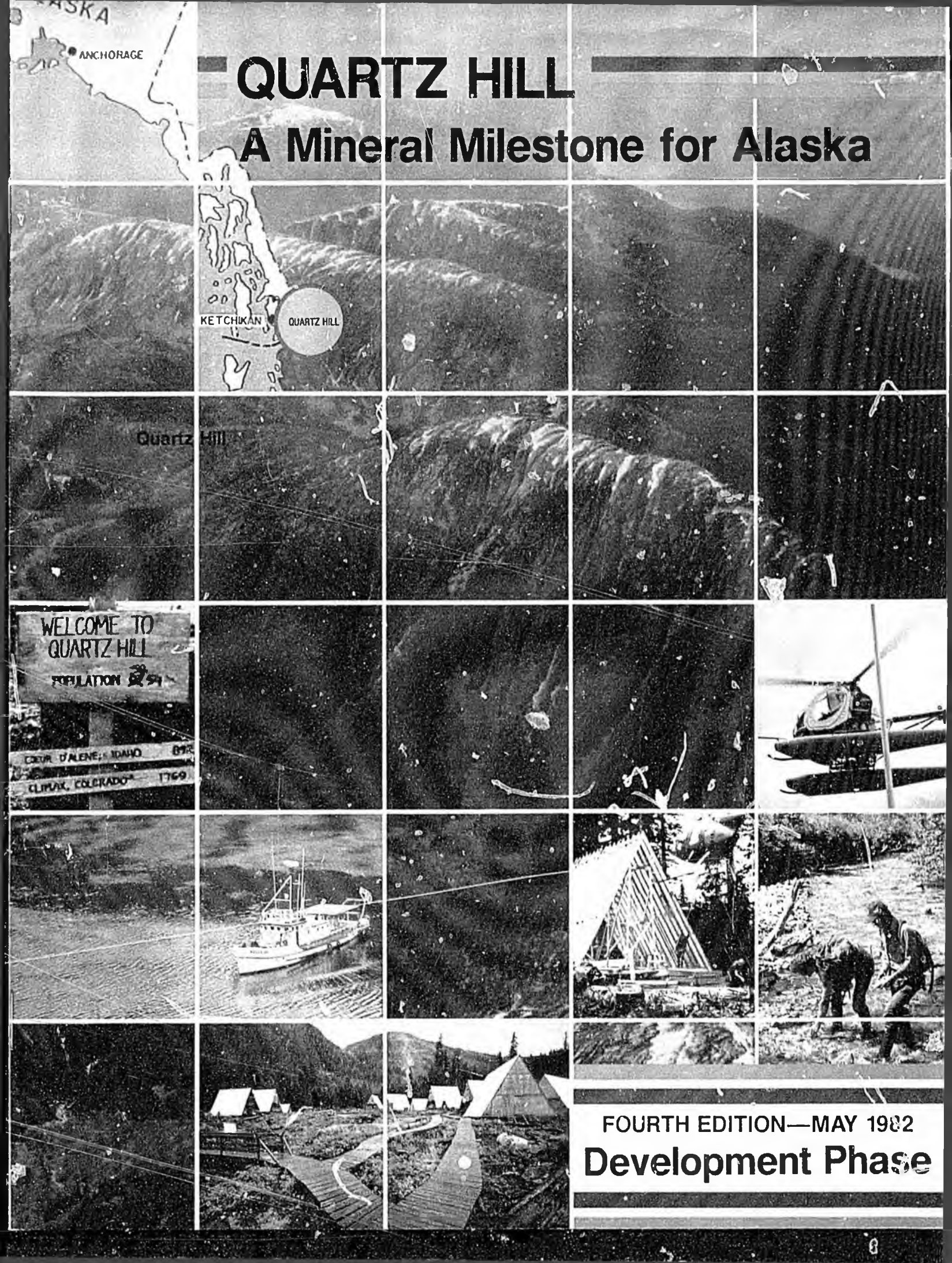
The U.S. Forest Service will be the lead agency for the EIS and will convene an Interdisciplinary Team (IDT) of agency representatives to assist in the EIS preparation. The Forest Service expects to receive agency input through the IDT so that permit conditions and mitigation requirements can be developed concurrently with EIS preparation. U.S.Borax is also incorporating measures for mitigation of adverse environmental impacts into project design to assure compliance with the Alaska National Interest Lands Conservation Act, with all pertinent federal and state environmental standards and regulations, and with all anticipated permit stipulations.



The wilderness area was designated by congress in the Alaska National Interest Lands Conservation (ANILCA). The Quartz Hill area was not included in the wilderness classification to allow development of the mine.


WILSON RIVER
BLOSSOM RIVER
MINE ACCESS ROAD
PRIMARY CRUSHER
ULTIMATE MINE AREA
ORE CONVEYOR IN TUNNEL
WELL FIELD
WATER SUPPLY PIPELINE
TUNNEL CREEK PLANTSITE
PLANT ACCESS ROAD
WILSON ARM
WHARF
TAILINGS LINE IN TUNNEL
TAILINGS DISPOSAL
BAKEWELL ARM
WHARF
FISH LADDER
BAKEWELL TOWNSITE
GCARIN
BOCA DE QUADRA
N
0
SCALE IN MILES
BORAX
QUARTZ HILL
MOLYBDENUM PROJECT
ALASKA
BECHTEL
CIVIL & MINERALS, INC.
FIGURE 2
DEVELOPMENT CONCEPT WITH
TUNNEL CREEK PLANT SITE

1211-14-00



QUARTZ HILL

A Mineral Milestone for Alaska

FOURTH EDITION—MAY 1982

Development Phase

This booklet is the fourth in a series of reports describing the continuing evolution of the Quartz Hill Molybdenum Project in southeastern Alaska, from discovery of the ore body to eventual operation of the mine and production of molybdenum concentrate (MoS_2).

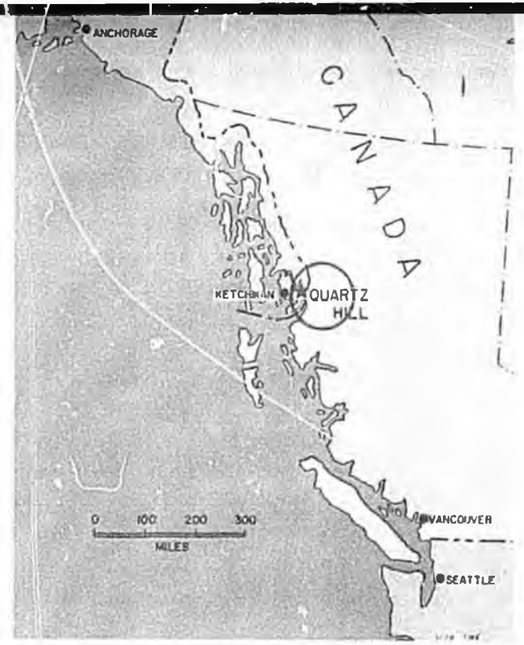
This edition deals with conceptual plans for the proposed molybdenum mine. It must be emphasized, however, that although the actual development plans for the Quartz Hill Molybdenum Project are preliminary and subject to change, the commitment to develop and operate the molybdenum mine is not. U.S. Borax and its affiliate Pacific Coast Molybdenum Company intend to be a responsible part of the future of Alaska.

QUARTZ HILL MOLYBDENUM DEPOSIT

Quartz Hill is the name given to a knoll on which molybdenum-containing ore was exposed and first discovered.

The area of the ore deposit, discovered and claimed in 1974 by geologists of the United States Borax & Chemical Corporation, is located near the Canadian border in the extreme southeast part of the Alaskan panhandle, 45 air miles directly east of Ketchikan, (Alaska's fourth largest city) and 665 miles northwest of Seattle, Washington.

The Quartz Hill ore deposit lies at the head of a peninsula bounded by the Wilson Arm/Smeaton Bay fjords on the north, and the Boca de Quadra fjord on the south. To the north of the ore deposit, the 23-mile long Blossom River drains into Wilson Arm, while south of Quartz Hill, the 20-mile long Keta River flows into Boca de Quadra. Both are salmon spawning rivers; the streams in the immediate area of the deposit are not.



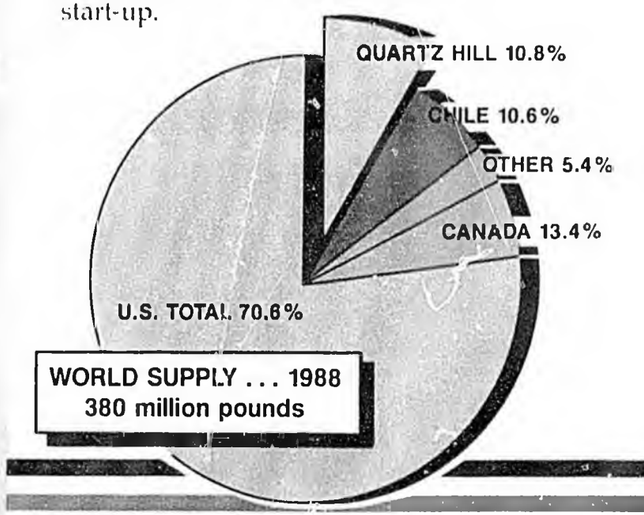
The Quartz Hill area, with its large deposit of molybdenum disulfide (molybdenite, MoS_2) near the surface, is a unique and remarkable geologic feature of North America. It represents about 10% of the world's known molybdenum reserves.

U.S. Borax estimates the proven and probable mineable ore reserves to be more than 1.5 billion tons with an average grade of 0.136% MoS_2, using a cut-off grade of 0.07% MoS_2. This includes 200 million tons of at-surface ore grading better than 0.20% MoS_2.

Based upon a mining and processing rate of 60,000 tons of ore per day, the Quartz Hill mine would produce 40 million pounds of contained molybdenum per year. This output could supply about 11% of the world's supply of molybdenum. At this rate of extraction, the Quartz Hill mine is expected to have a productive life of about 70 years.

. . . in S.E. ALASKA

While 60,000 tons of ore per day is the maximum contemplated processing capacity, constructed capacity and output may be lower, depending on a forecast of market demand at the time of start-up.



HISTORY AND PRESENT STATUS OF THE QUARTZ HILL PROJECT

At the time of discovery of the orebody in 1974, Quartz Hill, as part of the Tongass National Forest, was open for multiple use, including mining activities. The area is administered by the Forest Service, U.S. Department of Agriculture.

In 1976 U.S. Borax applied for a "special use" permit to build a surface access road to the ore deposit so that it could conduct an operation called bulk sampling.

This operation would allow enough ore to be removed to confirm the quality and uniformity of the deposit, and to evaluate the milling processes by which the molybdenite mineral could be economically extracted from the ore.

The road permit was granted but subsequently denied by the Undersecretary of Agriculture on December 1, 1978, the same day the Misty Fjords National Monument, including the Quartz Hill area, was established by Presidential proclamation. The Quartz Hill area was also withdrawn from mineral entry and proposed as a wilderness area.

These administrative actions placed the future of the Quartz Hill project in doubt until the passage of the Alaska National Interest Lands Conservation Act (ANILCA, Public Law 96-487) on December 2, 1980. This Act confirmed the establishment of the 3.2 million-acre Misty Fjords National Monument and designated all of it except the 149,000 acres surrounding the Quartz Hill area as Wilderness. The Act allows surface access to the deposit for bulk sampling and operation of the mine under special conditions that include the protection of the environment and fishery of the Monument.

The ANILCA Timetable

The Alaska National Interest Lands Conservation Act (ANILCA) of December 2, 1980, is the most significant federal land management action since the acquisition of Alaska in 1867. It placed more public land in the protective designation of parks, refuges, wilderness, etc. than any prior act of our country.

It also dealt with the Quartz Hill claims in that the Act acknowledged the mineral resource importance of the deposit and set forth special language to protect the valid claims, the resource and the environment in which it is located.

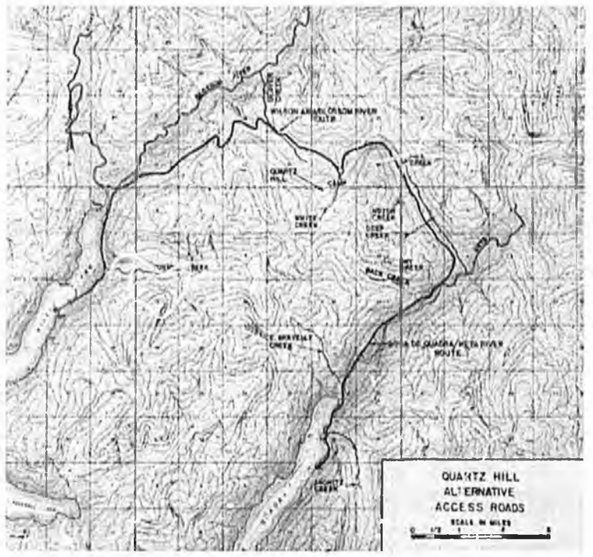
That special language mandates surface access to the claims for bulk sampling under conditions that allow an expedited environmental review process and requires two documents:

Within six months after passage of ANILCA, the U.S. Forest Service was to publish a Draft Mining Development Concepts Analysis Document (CAD) and distribute it for comments, suggestions, and criticisms. This was to be followed by a final CAD three months later. These provisions were met; the final CAD was published by the September 1981 deadline. The CAD is not a decision-document but is intended to aid in the understanding of the engineering, economic, social and environmental implications of the total Quartz Hill Molybdenum Project.

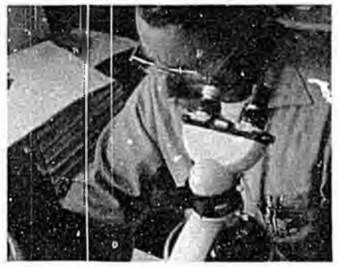
Within one year after passage of ANILCA, the U.S. Forest Service was to issue a draft Environmental Impact Statement (EIS) dealing with the surface access road and bulk sampling phase of the Quartz Hill Molybdenum Project. The draft EIS was issued on December 3, 1981 and a supplement thereto was issued in April 1982. The preferred alternative is "bulk sampling and surface access via the Blossom River route with stipulations that tailings disposal will not be authorized in Wilson Arm/ Smeaton Bay."

Various factors influenced the preferred alternative decision but it appears the controlling factor was the likelihood of the Blossom River access route being used for the future development and operation of the Quartz Hill mine.

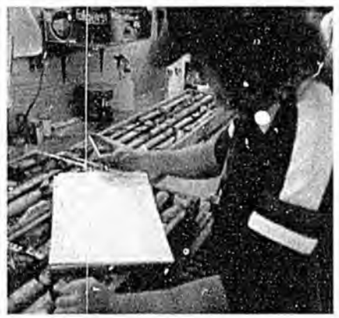
The Act also allows for the future development and operation of the mine under reasonable regulations that would protect the environment. This includes the right to lease the lands necessary to such development and the right to explore and patent the minerals in those claims preempted by the December 1978 Monument proclamation. The core claims had been validated prior to December, 1978 and were not affected by the proclamation.



DEVELOPMENT SCHEDULE OF THE QUARTZ HILL MOLY PROJECT



Seven Summers and $41,000,000 Later . . .



Over a period of seven years, U.S. Borax has spent $41 million on the Quartz Hill Molybdenum Project in an exploratory and development phase consisting of geologic mapping, core drilling, surface sampling, surveying, aerial topographic mapping, underground investigations, conceptual engineering, field investigations of facility sites, metallurgical testing, environmental baseline data collection, market investigations and project evaluations. This field effort was supported from a campsite constructed of temporary A-frame buildings and helicopter landing pads. At present, the only access to the campsite area is by helicopter.

As of 1981, 231,214 feet (more than 43 miles) of rock cores have been drilled from 420 holes (some to depths greater than 1,000 feet) to provide samples of the ore body. The cores have been photographed, catalogued, analyzed and stored.

Sampling Phase

During this exploratory phase, the development of the Quartz Hill Project will proceed in two additional steps:

- An underground examination which not only permits a visual determination of the continuity of the ore body, but it also confirms the molybdenum assay data obtained from drill hole samples.
- The metallurgical tests necessary to determine the size to which the ore must be crushed and ground in order to free the molybdenite from the host rock. The tests also are needed in order to find out what techniques will be used to bring about the separation of the liberated molybdenite particles from the particles of the host rock.

The separation technique is a well-known process called *flotation*, but since each ore behaves differently, the specific process to be used to separate Quartz Hill ore from rock must be determined by test runs on samples of the actual orebody.

Following the exploratory development phase, the bulk sampling stage will include:

- The collection of a bulk sample of more than 5,000 tons from underground workings that is representative of the mineralized ore body. This sample would be used in detailed metallurgical tests involving the extended operation of a pilot plant and the design of various unit processing steps into a continuous operation.

While bulk sampling is neither a major operation nor a complicated procedure, it does require a surface access road to the orebody so that heavy equipment can be moved to the site to haul out the ore. The processing and economic data to be obtained from bulk sampling tests is necessary to provide confidence for the engineering and financing decisions needed at a later stage.

Feasibility Phase

The primary goals of a feasibility study are to confirm the mineral value of the Quartz Hill ore deposit, to analyze the engineering and environmental aspects involved in the development and operation of the Quartz Hill mine, and to complete a marketing and economic analysis of the production and sale of the mined and processed molybdenum.

OPERATION OF THE PROPOSED QUARTZ HILL MOLYBDENUM MINE

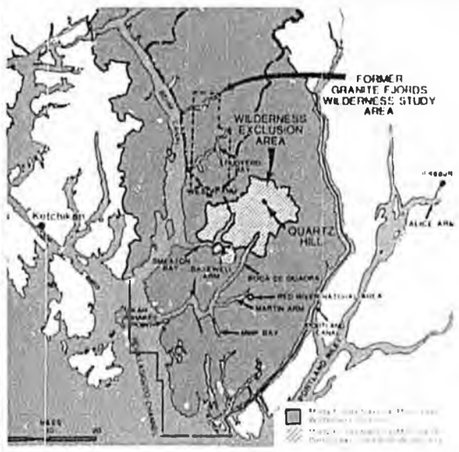
Construction & Operation

The construction of the Quartz Hill mine and its support facilities will require:

- a favorable feasibility study report;
- an approved Environmental Impact Statement;
- a granting of all necessary permits.

All appear to be achievable.

Construction of the Quartz Hill mine and mill involves the building of facilities needed to handle



and process the ore and its resulting concentrates, and to dispose of the slurry of waste mill tailings. In addition to facilities involved in the actual separation of the molybdenum from the ore body, support facilities also will be needed: offices, warehouses, maintenance shops, fuel storage tanks, water supply systems, sewer system, housing, electrical power distribution system, and a marine terminal capable of accommodating barges, fuel tankers, cargo vessels, and ferries.

If the employees at the mine are to live in Ketchikan and be transported to Quartz Hill at intervals, dormitory and other living accommodations will have to be provided. But if the employees and their families are to live near the Quartz Hill minesite, then U.S. Borax will have to construct a townsite complete with houses, stores, schools, churches, hospital, restaurants, recreation facilities, and all the necessary services and utilities; water, electricity, telephone and sewage systems.

The large scale effort of the Quartz Hill mining operation may be visualized from the fact that the mining townsite to be built would be of the same size and complexity as Wrangell, Alaska; a well-established community of long standing.

The further development of the Quartz Hill Molybdenum Project awaits the beginning of the bulk sampling phase. This, in turn, depends upon the prior construction of a surface access road.

Proposed Mine Operation

Because the orebody is exposed at the surface, an open pit mining technique would be used at Quartz Hill. The open pit eventually is expected to reach the dimensions of two miles long, one and one-third miles wide, and 800-2,300 feet deep.

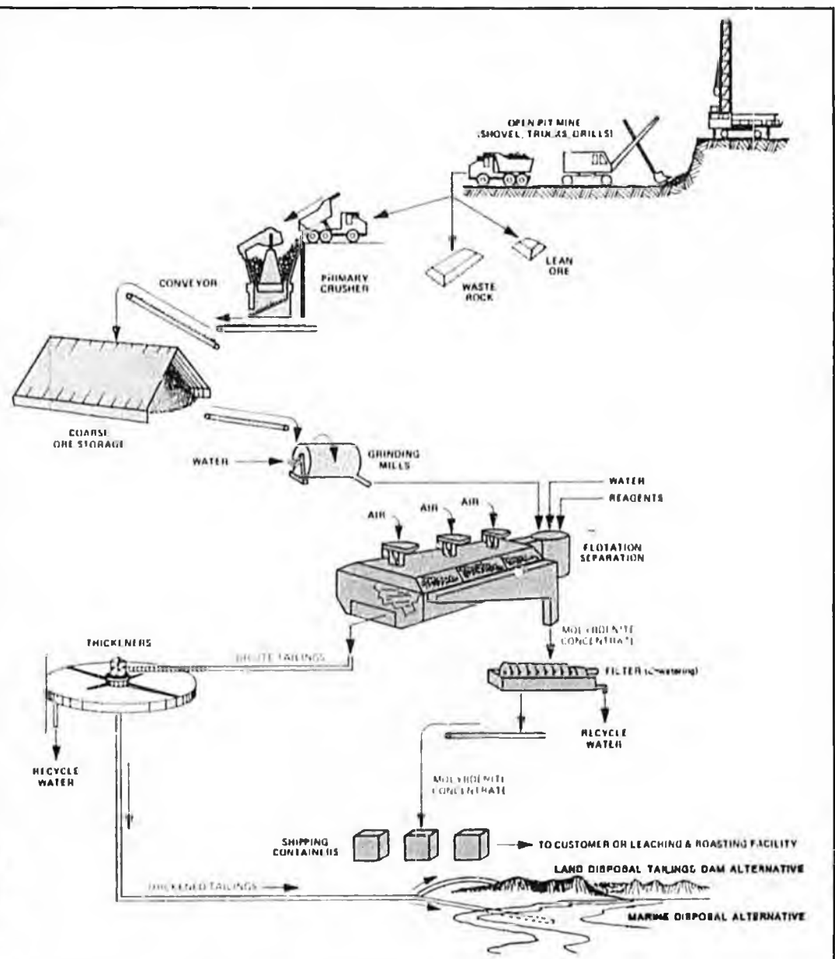
After blasting of the ore on fifty-foot high benches, the broken ore will be excavated using electric shovels, each capable of handling 17 cubic yards of rock in a single scoop. Diesel-powered, but electric-driven, rear-dump trucks, each capable of holding 120 tons of rock, will transport the broken ore from the pit to the primary crusher.

In full operation, the mine may process as much as 60,000 tons of ore per day from which will be separated 100 tons of molybdenite product (for containerized shipment to a location in the lower 48 states).

Because of problems and environmental impacts associated with the disposal of the tailings on land, U.S. Borax favors marine disposal. The tailings would be discharged as a slurry about 150 feet below the surface of an adjacent fjord. The final recommendation will be based on a complete physical and biological evaluation and must be approved by the Environmental Protection Agency and Alaska Department of Environmental Conservation.

A 9-mile long pipeline or pipelines would gravity-transport the tailings from mine to fjord. The physical nature of the tailings coming from the mine would be roughly equivalent to that of very fine sand, resembling but heavier than the natural glacial sediment, now carried down by many Alaskan rivers to the sea. The actual volume of Quartz Hill mine tailings to be discharged into a fjord is similar to the silt load deposited by the Stikine River into the ocean, just north of Quartz Hill, near Wrangell, Alaska. The difference will be that the mine tailings will not be visible from the surface of the fjord.

Operation of the Quartz Hill mine will require the use of water from local rivers and streams and the construction of reservoirs. An electrical generating plant will have to be constructed to meet the power requirements of the project.



THE QUARTZ HILL PROJECT AND ITS ENVIRONMENTAL PROGRAM

Even before the passage of ANILCA, U.S. Borax, in recognition of its commitment to carry out its mining operations with a minimum of adverse effects upon the area's environment and fisheries, instituted a program to collect significant baseline data concerning the Quartz Hill ecology.

Since 1975, more than $5 million has been spent on probably the most de-

tailed and comprehensive environmental baseline study ever undertaken by an American mining company. The studies are to define the air, water, land and biological conditions that now exist at the Quartz Hill area.

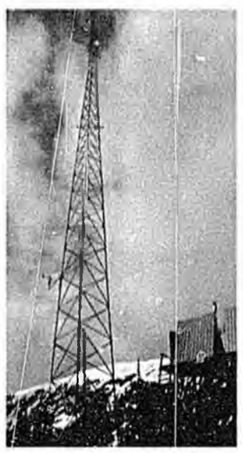
Consider the weather. Quartz Hill is subject to what is known as a maritime climate: cool summers, mild winters, and heavy precipitation. The monthly normal mean temperature ranges from 33°F in January to 58°F in August. The lowest and highest single temperature readings recorded in the environmental study were −14°F in January 1980, and 90°F in August 1980, respectively.

Quartz Hill receives more than 100 inches of rainfall per year, with October and November being the wettest months. In 1980, however, the measured rainfall at Quartz Hill was almost 130 inches (about 148 inches at Ketchikan) of which almost 29 inches (about 25 percent of the annual total) fell in October. Along with this intensive precipitation there is an

annual average wind speed of 12.4 mph.

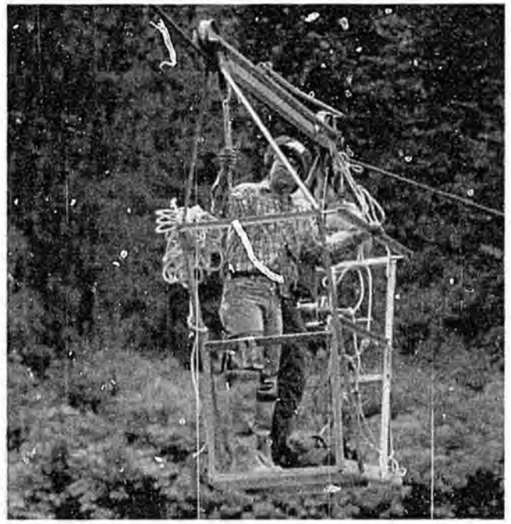
The U.S. Borax baseline environmental studies at Quartz Hill include measurements of the following:

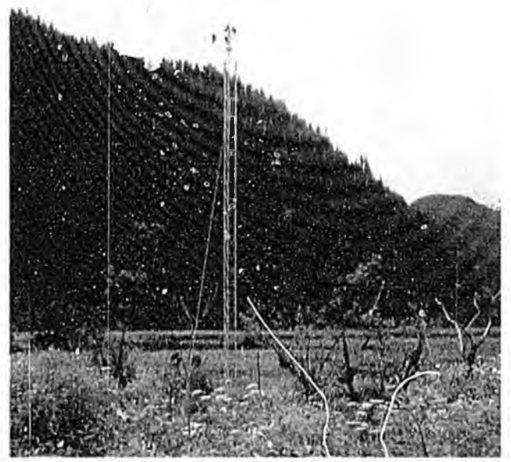
- Meterology
- Surface Hydrology
- Water Quality
- Aquatic Biology
- Coastal & Marine Biology
- Physical & Chemical Oceanography
- Terrestrial Vegetation & Wildlife
- Archeology



Meterology

Six instrumented towers (one is ten feet tall, four are 30 feet tall and one is 150 feet tall) record wind speed and direction, and temperature. Rainfall and snowfall (precipitation) are measured at the 150-ft. tower, in camp and at the confluence of Hill Creek and the Keta River.





Water Quality

Over a three year period water samples have been taken from 17 stations measuring heavy metals, dissolved oxygen, temperature, turbidity, pH, conductance, hardness, organic compounds and suspended solids and sediments.

Surface Hydrology

Depth and velocity of flow of the surrounding rivers and creeks are measured. In addition, there is a continuous, year-round measurement of temperature, conductance, stage and flow with the USGS continuous monitoring stations on the Blossom and Keta Rivers and White Creek.

QUARTZ HILL AND THE ENVIRONMENT . . .

Aquatic Biology

Special attention is being directed to four out of five species of North American salmon that are in the area . . . king, pink, chum and coho; sockeye salmon do not use the Blossom or Keta Rivers. Escapement and spawning activity surveys are made for each species in the potential zones of impact as well as the total river. Habitat utilization areas are documented and macroinvertebrates and periphyton algae species and their abundances are determined.

occurrence are documented. In addition, crab and shrimp surveys and long line or otter trawls define demersal species and abundances.

Physical and Chemical Oceanography

Since the marine disposal of the mine's tailings into a fjord is a preferred method; the configuration, depths, currents, water hydrography, nutrients, sediment transport, bottom sediments and the biota of the two potentially useful fjords (Wilson Arm/Smeaton Bay and Boca de Quadra) have been studied.

Coastal and Marine Biology

The total fjord ecosystem is defined from the tidal area to the deep bottom benthic regions; plants, phytoplankton, zooplankton, pelagic and demersal fishes, and benthic organisms are identified and relative abundance, location and

Terrestrial Vegetation and Wildlife

Almost 50 percent of the Quartz Hill area is covered by forests of spruce and hemlock; the quantity and quality of the trees are unsuitable for commercial timber harvest. Another 20 percent of the area is covered by low-growing shrubs of alpine heath, and 20 percent by miscellaneous growth. The remaining 10 percent of the land consists of boggy, highly water saturated, easily disturbed soils called muskeg.

Twelve different kinds of mammals (including mountain goat, black and brown bears, wolf, wolverine, marten), and 63 different kinds of birds (including bald eagles and various waterfowl), and one species of amphibian have been seen in the Quartz Hill area. To date, no threatened or endangered animal or plant species have been observed.

Archeology

To date, surveys reveal no evidence of any ancient or historical structures or sites in the Quartz Hill area.

ITS SOCIO-ECONOMIC IMPACTS . . .

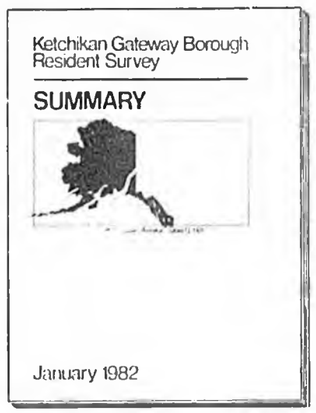
At present, with no amenities, the Quartz Hill area is socially primitive: it has no access road, no permanent buildings, no airstrips, no electric power lines or other utilities and no permanent population. Any large scale activity at Quartz Hill, therefore, would have to depend to some degree for support upon the services offered by Ketchikan, the nearest American municipality, 45 air miles directly west and accessible only by air or sea.

The Ketchikan Gateway Borough has a population of about 15,000 people, two-thirds of whom live in the city of Ketchikan itself. Obviously, any accelerated social or municipal activity sparked by the development of the Quartz Hill Molybdenum Project will have a profound and widespread effect upon Ketchikan.

In 1980, Ketchikan had a police and fire department, a school district with 2,485 students, a 105-bed hospital, two clinics, a theater, numerous small boat harbors, parks, beaches, and a ski area.

Housing in Ketchikan is very scarce; vacancy rates, particularly for apartments, are low and there are waiting lists of potential tenants. The borough's primary source of employment today involve timber (pulp and lumber), retail trade, and governmental services, commercial fishing (salmon, herring, crab), and tourism (Ketchikan is a favorite stopover for Alaskan cruise ships).

U.S. Borax has conducted a survey in Ketchikan to assess both the positive and negative feelings about the impacts to be expected from the construction and operation of the Quartz Hill mine. The impacts will vary depending upon whether the mine's workforce lives in Ketchikan and commutes at intervals to Quartz Hill, or whether the workforce lives in a town at the mine site.



MO-LYB-DE-NUM. A silvery-white, very hard, metallic element used for electrodes of mercury-vapor lamps, as wire for winding electric-resistance furnaces, and in steel alloys. As an alloying agent, it increases the harden-ability and toughness of quenched and tempered steels at high temperatures. Used in nickel-based alloys that are heat-resistant and corrosion-resistant; in electrodes in electrically heated glass furnaces and forehearths; in nuclear-energy applications; for missile and aircraft parts; and as a wire for filaments for metal-evaporation processes and for filaments, grids, and screens in electronic tubes.

. . . AND ITS ECONOMIC ASPECTS

Based on the 1981 prices of molybdenum, the 40 million-pound annual output of the Quartz Hill Mine should have a value of more than $340 million. Thus, at present, the gross value of the Quartz Hill molybdenum deposit, over a 70-year lifetime of mine activity, is estimated at about $24 billion.

Construction of the mine, expected to begin in 1984, will require a workforce of 1,000 people and a capital investment of $870 million (in 1980 dollars). Construction will take 3½ years with the mine currently scheduled to begin operation in late 1987.

Operation of the mine will require over 850 employees with an annual payroll of $25 million.

Thus, U.S. Borax is pioneering in the significant development of the first, large, non-fuel mineral find in Alaska.

U.S.BORAX

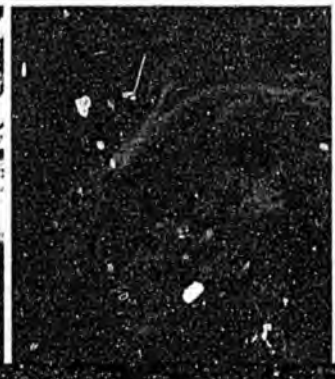
we are involved in Alaska!

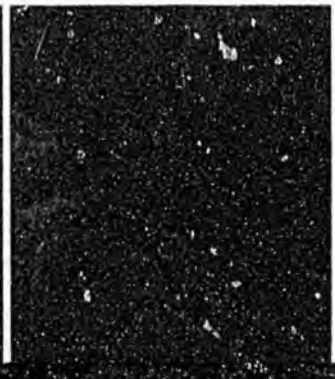
ALASKA

. . . a land of superlatives:

- With an area of 586,412 square miles, it is America's largest state, more than twice as large as Texas, the next largest state.
- A single glacier, the Malaspina, located at the northern end of Alaska's panhandle, is larger than the state of Rhode Island.
- With an elevation of 20,320 feet, Mt. McKinley in south-central Alaska is the highest mountain in North America.
- At the southern tip of Alaska's Panhandle, the United States Borax & Chemical Corporation has explored and claimed the Quartz Hill area, which may turn out to be the largest molybdenum orebody in the world. Molybdenum is a strategic metal with many industrial and defense uses.

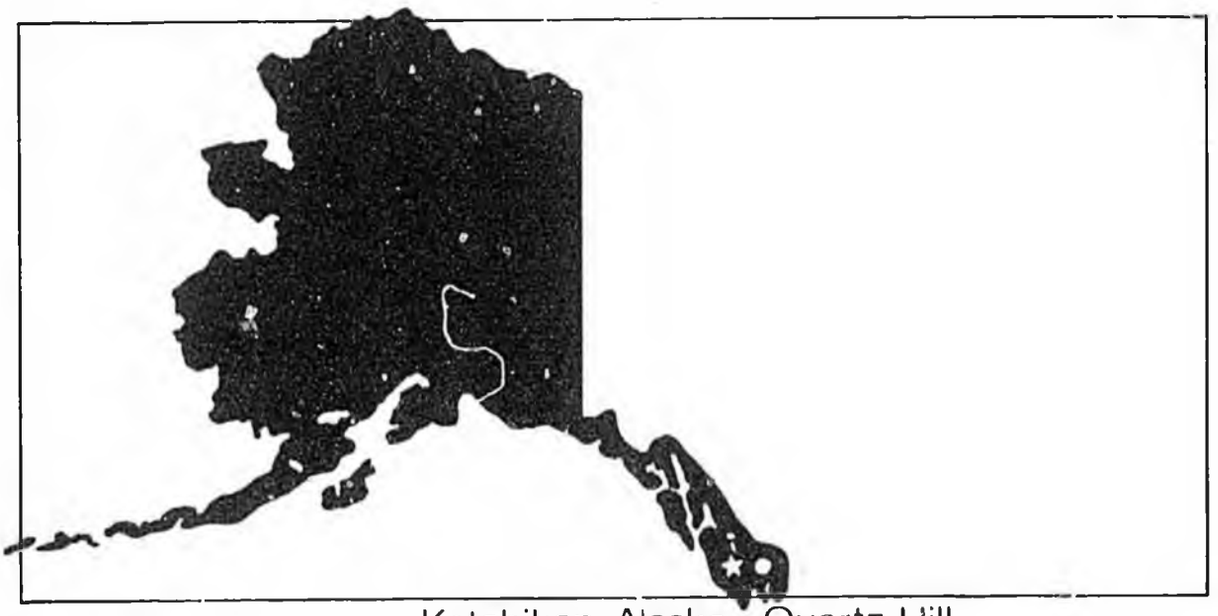
We are involved in Alaska





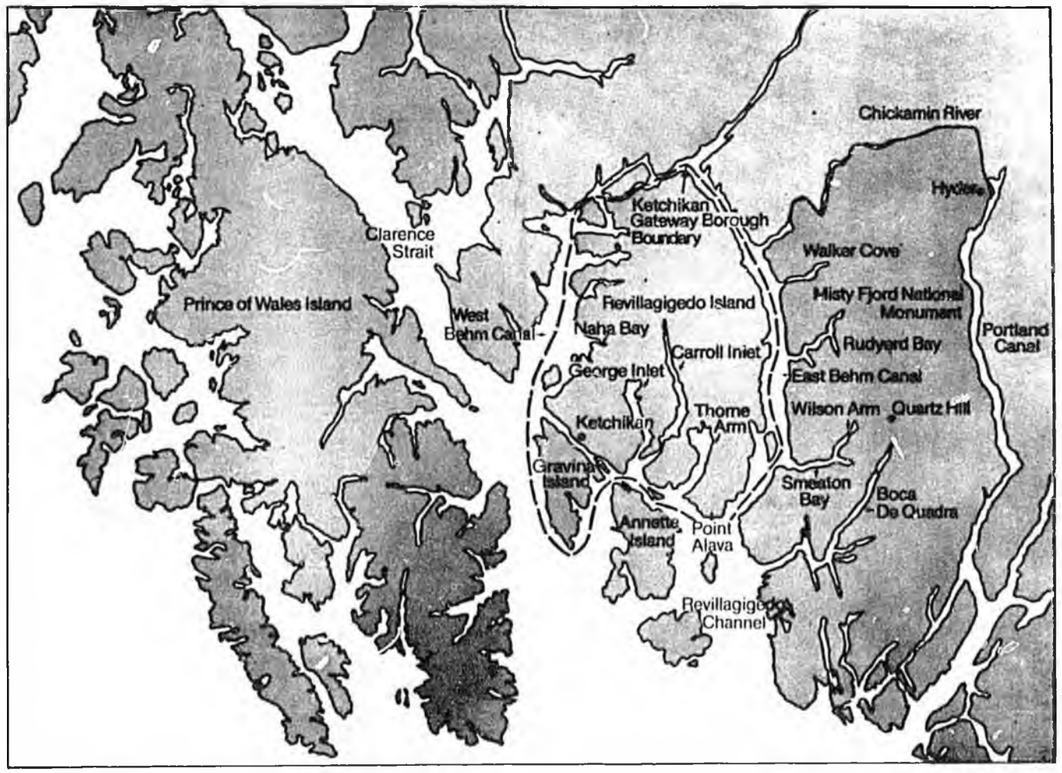
Ketchikan Gateway Borough Resident Survey

SUMMARY



Ketchikan, Alaska Quartz Hill

January 1982



The Survey

The Ketchikan Gateway Borough Resident Survey was sponsored by United States Borax and Chemical Corporation (U.S. Borax) in order to meet key planning and public participation needs associated with the proposed Quartz Hill molybdenum mine. The survey was conducted by ENTERCOM, a public opinion and socioeconomic research firm, with the assistance of local, state and federal officials, individual residents, and a citizen task force formed by the City and Borough mayors.

The survey data are being used by the U.S. Forest Service, state planning and regulatory agencies, Borough and City governments, and U.S. Borax in developing information key to evaluation and planning decisions regarding the mine and its impacts. The survey also provided residents of the Borough a representative opportunity to participate in the planning and evaluation phases of mine development.

The survey results are based on a scientific probability or random sample of four hundred three adult residents of the Borough conducted in mid-Fall, 1981. Random sampling assures that the results accurately reflect the results that would have been gained from a survey of all adult residents of the Borough.

The residents voiced their attitudes about living in Ketchikan, population growth, employment opportunities, local government, land use, community services, management of commercial fishing, and recreation opportunities, including wilderness recreation. In addition, residents gave their opinions about changes that could accompany development of Quartz Hill, including their intentions of seeking work at the mine or mill. Finally, the residents provided information about their employment, housing, recreation, income, among many other personal and family characteristics.

This booklet is a summary of the survey results. If you wish to see a copy of the complete report, it is available in the Planning Office at the Ketchikan Gateway Borough office building in Ketchikan.

Resident Profile

Almost two-thirds of the Borough's adult residents have lived in the Ketchikan area for twenty years or less, while only seven percent have lived there for more than forty years. Further emphasizing the relative newcomer nature of Ketchikan's population are the twenty percent who have lived there three or less years and the twenty-four percent who have been residents for four to ten years.

Sixty-eight percent of the residents have migrated to the Ketchikan area from the pacific coast states, especially Washington and other parts of Alaska.

Fifty-nine percent of the adult residents fall between the ages of twenty-five to forty-four years. Eleven percent are eighteen to twenty-four years old, and thirty percent are over forty-four years old. Eighty-seven percent of the respondents were White, eight percent were Native Americans and the remaining five percent were Asian, Pacific Islander or Black.

Almost two-thirds of the residents own their own homes. A little over half live in a single family house. Those who rent/lease their residence pay on the average $320.00 a month with almost half paying over $400.00.

Thirty-one percent of the households in the Gateway Borough are made up of two persons. Another twenty percent have only one person. Seventeen percent of the households in the Borough are made up of five or more persons. The average number of persons per household is 2.82 in the City and 3.18 in the remainder of the Borough.

Almost two-thirds of the Borough residents are located in the City of Ketchikan. Nearly nine out of ten of the Borough residents are high school graduates with almost half having had some college training. Of those that have been to college, a little more than two-fifths have graduated.

Ketchikan's Quality of Life

Ketchikan's people and social benefits are perceived as major advantages of living in the area. Many residents mentioned the friendly, honest and helpful people, small town life, slower pace of living, low crime rate, feelings of security, low population and familiarity with people as contributing factors.

Along with these benefits, environmental and recreational benefits were also seen as major advantages. These advantages are specifically related to outdoor recreation, living near the ocean, the area's natural beauty, mild climate, mountainous terrain and wilderness. Some residents cited the area's economic advantages and Ketchikan as "just being home" as major incentives for living in the area.

Residents also pointed out a number of disadvantages. In contrast to those who feel positively about the climate, forty percent of the residents felt that the area's rainy climate and hard winters were major drawbacks. Residents also expressed dissatisfaction with the cost of living, specifically as it relates to housing, recreation, food and commodities. Finally, isolation, traffic congestion, poor roads, lack of shopping facilities, lack of social/cultural activities and opportunities, and social problems were cited as disadvantages.

Weighing the advantages and disadvantages, three-fourths of the residents would rather live in the Ketchikan area than elsewhere, although many would move from the area for better job opportunities. The remaining quarter of the population would just as soon live elsewhere.

Most people feel there have been changes in Ketchikan over the past five years; and while there is considerable disagreement as to the direction of the changes, negative ratings outnumber the positive. Residents citing negative changes responded most often that the area had seen "too much population growth, too fast" and with it, possible negative impacts. Improved local services and facilities, improved recreational/social/cultural activities and improved roads and streets were the positive changes cited most often.

An increase in reasonably priced housing was indicated as the most critical issue that needs to be addressed in the Ketchikan area. Other than housing, no other need was mentioned more than ten percent of the time, although increased recreation facilities for youth, families and workers was a recurring theme.

Overall, Ketchikan's quality of life is viewed positively, with the area's friendliness and concern of neighbors contributing significantly to this perception. Fire protection services, the area as a place to raise a family, schools, social services and outdoor recreational opportunities are all strong positive aspects of Ketchikan.

In addition, the area's law enforcement/police protection, job opportunities, cultural opportunities, shopping facilities, health and medical facilities are all generally regarded as positive. The City and Borough government also received a majority of positive ratings, but they also received a substantial number of negative ratings.

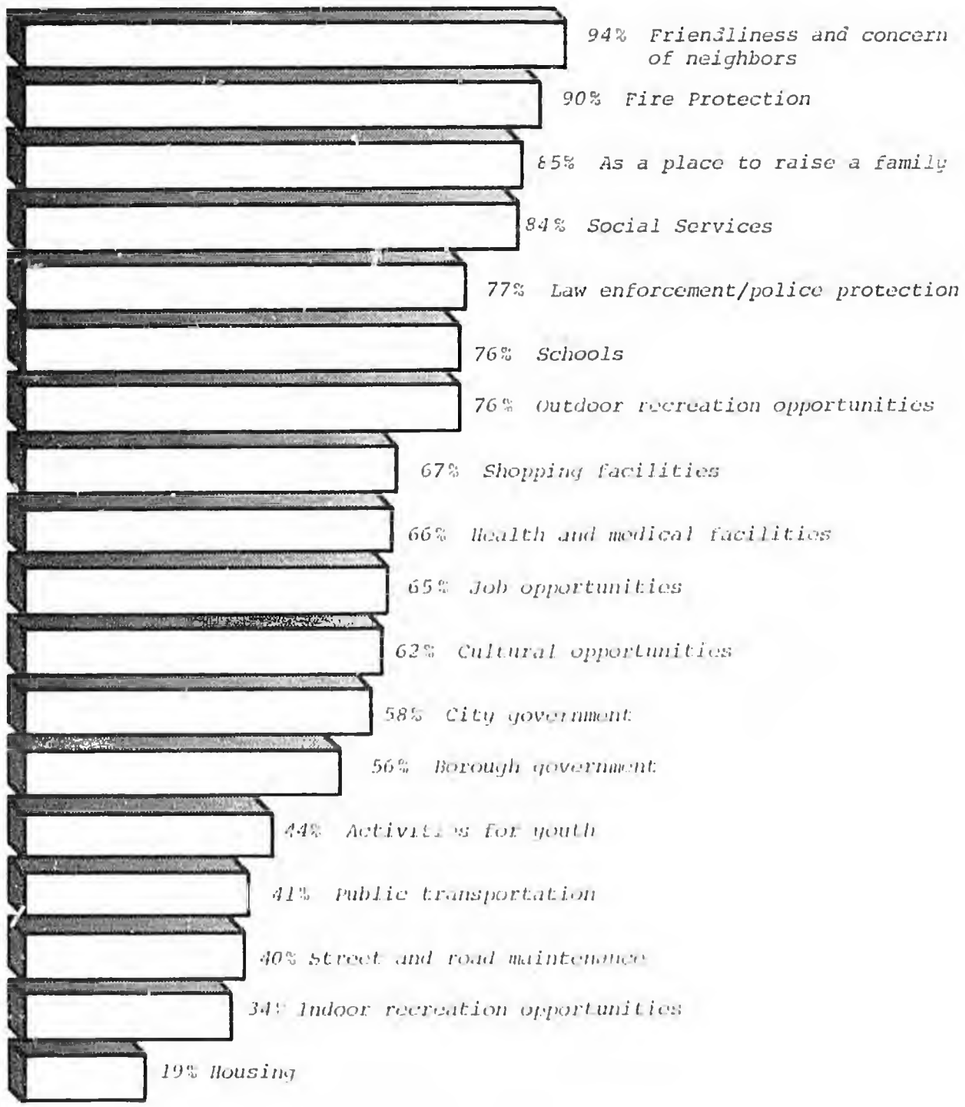
The area's public transportation services, activities for youth, street and road maintenance and indoor recreational facilities are viewed less positively, while housing is seen as the area's most negative characteristic.

Attitudes Toward Population Growth, Land Development, and Economic Sector Growth

Eight of every ten Borough residents felt the area's population has been increasing over the past five years. Feelings about the area's population growth ranged from apparently unqualified support for growth to unqualified opposition. Many residents gave more detailed responses pro and con, including, population growth has increased housing problems, it's inevitable and natural, or some growth is okay. When asked what areas of the Borough would be best suited for growth, north of town, Gravina Island and south of town, in that order, were by far the most mentioned locations.

At least ten percent wanted to

Percent of Residents Expressing Satisfaction With Specific Qualities of Ketchikan Life



see one of the following restrictions or qualifications placed on the sale or use of Borough lands: zoning, selling at a fair price, keeping it out of the hands of speculators, and provision of adequate services. Ten percent felt there shouldn't be any restrictions.

Residents almost unanimously approve of single lot sales to individuals as a means of developing housing on Borough lands, while only a third approved of the sale of large blocks of land to a single developer. The possibility of a mix of single lot sales to individuals and large block sales to a single developer was generally approved.

Residents are generally negative toward large-scale land developers. Often times they are viewed as "speculators". Interestingly however, three-fourths of the residents encourage development by developers if it is done in a responsible manner.

Increases in single family detached housing development is supported by most residents, and a large majority would like to see more apartment and single family attached housing developments. Only mobile home developments received less than majority support.

When asked to indicate their attitudes toward growth in areas of economic and recreation development, residents generally favored increases in all listed areas, except vacation home development and tourism.

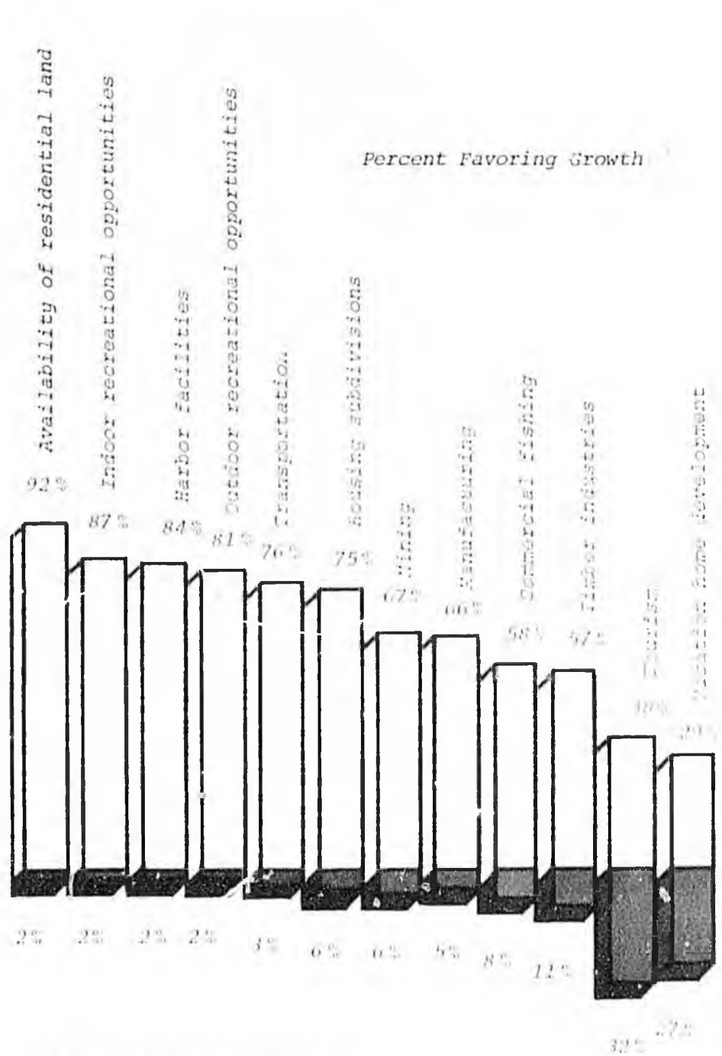
Perceptions of Local Government

Local government in the Ketchikan area received mixed reviews. While the Ketchikan City government received slightly more positive than negative responses regarding its response to the needs and problems of residents, the Borough received somewhat more negative than positive ratings. However when asked to rate eighteen specific local government services, a majority rated eleven as good or very good. Only road maintenance and planning and zoning received more negative than positive responses.

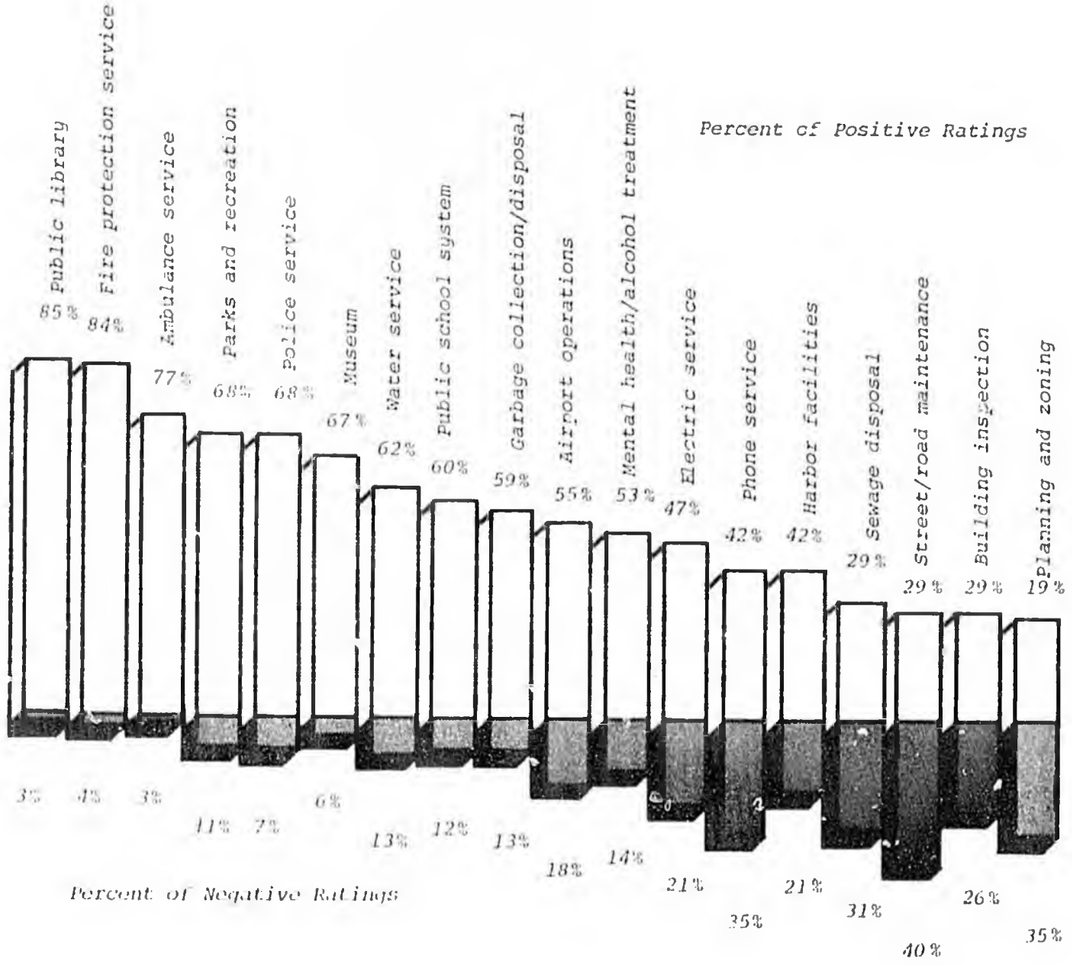
As far as local government services are concerned, over one-half felt they were receiving about the right amount of service for the taxes they are paying. Thirty percent said they were receiving less service than expected, and five percent felt they were receiving more than expected.

Fifty percent of the residents feel there are services which should be increased or added, while forty-three percent disagree. Topping the list was increased road and street maintenance. Seventeen percent of the residents feel there are local government services which should be decreased or eliminated, while almost three-fourths of the residents disagree.

Percent of Residents Favoring Growth and Percent of Residents Favoring Decrease in Specific Economic Sectors, Housing, and Recreational Opportunities



Percent of Residents Rating Local Government Services Positively and Negatively



The Proposed U.S. Borax Quartz Hill Project: Resident Awareness and Attitudes

One-fourth of the residents said they knew nothing or hardly anything at all about the Quartz Hill Project; thirty-six percent said they knew a little about it; twenty-one percent said they knew a fair amount about it; and six percent said they knew a lot about the project.

When asked what they remembered hearing or reading about the project, many residents said they had read or heard about local economic benefits, including job opportunities and boosting/stabilizing the economy. Equal numbers said they had read or heard about environmental issues, including methods and effects of tailings disposal, concern about adverse environmental effects and opposition from environmental groups, concerns over protection of the fish and fishing industry, environmental awareness and possible environmental litigation.

Less mentioned recall themes involved the nature of the mine and the ore including the size of the operation, access routes, and the need for molybdenum, and possible social impacts, including concerns about overpopulation and creation of a housing shortage.

The dominant sources of information about the project have been newspapers, radio and word of mouth. Other sources, including television, U.S. Borax, and the U.S. Forest Service, lagged far behind.

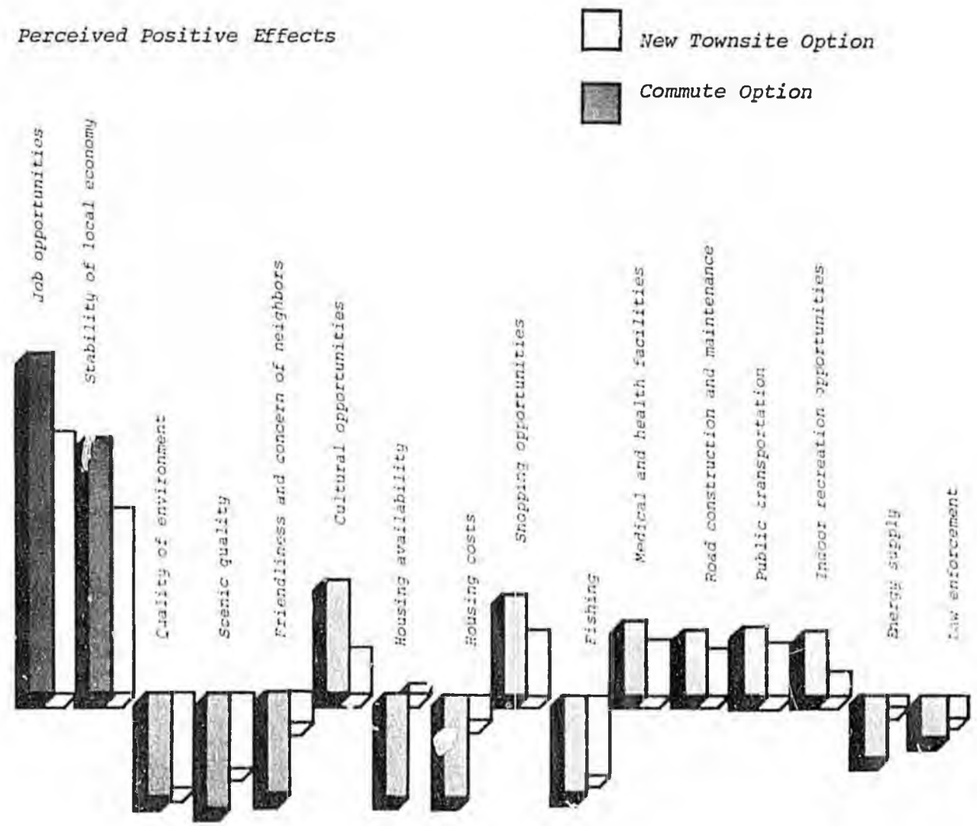
Among those with an opinion, more than eight of every ten persons feel U.S. Borax is somewhat to very concerned about the environment and about the concerns of local citizens. Among those with an opinion, almost nine out of ten felt the U.S. Forest Service meetings about Quartz Hill had been at least somewhat helpful in answering citizen concerns.

General Attitudes Toward the Quartz Hill Project

Two primary advantages to mine development are seen by Borough residents. First, almost three-fifths feel the mine will provide increased job opportunities, long term employment and a variety of jobs. Secondly, almost half of the residents feel mine development will boost/stabilize the local economy by attracting more business and bringing in more money. Other advantages mentioned by many residents include the need for molybdenum and the feeling the mine will bring beneficial population growth.

Although not mentioned nearly as often as job opportunities and boosting the economy, two potential problem areas were identified by substantial numbers of residents -- environmental impacts and population effects. One-fourth of the residents mentioned environmen-

Relative Sizes of Perceived Effects of the Two Mine Development Options



tal impact on wilderness, timber, wildlife and beauty of of the development area. Some residents previously cited population growth as an advantage of mine development, but a greater number are concerned about the disadvantages of an influx of people, including over-crowding, a housing shortage, and the strain on services and facilities. Finally fifteen percent said there won't be any disadvantages due to mine development.

Attitudes About the Commute and Townsite Options

A major issue pertaining to the development of the Quartz Hill Project is location of the mine's permanent work force and their families. Residents were given a brief explanation of the two options being considered, the Ketchikan Commute Option and the New Townsite Option, and were then asked what would be the main advantages and disadvantages of each option.

Benefits to Ketchikan and benefits to the work force and U.S. Borax were the main advantages residents expressed. The benefits to Ketchikan fell into two categories -- economic and social. By far the most mentioned advantage of the Commute Option was the boost to the local economy and the increase in money for Ketchikan.

Other perceived advantages include providing a broader tax base, more business to Ketchikan, more jobs and increased property values. Some of the social benefits of the Commute Option included more housing and more land available, increased population, new ideas and new people, more and better public transportation, more and better shopping, increased recreation/entertainment/cultural activities, and community growth.

Benefits to the work force and U.S. Borax included being closer to services/less expense, existing schools and being near family and friends. In addition some residents felt the Commute Option would cause less destruction to the environment.

Elimination of the commute and keeping families together are the primary advantages to the New Townsite Option. Residents also mentioned the elimination of the commuting costs for U.S. Borax, a more stable work force, easier and safer transportation and saving the worker money as related advantages to the New Townsite Option.

The advantages to Ketchikan appear as two primary themes, relieving of the negative/social impact and to a lesser extent, the increase of positive economic impact. Many residents see the New Townsite Option as relieiving or preventing many of the disadvantages of the Commute Option, specifically, the housing shortage, overcrowding and the burden on public services. In addition, some residents feel the New Townsite Option would provide a boost to Ketchikan's economy.

Three relatively equally mentioned themes appear as disadvantages to the New Townsite Option. First, there is concern for U.S. Borax and its work force because of isolation and the remoteness of the area, the need for services, inadequate transportation to and from Ketchikan, inadequate schools, the expense of building a new town, lack of shopping and medical facilities, and boredom/lack of recreation. Second, some residents feel the Townsite Option will decrease or lessen the mine's positive economic impact on Ketchikan. Third, a number of residents cited the adverse effects on the environment, including loss of scenic beauty, wildlife, fish and forests. Finally, and most interesting, is the single most mentioned response was that there will not be any disadvantages to the Townsite Option, an opinion cited by fifteen percent of the Borough residents.

Residents were asked to express their opinions on the future of the Borough seven years from now, given three alternatives. The alternatives were mine development with the Commute Option, mine development with the Townsite Option and a future without mine development. In general, job opportunities and economic stability are clearly seen as the major positive impacts of mine development and changed environmental and scenic quality are clearly seen as the major negative impacts.

As expected, the relative impacts of the Commute and Townsite Options are clearly different both in the type of impact and level of impact. An important finding in the data, although not significant in every case, was the Commute Option is generally seen as producing both the greater positive impacts and the greater negative impacts than is the Townsite Option.

Responsibilities for Preventing Mine Development Problems

Residents were asked to indicate what the local and state governments, U.S. Borax, and the U.S. Forest Service should be doing to prevent any serious problems with mine development. Surfacing first is that one-fourth of the residents have no opinion on the role of each of the four agen-

cies. Second, at least ten percent of the residents and as many as twenty percent, indicated that each of the organizations should (or can) do nothing about the potential problems, and in addition two percent to fourteen percent said they are already doing everything they can.

Some of the concerns indicate some residents feel the local governments are responsible for planning/preparing for the need for increased services, including housing and schools. Some residents feel the state should help provide funding for the additional services and that U.S. Borax should help plan/provide for housing and offer financial assistance for the impact of mine development.

Other concerns mentioned by residents include the establishment, adherence and monitoring of regulations and guidelines regarding environmental impact. Many residents indicated the U.S. Forest Service and the state were responsible for enforcement of the environmental regulations and guidelines and some specifically mentioned U.S. Borax responsibility to adhere to the regulations and guidelines and protect the environment.

Attitudes Toward Borough Expansion and Provision of Borough Land for Work Force

Ketchikan area residents are generally opposed to the idea of expanding the Borough boundary to include the Quartz Hill area.

Based on the assumption that the mine is to be developed, and that the Townsite Option had been chosen, those opposed to Borough expansion cited perceived inadequacies and limitations of the Borough government, distance of the townsite, isolation, and the need for self determination as factors supporting their opinion.

Persons favoring expansion cited increased tax revenues and other revenues to Ketchikan as a result of expansion, as well as the Borough's ability to control, regulate, zone and enforce codes in the Quartz Hill area as primary considerations in their support of annexation.

Residents were then asked to assume that the mine was to be developed and that the Commute Option had been selected. Based on this, residents were asked how they felt about blocks of Borough land being provided to U.S. Borax for housing development for its mine work force and their families. Nearly two-thirds of the respondents favored such a transmittal of land, while the remaining one-third disapproved.

Respondents favoring such a transmittal felt that it could relieve possible housing/ shortages by providing living facilities for the mine work force, as well as keep housing costs down. Some indicated that such land provision would be good for Ketchikan because it would support the Commute Option with its business and tax revenue benefits. In addition, a fair number of residents felt that it would assure Borough control in planning, development and zoning, including enforcement of housing standards. Others said U.S. Borax should develop the land, provide services and keep the Borough out of it.

Some respondents were concerned that such a provision of land might isolate mine work force families from the rest of Ketchikan residents by creating a company town. Others said that U.S. Borax should buy the land and pay a good price for it.

Awareness, Use, and Opinions of Possible Access Routes

Residents were shown locations of the two possible access routes to Quartz Hill and asked how familiar they were with the Wilson Arm and Boca de Quadra areas. Familiarity with both areas was generally equal with fifty-five percent expressing familiarity with Wilson Arm and fifty-one percent saying they were familiar with Boca de Quadra.

Residents familiar with an area were asked how often they or other household members had visited that area in the past three years. Again, the figures on visitation were generally equal, with approximately one-third of the persons familiar with each area not having been to that area in the past three years. Visitation to either area at least four times in the past three years was mentioned by approximately one-fourth of the residents. Residents received a brief description of the two possible access routes to the proposed mine and then were asked to rate the acceptability of each. While both routes received more positive than negative ratings, residents clearly feel Wilson Arm is more acceptable than Boca de Quadra.

Among those residents with an opinion, seventy percent feel Wilson Arm is definitely (28%) or somewhat (42%) acceptable while fifty-one percent feel Boca de Quadra is definitely (15%) or somewhat (36%) acceptable. The relative lengths and safety of the routes seem to be the major reasons for Wilson Arm's higher acceptability. Generally speaking, both routes have approximately equal support and opposition because of environmental impacts.

The data also showed that placement of a docking facility at either location would result in a net increase in the numbers of visitors to the area, with the larger increase occurring for Wilson Arm. An interesting result showed more than a third of the residents felt their usage of either area would not change because of placement of a docking facility.

Outdoor Recreation

Picnicking and hiking/walking for pleasure were at the top in resident participation. Also near the top were boating and fishing, followed by shellfish gathering. Although these activities often require expensive equipment, the high incidence of participation clearly reflects the maritime character of Ketchikan and its residents.

Following distantly behind these activities were camping, either in the form of tent camping, backpacking, or the use of U.S. Forest Service cabins, and hunting, either big game or small game.

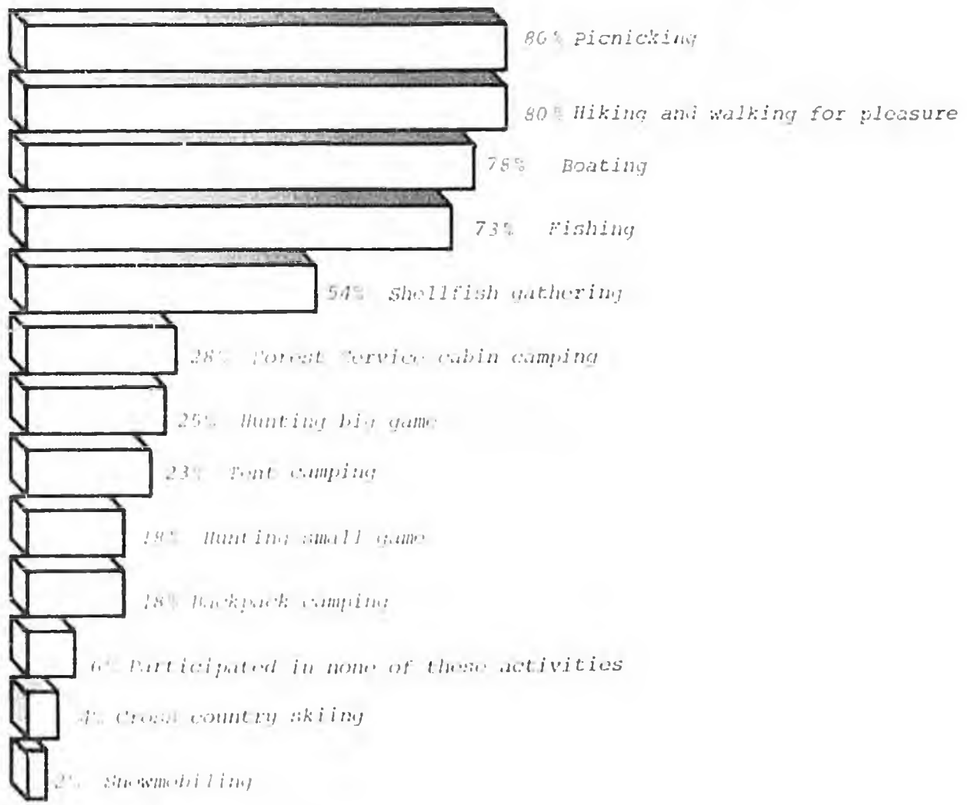
Not surprisingly, on and around Revilla Island, where the bulk of the Borough population resides, is the site of most resident outdoor recreation. In the Misty Fjords National Monument, Rudyerd Bay area attracted the most residents during the past year, while the Wilson Arm and Boca de Quadra areas rated second and third respectively.

Attitudes Regarding Wilderness Recreation, Protection of Misty Fjords National Monument, and Commercial Fishing

Nine of every ten residents personally feel it is at least somewhat important to have recreational experiences in a wilderness area, and for most of them, such experience is very important. Almost three-fourths of the residents valuing wilderness recreation also felt it was at least somewhat important that their experience be in solitude -- that they encounter very few or no other persons.

Two-thirds of the residents feel the Misty Fjords National Monument is receiving at least adequate protection. One-third feel that about the right amount is being done to protect the Monument, while another third feel too much is being done. Only thirteen per-

Percent of Resident Participation in the Area's Outdoor Recreational Activities



cent feel not enough protection is occurring.

A majority feel there is at least adequate protection and management of Southeast Alaska's commercial fisheries. Most of these feel there is about the right amount of protection, while seventeen percent feel there is too much protection.

Nonetheless, almost a third of the residents feel there is not enough protection and management. The primary reasons for feeling there is not enough regulation include lack of enforcement of the 200 mile limit, too much over-fishing, and the need for more hatcheries.

Employment

The effective labor force of the Borough represents three-fourths of the residents over sixteen years old. Of those not in the labor force, over half are housewives and the remainder are relatively evenly divided between students and retirees. The Borough's unemployment rate in mid-Fall 1981 was 9.4%

The survey also revealed:

- Eighty-four percent of employed persons interviewed are employed full-time.
- Seventeen percent of the employed have more than one job.
- Fourteen percent of those employed have a primary job that is seasonal.
- Eighteen percent of the employed residents work in professional services, while fifteen percent work in the wholesale and retail trade, and fifteen percent work in manufacturing. Thirteen percent are employed in public administration, while ten percent work in business services, and seven percent work in mining or construction. Six percent are employed in the fishing or forestry industries.
- Fifty-three percent of those employed work in the private sector, while twenty-seven percent work in the public sector, and sixteen percent are self employed.
- Fifty-seven percent of the employed residents are employed in the City of Ketchikan, twenty-eight percent outside of the City, and fifteen percent held jobs both inside and outside the City.
- Twenty-six percent of the currently employed residents had been unemployed at some time during the past two years. Twenty-two percent of the respondents held seasonal jobs during the past two years which partly explains this rate of unemployment.

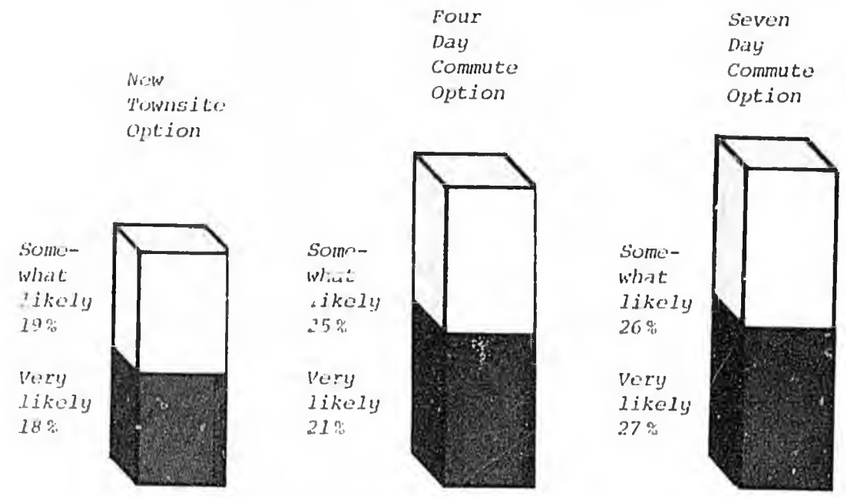
Interest in Quartz Hill Employment

After being told that U.S. Borax intends to provide local and on-site training for persons interested in working at the mine, the residents were asked to indicate their likelihood of applying for a job at the mine or mill under three different conditions.

Thirty-seven percent of the residents expressed an intention to apply for a job knowing it would necessitate a move to the new townsite -- half of these persons said they would be very likely to apply. The figure rises to forty-six percent for the four day Ketchikan Commute Option, with almost half saying they would very likely apply, and it rises further to fifty-three percent for the seven day Commute Option with half saying "it's very likely" they will apply.

To the adult residents of Ketchikan, employment at the mine or mill is a very attractive possibility, and the possibility of remaining in Ketchikan and having every other seven days off makes it even more attractive.

Percent of Residents Likely to Apply for a Quartz Hill Job



fact sheet

issued by the public relations department
3075 Wilshire Boulevard, Los Angeles, California 90010 · 381-5311

U.S.BORAX

- QUARTZ HILL FACT SHEET - April, 1982

SECTION I

Location

The U.S.BORAX Quartz Hill Molybdenum project is located on a knoll, named Quartz Hill, in an elevated valley on the mainland in southern Southeast Alaska, about 45 air miles east of the city of Ketchikan. The site is within the Tongass National Forest and the Misty Fjords National Monument. Quartz Hill is approximately 665 miles north of Seattle.

Background

Exploration and Discovery

In 1971, U.S.BORAX geologists began exploration in this area of Alaska and in the fall of 1974 discovered the Quartz Hill molybdenum deposit.

Exploration Camp

The Quartz Hill camp was opened in 1975 with about 25 employees. It has operated every summer since that date. In 1981 the camp population peaked at 120, the majority of which were contractors.

Ownership

U.S.BORAX discovered and acquired the Quartz Hill molybdenum deposit in 1974. The deposit was acquired by the location of mining claims and U.S.BORAX's interest in these claims was subsequently conveyed to Pacific Coast Molybdenum Company, an affiliate corporation. U.S.BORAX manages the Quartz Hill project under a contractual agreement with Pacific Coast Molybdenum Company.

Size

U.S.BORAX estimates that more than 230,000 feet of core drilled through 1981 has indicated a mineral deposit in excess of 1.5 billion tons of mineable ore grading 0.136% molybdenite (MoS_2) using a cutoff grade of 0.07% MoS_2 with portions of the orebody averaging 0.20% MoS_2. It is a large deposit and is located near surface which allows a large-scale low unit cost operation.

As of August 1981, the lateral extent and depth of the deposit had not yet been completely determined. Additional drilling over the next several years is planned.

Current information through 1981 ranks Quartz Hill as one of the largest known molybdenum deposits in the world.

Project Permitting Timetable

The Alaska National Interest Lands Conservation Act (ANILCA) requires that the following be completed on or before the given dates.

June 2, 1981 - The Secretary of Agriculture in consultation with the Secretaries of Commerce and Interior and the State of Alaska shall prepare a draft Concepts Analysis Document analysing the concepts under consideration for the development of Quartz Hill. (Sec. 503(h)(2))

Sept. 2, 1981 - The final Concepts Analysis Document will be issued.

Sept. 2, 1981 - Holders of valid mining claims within Misty Fjords National Monument or Admiralty Island National Monument (defined as "core claim" by the Act) are entitled to file applications for prospecting permits on adjacent unprospected claims as defined by Act. (Sec. 504)

Dec. 4, 1981 - The Secretary of Agriculture shall issue a draft environmental impact statement (EIS) on the Quartz Hill access road and bulk sampling phase without stipulating a preferred alternate access route. (Sec. 503(h)(3))

The final EIS will be issued upon completion of the review of the draft.

Within four months of the issuance of the final EIS, the Secretary of Agriculture shall complete any administrative review and shall issue a special use permit for a surface access road for bulk sampling. However, the Secretary shall not issue the permit until the full 1981 field season of baseline data gathering work has been completed.

Environmental Baseline Data Collection

U.S.BORAX began its data collection programs in 1975. It presently consists of the collection of baseline data on water hydrology and quality, meteorology, snow, geology, physical and chemical oceanography, coastal and marine biology, aquatic and terrestrial biology, archeology and socio-economics. This information will be used for project permitting. Estimated total project environmental costs through July 1981 were over five and one half million dollars.

Project Costs

Total project costs through 1981 were approximately forty million dollars.

Current Activities at Quartz Hill

During the 1981 field season, U.S.BORAX drilled over 60,000 feet of core and excavated 3,840 feet of drifts in two adits.

Suitable sites for associated mine development facilities such as a plant, water reservoir, tailings disposal, a camp or town, roads, etc., is being investigated.

SECTION II

Construction and Operations

Based on current knowledge the following is the planned schedule:

Life of Deposit	The Quartz Hill mine is estimated to have a life of 70 years, at an ore processing rate of 60,000 tons per day.
Construction	Construction of the mine is currently scheduled to begin in 1984. Construction is estimated to take 3½ years and the mine is scheduled to begin operation in late 1987.
Employment	The construction work force is expected to require 1,000 persons. Operation is expected to require approximately 850 full-time employees. Mine construction requires a moderate to high percentage of skilled labor. Mine operation will require trained operators and craftsmen.
Costs	Construction of the mine is expected to cost $870 million in 1980 dollars. The annual payroll during operation is expected to total $25 million per year.
Townsite	Studies were begun in 1981 to determine whether employees will live in Ketchikan with their families and commute to the remote site, or whether a community will be built near Quartz Hill to accommodate both the employees and their families. U.S.BORAX will complete these studies in 1982.
Production	Mining Operation: The Quartz Hill molybdenum deposit occurs at the surface and will be mined by the open-pit method.
Markets	In full production, the Quartz Hill mine should produce about 40 million pounds of contained molybdenum (Mo) per year. The annual value of molybdenum product will be approximately $340 million based on the average 1981 market price. At current molybdenum prices the total gross value of the deposit approximates $24 billion.
Uses	Molybdenum is a critical material used principally in the manufacture of high strength steels, high temperature alloys, and for corrosion

resistance. Molybdenum and its alloys are used in automobiles, oil and gas drilling and pipelines, solar panels, stainless steel, catalysts, pigments, cast iron, super-alloys, lubricants, tooling machinery, and many other end products.

Tailings Disposal

The mining operation will produce almost three pounds of molybdenite per ton of rock. The balance of the crushed rock must be disposed in either an adjacent fjord or a suitable land site.

OFFICE OF THE
EXECUTIVE VICE PRESIDENT & PROJECT DIRECTOR
QUARTZ HILL

U.S.BORAX

March 11, 1983

ELECTRIC POWER FOR THE QUARTZ HILL MOLYBDENUM PROJECT

Summary

The Quartz Hill molybdenum project will require 44 megawatts of electric power when the first phase of construction is completed in the late 1980's, and another 16 megawatts when expanded in the early 1990's. Since an outside source of power is not currently available, plans call for the construction of a thermal power plant at Quartz Hill.

An expansion of hydro generating capacity coupled with the construction of a power intertie system for Southeast Alaska has been under consideration for some time. If plans for an intertie and increased generating capacity can be integrated with the Quartz Hill development, then important mutual benefits should result.

It is hoped that this paper will provide a starting point for discussions between U.S. Borax and between the state and local groups who are responsible for power development in Southeast Alaska.

UNITED STATES BORAX & CHEMICAL CORPORATION · 3075 WILSHIRE BOULEVARD · LOS ANGELES, CALIFORNIA 90010 · (213) 381-5311
MAIL ADDRESS: P. O. BOX 75128, SANFORD STATION, LOS ANGELES, CALIFORNIA 90075

The Project and its Power Requirements

The United States Borax & Chemical Corporation, acting on behalf of Pacific Coast Molybdenum Co., is engaged in the development of the Quartz Hill molybdenum deposit located 45 miles east of Ketchikan in the Misty Fjords National Monument.

The deposit, one of the largest of its kind in the world, contains ore reserves equal to a life of about 70 years at a production rate of 60,000 tons of ore per day. U.S. Borax has engaged Bechtel Civil and Minerals, Inc. to complete engineering studies for the construction and operation of a mine and processing plant to be located at the site.

Current plans call for the construction of a 40,000 ton per day mine and mill at Quartz Hill which is expanded to 60,000 tons per day four years after start-up.

The project schedule is as follows:

Complete project EIS and obtain all permits:	- Mid-1984
Start construction of 40,000 ton plant	- Late 1984
Complete construction of 40,000 ton plant	- Late 1987
Start 20,000 ton expansion	- Mid 1990
Complete 20,000 ton expansion	- Late 1991

The project schedule is contingent upon obtaining all required permits as planned and upon the Company's continuously updated assessment of market demand for molybdenum.

Power requirements are large. Demand at 40,000 tons per day is 44 megawatts, and at 60,000 tons per day demand is 60 megawatts. This compares with a total installed capacity in Southeast Alaska in 1980 of 176 megawatts operating at a 24% capacity utilization.(1)

No outside source of power is currently available and Bechtel Civil and Minerals has studied a wide variety of options for power generation including locally generated hydro power, steam, gas turbine, and diesel plants, with the burning of a variety of fuels from coal to natural gas.

Locally generated hydro power has been ruled out because of the unavailability of sites and the wilderness classification of the surrounding area. (see figure 1-2). A coal fired steam plant is uneconomic because of the extremely high capital cost required for

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(1) State of Alaska Long Range Energy Program 1982 Report. Department of Commerce & Economic Development

coal handling facilities and the severe air quality restrictions in the area which would require a very expensive scrubber installation.

Bechtel has concluded that diesel and gas turbine-combined cycle are the two most practical alternatives. Although diesel is slightly lower in capital cost, the combined cycle configuration is favored because it can operate on a greater variety of fuels (from natural gas to No. 6 fuel oil) and permits better NOx control.

Costs

Capital costs for various configurations of power plants, including fuel handling and storage facilities, range from $90 to $134 million for an 80 megawatt capacity plant. In the following discussion all costs, capital and operating, are expressed in current 1982 dollars.

Fixed costs range from 5.5 to 3.5¢ per kWh depending on whether or not scrubbers are installed and on the type of generator drive. There are many methods of calculating annual fixed costs for power plants. A method widely accepted in the power industry is to calculate fixed charges as a percentage of capital investment related to interest on investment, depreciation, income and property taxes, insurance, and administrative expense. On this basis a fixed charge rate of 18% is a reasonable figure in 1982.

Capital and Fixed Costs

	Mine Output Tons/day	Installed Capacity MW	Operating Rate MW	Capital Cost million	Fixed Cost Per kWh Generated
Gas turbine-combined cycle with scrubber	40,000	63	44	$ 104	$ 0.055
	60,000	81	60	134	0.052
Gas turbine-combined cycle w/out scrubber	40,000	63	44	76	0.040
	60,000	81	60	97	0.038
Diesel w/out scrubber	40,000	60	44	66	0.035
	60,000	82	60	90	0.035

The decision on whether to install flue gas desulfurization scrubbers involves a trade-off between capital and operating cost. In order to burn low cost fuel at Quartz Hill (No. 6 fuel, 2% max. sulfur) scrubbers are required, which increases the capital cost of the power plant by about 38%.

Operating costs, which range from 6 to 7.5¢ per kWh in 1982 terms, vary with the type of fuel used, and are estimated as follows:

	Fuel(1) Oil	Fuel Cost Per kWh	Operating & Maintenance per kWh	Total Operating Cost per kWh
Gas turbine-combined cycle with scrubbers	#6	$ 0.049	$ 0.011	$ 0.060
Gas turbine-combined cycle w/out scrubbers	#2	0.069	0.006	0.075
Diesel without scrubbers	#2	0.067	0.006	0.073

Total costs of around 11¢ per kWh for various configurations are quite similar but the cost mix is significantly different.

	Mine Output Tons/day	Installed Capacity MW	Fixed Cost per kWh	Operating Cost per kWh	Total Cost per kWh
Gas turbine-combined cycle with scrubbers	60,000	81	$ 0.052	$ 0.060	$ 0.112
Gas turbine-combined cycle w/out scrubbers	60,000	81	0.038	0.075	0.113
Diesel w/out scrubbers	60,000	82	0.035	0.073	0.108

Estimates of power demand and energy consumption are shown in the attached Table I.

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(1) No. 6 oil (S:2% max) at $0.66 per gal.

No. 2 oil (S: 0.05% max) at $0.94 per gal.

Quartz Hill and Southeast Alaska Intertie System

Southeast Alaska's electric power system is in a relatively primitive stage of development. The lack of an intertie system forces each community and industry to develop its own power source independently and in isolation. Capacity utilization at 24% is about half the utilization rate in the Lower 48. Load profiles in one consuming area cannot be balanced by a different load profile in another area. All of these factors tend to force high power costs onto all users in Southeast Alaska. The integration of Quartz Hill with its large, steady load into an intertied power system should significantly reduce costs to all users of the system.

A power intertie system for Southeast Alaska has been under discussion for some time. Any consideration of an intertie and expansion of generating capacity in the Southeast region should include Quartz Hill as an integral part of those plans. If the development of Quartz Hill can be meshed with the development of an intertie system, then capital expenditures and power costs may be reduced at Quartz Hill while at the same time the system would benefit from the addition of a large, firm, and steady load.

Several possibilities for integration are apparent:

1. Supply of all of Quartz Hill's requirements by means of an intertie and a large increase in generating capacity.

2. A firm supply of a significant block of Quartz Hill's requirements, say, 20 to 40 megawatts, preferably in time to accommodate the expansion from 40,000 to 60,000 tons of ore per day.

3. Supply of seasonally surplus power on a non-firm basis.

Options 1 and 2 are the most attractive to U.S.Borax, since they would permit reductions in capital cost of an owned power plant, both in terms of capacity and quite likely in terms of its configuration and cost per unit of capacity.

For these options to be attractive, a meshing of schedules for both power development and the project development would be required. It is possible that if firm schedules for the reasonably early delivery of power to Quartz Hill could be accomplished, the project schedule could be altered to accommodate them.

Although option 3 may produce significant benefits for the power generation and distribution entity, it is less attractive to U.S.Borax than options 1 and 2 because it will not reduce capital investment in generation facilities at Quartz Hill.

It is clear that the price of power delivered to Quartz Hill would have to reflect the mutual benefits and costs of a specific arrangement to both buyer and seller.

T A B L E I

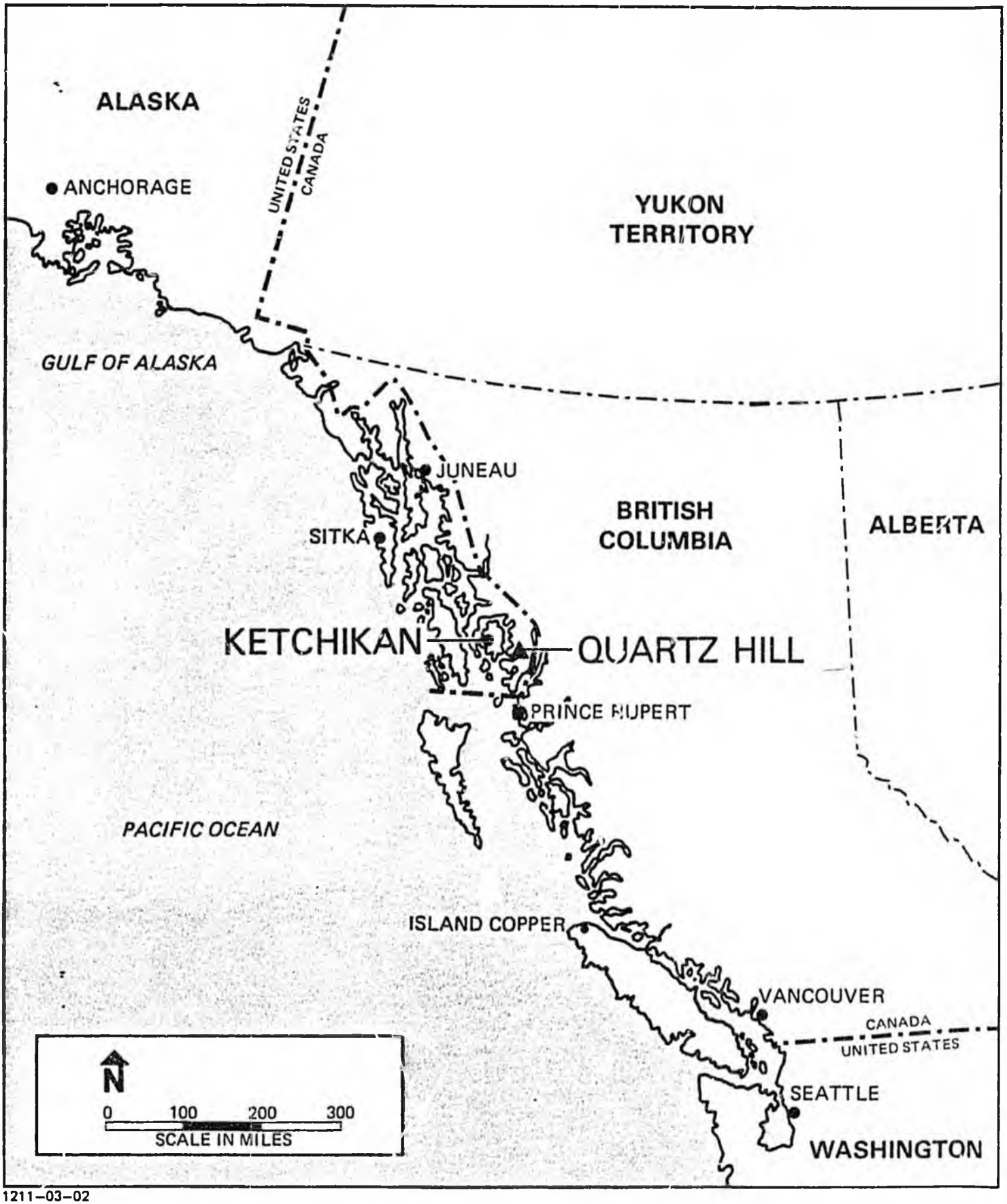
POWER DEMAND AND ENERGY CONSUMPTION

Year	-2	-1	0	1	2	3	4	5	6 and thereafter
Average Demand, MW	5	5	16	23	32	44	51	48	54
Annual Energy Consumed kWh x 10^6	10	10	100	190	270	340	400	410	455

Notes:

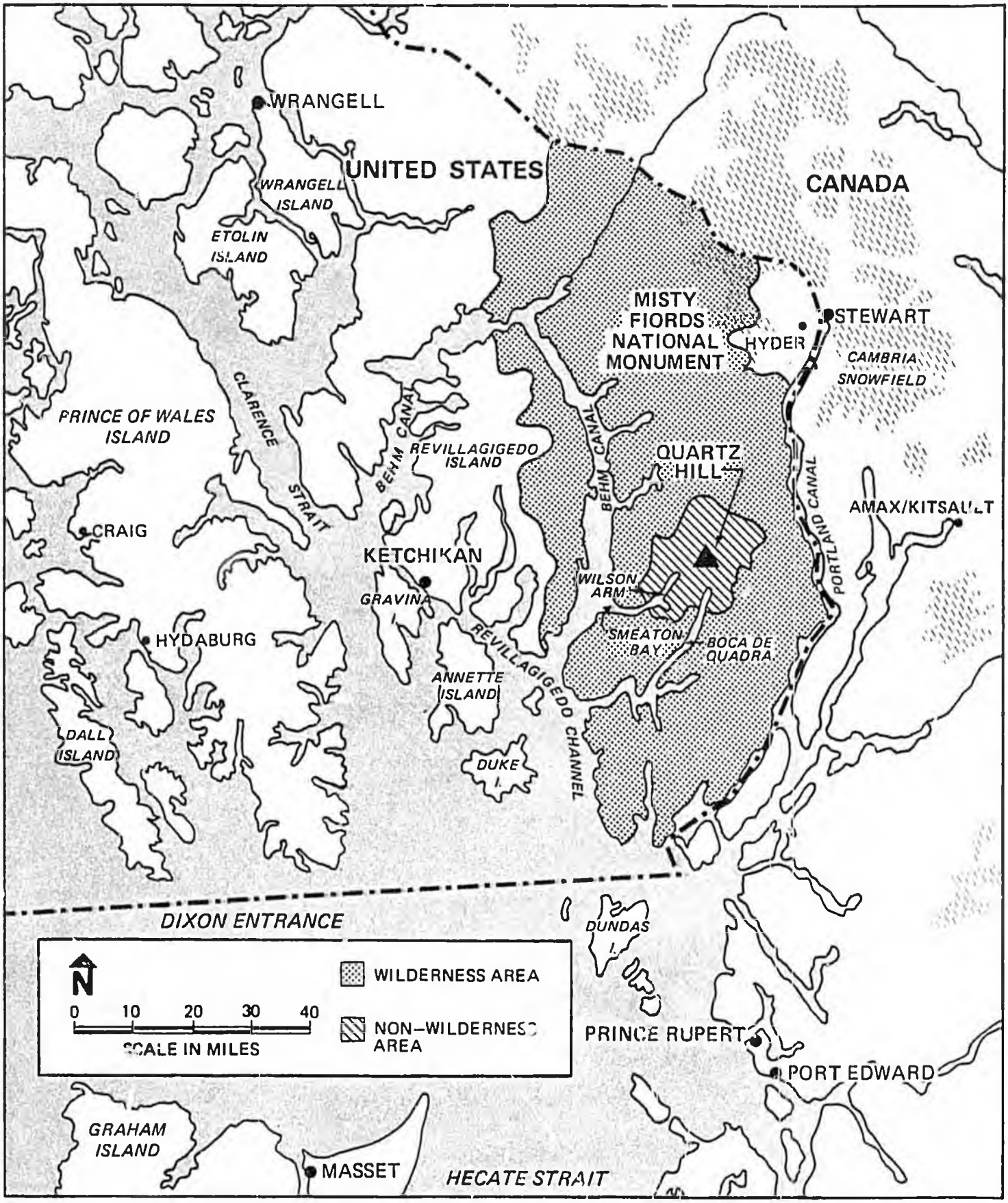
1. In current project schedule, year 0 is 1987
2. In years -2, -1, 0, 3, and 4, construction demand is 5 MW
3. 40,000 tons per day mine and plant is started up in year 0
4. Expansion to 60,000 tons per day is started up in year 4

FIGURE 1–1
INDEX MAP OF NORTHWEST UNITED STATES AND CANADA

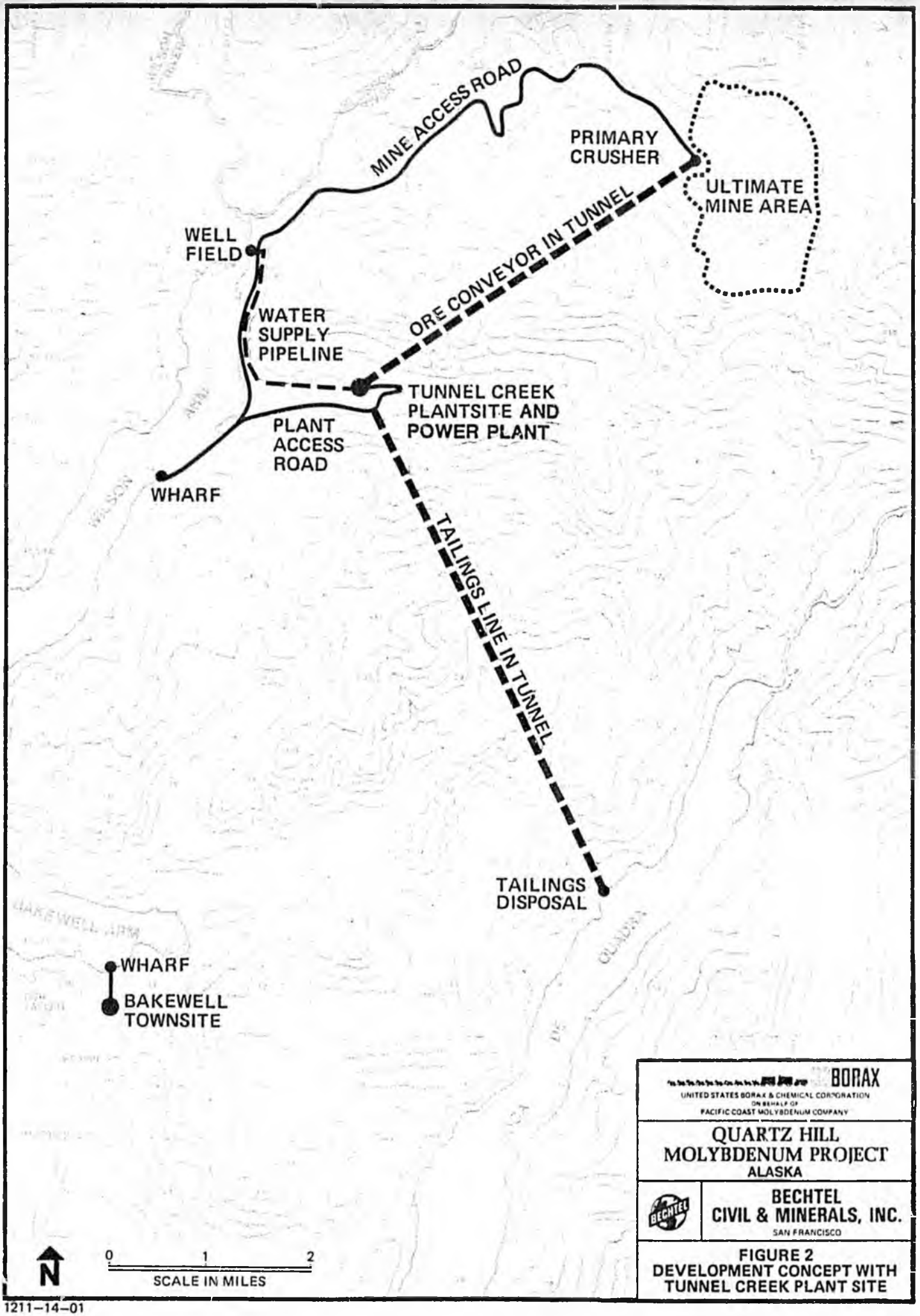


1211–03–02

FIGURE 1–2
MISTY FIORDS NATIONAL MONUMENT



The wilderness area was designated by congress in the Alaska National Interest Lands Conservation (ANILCA). The Quartz Hill area was not included in the wilderness classification to allow development of the mine.



BORAX
UNITED STATES BORAX & CHEMICAL CORPORATION
ON BEHALF OF
PACIFIC COAST MOLYBDENUM COMPANY

QUARTZ HILL MOLYBDENUM PROJECT
ALASKA

BECHTEL CIVIL & MINERALS, INC.
SAN FRANCISCO

FIGURE 2
DEVELOPMENT CONCEPT WITH TUNNEL CREEK PLANT SITE

1211–14–01

QUARTZ HILL PROJECT

FEB 28 1983

USBORAX

February 24, 1983

The Honorable Bettye Fahrenkamp
Chairwoman, Senate Resources Committee
State Capitol
Pouch V
Juneau, Alaska 99811

Dear Bettye:

I would again like to thank you for making it possible for us to brief you and the other Resource Committee members on our Quartz Hill Project. As we move into development of the total project Environmental Impact Statement, we consider it especially important to keep all interested persons aware of our plans and progress.

I would also like to again extend our invitation to you and your committee to visit our project. As we discussed, any time after the first of May should be suitable weather. As a suggestion, it would be possible to take the early morning flight out of Juneau and we could pick you up at the airport and take you directly to the site. We could either rush through the visit and return you to the airport for a mid-afternoon flight back to Juneau, or, and more to our liking, we could have a leisurely tour, dinner together and you could return on the late evening flight to Juneau.

Senator Ziegler has kindly offered to be the go between for arranging such a trip so please feel free to let him know what plans would best meet your schedule.

Again, Bettye, thanks for the opportunity to make our presentation to your committee.

Sincerely,

DLF:es
cc Senator Ziegler
Bill Miles

D. L. Finney
Ketchikan Manager
Quartz Hill Project

Alaska State Legislature

Senate

Official Business

JAN 1 8 1983

Pouch V
State Capitol
Juneau, Alaska 99811

January 17, 1983

Mr. Don Finney,
Ketchikan Manager- Quartz Hill Project
U.S. Borax and Chemical Company
Box 5230
Ketchikan, Alaska 99901

Dear Don:

I'll be serving this year on the Senate Resources Committee which will be chaired by Senator Bettye Fahrenkamp of Fairbanks; a longtime and dear friend of mine.

She wanted me to ask you if you or somebody else on behalf of Borax would like to appear before the Senate Resources Committee to acquaint the members thereof as to the status of the project - a a sort of an overview of what's been accomplished to date and what you hope and anticipate to do in the future.

This course is not compulsory. It is only an offer, and there will certainly be no hard feelings if you decline.

The Resources Committee will be meeting in the Capital Building every Monday, Wednesday and Friday at 1:30 p.m. If you opt to give us the update, give me a call and we'll agree upon a date, subject of course, to the chairperson's okaying the same.

Best regards,

3—

Robert H. Ziegler, Sr.

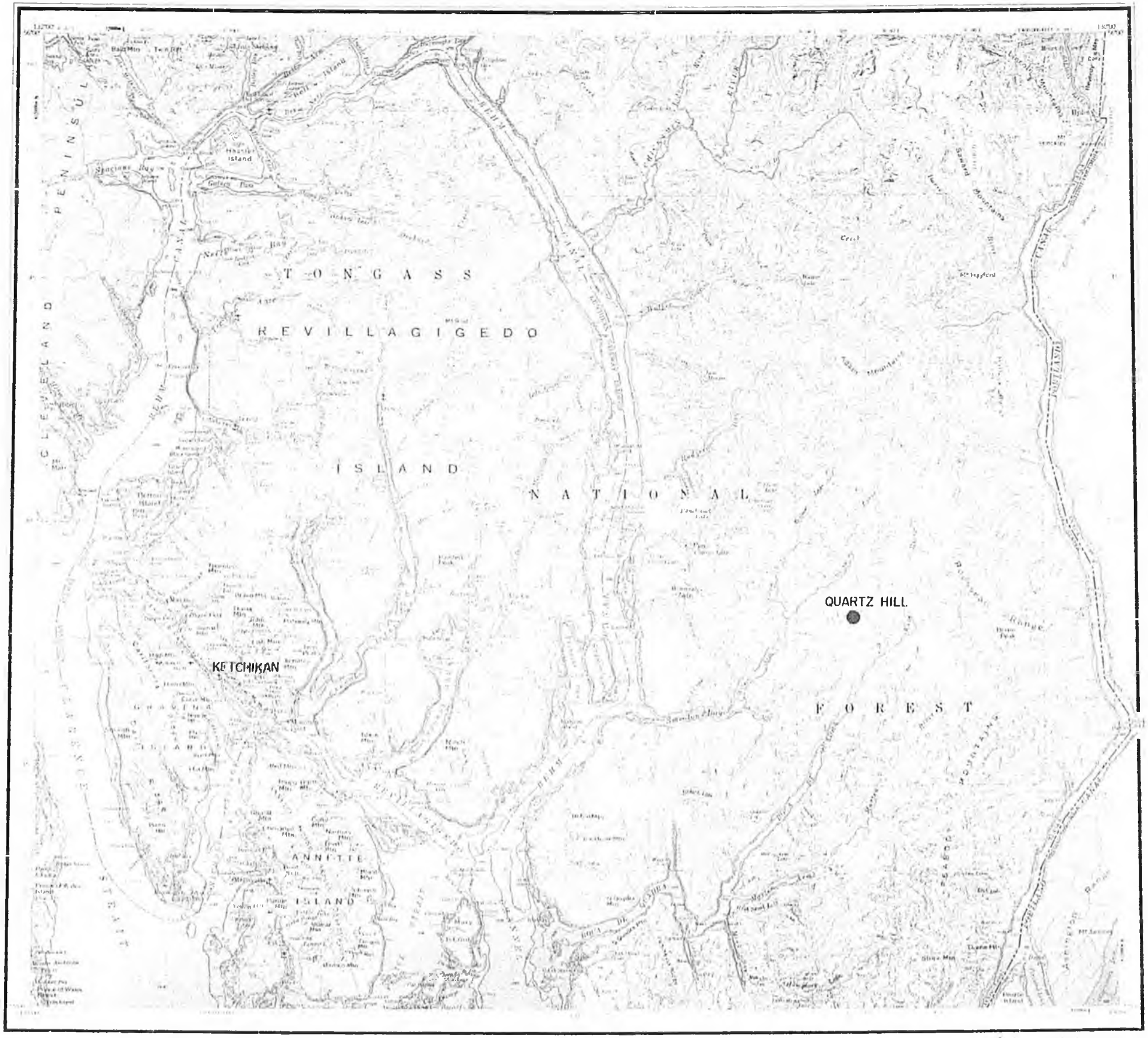
RHZ:lk

bcc: Senator Bettye Fahrenkamp

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

KETCHIKAN

ALASKA
TOPOGRAPHIC SERIES



KETCHIKAN, ALASKA-CANADA

Alaska State Legislature

Senate

Resources Committee

Official Business

Senator Bettye Fahrenkamp
Chairman

Pouch V
State Capitol
Juneau, Alaska 99811

February 23, 1983
3:10 p.m.

Senate Finance Room

MEMBERS PRESENT

Senator Fahrenkamp
Senator Ziegler
Senator Eliason
Senator Paul Fischer
Senator Vic Fischer
Senator Mulcahy
Senator Sturgulewski

SB 51 An Act Establishing the Shuyak Island State Park
and
A briefing on U. S. BORAX QUARTZ HILL MOLYBDENUM PROJECT

SB 51 --- Neil Johanseen, State Park Director, DNR; Jay Nelson, Executive Director, Alaska Environmental Lobby; and Larry Nicholson, Department of Fish and Game spoke in favor of SB 51.

Senator Mulcahy moved and asked unanimous consent that SB 51 be moved from committee with individual recommendation. There were no objections.

BORAX BRIEFING --- Don Finney, Ketchikan Manager of the Borax project presented a slide show and background information on the U. S. Borax Quartz Hill Molybdenum Project which is located about 45 air miles east of Ketchikan. Borax estimates that more than 230,000 feet of core drilled through 1981 has indicated a mineral deposit in excess of 1.5 billion tons of mineable ore, the largest such deposit in the world. Subjects presented were ANILCA timetable, sampling process, feasibility phases, construction and operation, proposed mine operation, surface hydrology, water quality, coastal and marine biology and the socio-economic impacts. Pros and cons of a company town were discussed.

Meeting adjourned at 4:05 p.m.

RESOURCES PLANNING ACT (USFS)

Alaska State Legislature

BETTYE FAHRENKAMP, Chairman
ROBERT H. ZIEGLER, SR., Vice Chairman
DICK ELIASON
PAUL FISCHER
VIC FISCHER
BOB MULCAHY
ARLISS STURGULEWSKI

POUCH V
STATE CAPITAL
JUNEAU, ALASKA 99811
(907) 465-3834
(907) 465-3835

Senate

Committee on Resources

MINUTES

February 6, 1984
3:11 pm

House Resources
Room 118, Capitol

MEMBERS PRESENT

Senator Fahrenkamp, Chairman
Senator Ziegler, Vice Chair
Senator Eliason
Senator Paul Fischer
Senator Vic Fischer
Senator Mulcahy
Senator Sturgulewski

Rep. Ringstad, Co-Chair
Rep. Shultz, Co-Chair
Rep. Bussell
Rep. Cowdery
Rep. Goll
Rep. Larson
Rep. Liska
Rep. Uehling
Rep. Vaska

CALENDAR

Briefing by U.S. Forest Service on RESOURCES PLANNING ACT (RPA)

Conrad Rienke, U.S. Forest Service Information Office, explained that the Resources Planning Act (RPA) created a nationwide program that sets the framework for the development of resources within our National Forests. He introduced a film that reviewed the current program.

Bill Edwards, Regional Administrator, RPA, U.S. Forest Service, outlined the nine possible alternatives currently proposed as development plans by the U.S. Forest Service. Using charts, he explained how each alternative would affect: research, anadromous fish, wilderness, timber harvests, cost of services, State and Private Forestry Program, reforestation, improved utilization of wood, and marketing.

Jim Caplan, Information Officer and Legislative Liaison, U.S. Forest Service, stressed the importance of public comment and review in the process of developing this assessment.

The meeting adjourned at 4:40 pm.

Chapter 2:

Program Alternatives and Their Comparison

INTRODUCTION

Chapter 2 displays and compares nine alternative programs for the 1985 Program Update. These alternative programs represent differing mixes of resource emphasis. Consequently, progress toward achievement of specific national goals would vary by alternative.

This chapter is the focal point of the Draft Environmental Impact Statement (DEIS) and (1) outlines the process used to develop the alternatives, (2) describes the alternatives that were considered but eliminated from detailed study, (3) describes the alternatives considered in this DEIS, including the alternative of no action, and (4) provides data for comparison of the alternatives.

DEVELOPMENT OF THE ALTERNATIVES

The RPA Program alternatives are based on data and information developed in National Forest System planning, State forest resource planning, and extensive field level input on research program planning. The International Forestry portion of the alternatives was derived from a special study.1/ For more explanation of how data were developed see appendices D, I, and J.

Each alternative is a complete program option that presents a different combination of management activities, technical assistance, and research which in turn, produces varying output levels of goods and services.

1/ Doolittle, Warren T., 1983. International Forestry Program for USDA Forest Service. Society of American Foresters. Bethesda, MD. Unpublished Report.

The following guidelines were used to develop alternatives:

- Each alternative should be achievable.
- A "no action" alternative should be formulated that shows the most likely conditions expected to exist in the future if current direction from the 1980 RPA continues.
- Alternatives should reflect a broad range of resource outputs and expenditure levels.
- Each alternative should represent the most cost-efficient combination of management and other activities that meet the objectives established for the alternative.
- Each national goal and issue should be addressed in one or more alternatives.
- A reasonable number of alternatives should be examined. Those that duplicate costs and resources' emphases should be eliminated from further consideration.
- Alternatives should provide a realistic and achievable transition from current program and budget levels.
- Alternatives should reflect rational, professional judgment.
- Alternatives should consider policies regarding increased productivity.
- Alternatives should be realistic in terms of workforce and contracting capabilities.
- Alternatives should be sensitive to the need for key investments that are the basis for future outputs. Examples include reforestation, timber stand improvement (TSI), and road construction.
- Alternatives should be based on sound economic, social, and biological management principles. Special attention to these principles is required when considering the need for new capital investments versus operation and maintenance costs.
- Alternatives should consider the capability of cooperators to finance their proportionate share of programs.
- Alternatives should recognize historical budget trends, and that specific programs can differ in rate of increase or decrease.

- At a minimum, individual resource objectives should comply with legal requirements.

- All alternatives should be designed to prevent significant impairment of the land's productivity.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

Some alternatives were initially considered but eliminated from further analyses. These alternatives were generally of two types: alternatives based on several budget increments, and alternatives based on existing functional and multiple use plans. A brief description and the rationale for their elimination follows:

Budget Increments

Budget increments were initially considered as a means of determining alternative levels of output for the 1985 RPA Recommended Program. This "budget increment" approach did not provide the opportunity to reflect the resource mixes based on National Forest land management plans or State forest resource plans. It made budget the primary determining factor for program alternatives, rather than responding to needs in the Assessment. Finally, it did not provide for design of alternatives that directly addressed the national goals.

Existing Direction Alternative

An "existing direction" or multiple-use alternative was examined which provided levels of goods and services if existing management plans were extended into the future. This alternative would have been based on existing National Forest multiple-use plans, timber-management plans, and a number of other functional resource plans.

This alternative was eliminated from further consideration in lieu of the integrated plans currently being developed for National Forests.

LEGISLATIVE PROPOSALS

During development of the alternatives, two potential legislative proposals were conceived. Both are opportunities to increase revenues from specific uses of the National Forests. The increased revenues would be used to increase investments to maintain or improve the goods and services from the National Forests.

The first proposal affects the range opportunity area. The Public Rangeland Improvement Act (PRIA) of 1978 established the current grazing fee formula on a 7-year trial basis from 1979 to 1985. By December 31, 1985, the Secretaries of the Interior and Agriculture are to report to Congress

"... their evaluation of the fee formula established in... this Act and other grazing fee options, and their recommendations to implement a grazing fee schedule for the 1986 and subsequent grazing years." Beginning with 1986, grazing fee legislation could be enacted which would allow implementation of a fee system that would (1) achieve fair market value over time, and (2) recover or exceed costs of grazing permit administration. Currently, about 46 percent of the costs are recovered.

The second proposal affects the recreation opportunity area. Many public comments on the 1980 RPA supported higher recreation fees for services provided. Legislation could be enacted resulting in revenues that would be returned to the collecting unit and utilized to provide outdoor recreation opportunities, safety, and convenience for visitors. Currently, only 8 percent of the recreation administration costs are recovered. The fee system would be based on an annual charge per individual or family. The annual charge would entitle persons to general recreation use of National Forest System lands and Congressionally designated areas and most day use sites including picnic facilities and primitive type camping facilities. Additional fees would be charged for use of specific sites, facilities, or services with high capital investment costs such as large, highly developed campgrounds and swim beaches, guided cave tours, and boat ramps. The annual fee would be set at a level to minimize competition with the private sector and to encourage the private sector to develop facilities to help meet many future recreation needs. An example of this user fee is shown in Alternative 9.

ALTERNATIVES CONSIDERED IN DETAIL

Nine alternatives are considered in the DEIS. They represent different combinations of resource management emphases. Each alternative produces different levels of activities, goods, services, and research in response to the needs and opportunities derived from the 1979 Assessment, the Assessment Supplement, and the stated national goals. Each alternative represents an integrated mix of resource outputs, new technology and planned technology transfer. The physical, biological, social, and economic effects of each alternative are discussed in chapter 4.

In this section, each alternative is briefly described for NFS, S&PF, and Research. A display of major activities, outputs, and costs follows the description of each alternative for NFS and S&PF. For Research, costs are shown by nineteen problem areas for each alternative. Appendix tables L.1A, L.1B, and L.1C are provided for more detailed comparison of the alternatives. Summaries of region and station outputs, activities, and costs, which make up the national alternatives, are displayed in appendix H.

The State and Private Forestry programs are closely integrated with the Forest Service Research program and with the administration of the National Forest System. S&PF provides the link in the transfer of

technology from researchers to users of new knowledge. Cooperative forestry programs often have direct impacts on the protection and management of National Forest System lands that are interspersed with private or other non-Federal ownership. In some areas, cooperative programs in fire and forest pest management are essential to protection of lands in the National Forest System and other Federal lands.

The Research program is closely coordinated with related programs for the management and protection of the National Forest System, other Federal agencies, cooperative forestry assistance programs with States, university research efforts, and with the needs of private forest owners and industry. New technology and other research findings are often developed for specific needs of the National Forest System. A survey of National Forest System research needs indicated a high proportion of the research planned for each alternative was needed to support land management objectives in addition to meeting state and private forestry needs. State and Private Forestry programs play a vital role in the transmission and use of research information for a variety of forest management, protection, and utilization needs.

The International Forestry Program, while described within the Research program, also includes NFS and S&PF activities. This Forest Service-wide program has been planned under three broad areas of activity: research, training, and technical assistance. Many of the International Forestry activities currently overlap with domestic programs and are currently funded from these programs as well as from transfers of funds from other Departments and Agencies. Research currently administers most of the Forest Service's International Forestry program, but NFS and S&PF would gradually expand their international forestry activities during the planning period. The greatest participation by NFS and S&PF would be in Alternatives 6 and 8 where their share of the program would equal approximately 50 percent of the International Forestry budget by 2030.

Alternative 1 (Constant Outputs)

CONTINUE CONSTANT LEVEL AND MIX OF PROGRAM OUTPUTS.

This alternative provides for constant outputs, at the 1982 level of goods and services, into the future. The FY 1982 appropriations bill was used as a starting point for defining the output level. The Alternative provides for continuation of the 1982 direction; continuation of existing policies, standards, and guidelines; updating the 1982 budget only for real cost changes over time; and, to the extent possible, continuation of 1982 production levels and mixes of resource outputs. Resource outputs and activities are displayed in tables 2.27, 2.28, and 2.29.

National Forest System

If Alternative 1 were implemented, outputs would remain at the 1982 levels. Over the next 50 years, some unroaded areas would be entered through scheduled timber sale offerings. The annual sale offerings of 11.3 billion board feet of timber in 1986 would remain constant through time (table 2.1). However, a reduction in the size of trees harvested in the Northwest in 2030 could result in a slight decrease in board foot volume, although the cubic foot volume would remain constant.

This alternative would maintain permitted grazing use at a level of 9.7 million animal unit months (AUMs). This level is about 92 percent of the total potential capacity in 1986. In 1986, 74 percent of the range allotments would be managed with plans based on completed range analyses, increasing to 94 percent in 2030.

Recreation opportunities would remain varied with the current mix of opportunities available. Continuing the current recreation program would provide for 221 million recreation visitor days (RVDs) through 2030. Recreation use has historically increased about 2 to 3 percent per year. The alternative would not respond to this increase. The effect would be the need to close some facilities and reduce the quantity and quality of service. In the later periods, increased control measures may be required to minimize environmental impacts resulting from unmanaged use. Only 18 percent of the RVDs would be at established management standards by 2030.

Wilderness estimates in Alternative 1 include currently designated areas plus the Administration's recommendations on areas to be added. If the Administration position had not been determined or stated, the RARE II recommendations were used. The 1986 level of 31.9 million acres was held constant through the planning period.

Anadromous fisheries production would be constant at 110 million pounds through 2030. Current wildlife habitat diversity, as measured through management indicator species, would be maintained. In some regions, habitat for old-growth dependent species would decline, but viable populations would be maintained. Carrying capacity for species currently hunted and fished would decline approximately 5 percent below current levels by 2000. Total wildlife use reported in all opportunity areas would rise from 39.4 million user days in 1986 to 40.3 million in 2030.

Although mineral exploration and development would continue, increased emphasis would be on protection of surface resources and mitigation of adverse environmental impacts. Energy production would decline slightly from the current level of 9.3 quads to 9.0 quads in 2030. A quad

represents one quadrillion (1,000 trillion) British thermal units. For a comparison perspective, the annual U.S. energy consumption is approximately 70 to 80 quads.

This alternative responds to Congressional direction under the Clean Water Act to protect the quality, quantity, and time of water yields from all forested lands, and meets all legislative requirements to protect air quality over all Class I areas. Water yield improvement shows a slight rise of 350,000 acre feet from 1986 to 2030.

Table 2.1 displays a summary of selected National Forest System program outputs, activities, and costs. Appendix table L.1A displays an expanded summary.

Table 2.1- Selected National Forest System Program Outputs, Activities, and Costs - Alternative 1

	Units of Measure	1986	1990	2030
Timber Offered	Billion Board Feet	11.1	11.1	11.1
Reforestation	Thousand Acres	380	385	367
Timber Purchaser Roads	Miles	7789	7607	7376
Permitted Grazing	Million AUMs	9.7	9.7	9.7
Recreation Use	Million RVDs	216	217	221
Wildlife/Fish Use	Million WFUDs	25	25	25
Energy Produced	Quads	9.3	9.3	9.0
Total NFS Costs	Million of Dollars	1934	1957	1845

State and Private Forestry

The State and Private Forestry program would continue to provide limited levels of financial and technical assistance through State forestry agencies in support of selected high-priority market and nonmarket resources. Outputs attributable to Federal assistance would approximate 1982 levels. Any significant increase in forestry investments on State and private forest lands would have to result from State, local government, and private initiatives rather than from federally supported incentives or other assistance.

Multiresource planning and other technical assistance to private landowners would continue to be provided on almost 3.5 million acres. While this assistance would be generally directed at the production of timber outputs it would provide induced benefits for dispersed recreation, wildlife and fish habitat improvement, and forage production. Cooperative reforestation and timber stand improvement activities at the

Alternative 1 level would produce more than 1.6 billion cubic feet of increased softwood timber annually by the year 2040 (table 2.31). Cooperative assistance for the protection of soil and water resources would continue at 1982 levels; however, watershed improvement projects would be minimal at this budget level.

Technical assistance to loggers and processors to encourage more complete and efficient use of wood would continue at a moderate level, resulting in an additional 130 million cubic feet of wood to be made available annually from timber harvested.

Forest pest management programs for prevention, detection, evaluation, and suppression activities would follow recent trends on State, private, and Federal lands. Prevention activities would continue at a low level through resource planning, program development, and preventive thinning. Integrated pest management practices would continue.

Technical and financial assistance to States for wildland fire protection would continue with economic efficiency gradually improving through activities providing for better management, coordination, and cooperative responses to extreme fire situations.

Table 2.2 displays a summary of selected State and Private Forestry program outputs, activities, and costs. Appendix table L.1B displays an expanded summary.

Table 2.2--Selected State and Private Forestry Outputs, Activities, and Costs -- Alternative 1

	Units of Measure	1986	1990	2030
Reforestation	Thousand Acres	403	403	402
Timber Stand Improvement	Thousand Acres	195	196	197
Improved Wood Utilization	Million Cubic Feet	129	132	132
State Forest Resource Planning	Person Years	80	80	81
Total Cost - S&PF	Millions of Dollars	90	90	90

Research

The current research program provides a relatively low level of support to meet the long-run resource demands shown in the 1979 Assessment and in the Assessment Supplement.

This alternative assumes that the 1982 mix of research programs would continue with some modification later in the planning period as projects are completed. This alternative emphasizes development of new

information and technology to support the timber and protection goals. However, funding for timber and protection research is gradually decreased over the planning period while funding is gradually increased for range, recreation, minerals, wildlife, and fish, as displayed in appendix table L.1C.

Within the timber goal, emphasis would be placed on forest regeneration and yield techniques as appropriate for different regions of the country. In the South, research would continue to provide new engineering knowledge for economical harvesting and regeneration systems. Modest progress would be made toward the development of biotechnology techniques for forests.

Research under the protection goal would include modest funding for development of chemical, biological, or physical methods for controlling insect damage to wood in storage and in use; minimizing disease losses in intensive cultured and natural forests; and improving fire control methods. While some progress would be made in acid rain research, it would probably not be sufficient to meet anticipated needs.

Research on wildlife habitat, outdoor recreation, and urban forestry would continue to receive low priority. The demand for technology for rehabilitation of surface mining areas will likely remain high. Therefore, the research to rehabilitate and reclaim these lands disturbed by mining will be diversified to include revegetation, erosion control, hydrology, and nutrient cycling.

Table 2.3 displays a summary of Research program costs by opportunity area. Appendix table L.1C displays an expanded summary.

Table 2.3--Research Program Costs by Opportunity Area in Millions of Dollars--Alternative 1

Opportunity Area	1980	1990	2030
Timber	61.3	61.1	60.1
Range	3.2	3.2	3.7
Recreation	2.2	2.2	2.4
Wilderness	0.2	0.2	0.5
Wildlife/Fish	6.2	6.2	6.4
Water	8.4	8.5	8.1
Minerals	3.6	3.6	4.7
Protection	26.3	26.4	25.5
Total Research 1/	129.1	129.1	129.1

1/ Includes construction and administration costs.

The International Forestry program for NFS, S&PF, and Research in this alternative is a continuation of the current program of 4.6 million dollars through all time periods. The major effort is aimed at tropical forestry problems. Research will include development of information on U.S. and international timber supply-demand relationships. Cooperative research, technical assistance, and training with Canada, Mexico, and other countries would continue to address problems of mutual concern.

Alternative 2 (High Market)

EMPHASIZE ACHIEVEMENT OF HIGH OUTPUT LEVELS FOR TIMBER, RANGE, MINERALS, AND OTHER MARKET RESOURCES. PRODUCTION OF NONMARKET OUTPUTS WILL BE AT ECONOMICALLY EFFICIENT LEVELS, CONSISTENT WITH THE MARKET EMPHASIS.

This alternative places emphasis on timber, range, minerals, and other market outputs. Other resources are managed at levels economically and environmentally consistent with the emphasis placed on market-oriented outputs. Resource outputs and activities are displayed in tables 2.27, 2.28, and 2.29. There are no long-term budget limits on this alternative. However, in the near term, projected budget levels reflect a reasonable link to the fiscal year 1982 level and represent a program that can be implemented. Opportunities are expanded to collect and increase user fees and receipts for activities that have potential to produce income for the U.S. Treasury.

National Forest System

Alternative 2 results in a 34-percent increase in the amount of timber offered by 1990; by 2030, 82 percent more timber would be offered annually compared to the constant output alternative. Annual sale offerings of 13.6 billion board feet in 1986 would increase to 20.0 billion by 2030. The increase in sale offerings would require about 38 percent more miles of road annually than Alternative 1 by 1990. Alternative 2 was developed in part to analyze the effects of a departure from a nondeclining-flow timber sale schedule in reaching long-term sustained yield capacity and would include 692 million board feet of departure volume in 1986.

Permitted grazing on National Forest System lands would increase from 10.2 million AUMs in 1986 to 13.2 million AUMs in 2030. About 75 percent of the allotments in 1986 would be managed with a plan based on completed range analyses. This level would increase to 96 percent in 2030.

By 2030, recreation use would reach 367 million RVDs, a 64 percent increase above Alternative 1. While motorized recreation use would increase, roadless recreation opportunities would be reduced. By 2030, 61 percent of the RVDs are at management standards.

Wilderness acres shown in Alternative 2 are approximately 29 million acres in 1986 and increase to 31 million acres in the year 2030. Alternative 2 does not meet management our recovery objectives for endangered, threatened, and sensitive species. The carrying capacity for species commonly hunted and fished would generally decrease 5 to 10 percent below current levels by 2000. The 170 million pounds of commercial fish harvested in 2030 represents a 55 percent increase above the 1986 level of 109 million pounds. Total wildlife use reported in all opportunity areas would rise from 38.4 million user days in 1986 to 52.9 in 2030.

Soil and water resource improvements would be implemented on 75 percent of the areas with unsatisfactory watershed conditions. By 1987, specific opportunities would be identified for increasing water yield on selected areas. Cost-effective vegetative management programs to increase water yield would begin in 1988 and be completed by 2030. Compared to the current level, there would be a nearly 1 million acre-feet increase in water yield by 2030. Flood-hazard reductions would be implemented by the year 2000 on 20 percent of current flood source areas and on remaining areas by 2030.

Mineral exploration and development would be facilitated by timely processing of applications. Energy produced would increase 47 percent by 2030, from 9.4 quads in 1986 to 13.8 quads in 2030.

Table 2.4 displays a summary of selected National Forest System program outputs, activities, and costs. Appendix table L.2A displays an expanded summary.

Table 2.4--Selected National Forest System Program Outputs, Activities and Costs -- Alternative 2

	Units of Measure	1986	1990	2030
Timber Offered	Billion Board Feet	13.6	15.2	20.0
Reforestation	Thousand Acres	466	577	738
Timber Purchaser Roads	Miles	9010	10496	11966
Permitted Grazing	Million AUMs	10.2	10.7	13.2
Recreation Use	Million RVDs	218	240	367
Wildlife/Fish Use	Million WFUDs	25	27	33
Energy Produced	Quads	9.4	9.8	13.8
Total NFS Costs	Millions of Dollars	2320	2715	2852

State and Private Forestry

The State and Private Forestry program under Alternative 2 would be accelerated to meet the highest timber and range production goals indicated in current State Forest Resource Plans.

Federal technical and financial assistance would be expanded in an effort to increase and protect the volume of timber produced on State and private forest lands. Specific cooperative efforts would be made to accelerate forest management planning assistance to landowners, targeting on high potential opportunities, and stimulating investments on private lands with full consideration of landowner objectives.

Cooperative reforestation and timber stand improvement activities would produce more than 6.2 billion cubic feet of increased softwood timber annually by 2040 (table 2.31), which is almost four times the Alternative 1 level. Expanded technical assistance to loggers and processors would encourage more complete and efficient utilization of timber harvested. Annual usable wood volume would be increased by 151 million cubic feet in 1986, and by 324 million cubic feet by 2030, a 145-percent increase over the Alternative 1 level.

Increased emphasis would also be placed on cooperative programs that protect and encourage the production of nonmarket outputs from State and private forest lands. Technical assistance for protection of soil and water resources, and watershed improvement would be highest in this Alternative.

Forest pest management prevention activities would be increased to a high level through integrated pest management strategies of resource management and direct treatments. Detection, evaluation, and suppression activities on both State and private and Federal lands would also be commensurate with the value of the resources and products protected.

Table 2.5 displays a summary of selected State and Private Forestry program outputs, activities, and costs. Appendix table L.28 displays an expanded summary.

Table 2.5--Selected State and Private Forestry Program Outputs, Activities, and Costs -- Alternative 2

	Units of Measure	1986	1990	2030
Reforestation	Thousand Acres	772	1291	1380
Timber Stand Improvement	Thousand Acres	581	1001	1113
Improved Wood Utilization	Million Cubic Feet	151	292	324
State Forest Resource Planning	Person Years	100	183	191
Total Cost - S&PF	Millions of Dollars	149	254	282

Research

The research program as proposed in Alternative 2 would provide medium support to meet the long-run resource demands and protection concerns outlined in the 1979 Assessment and the Assessment Supplement. Research is directed toward high output levels of timber and other market resources. Research planning with the Nation's forestry schools under the 1981 Farm Bill would primarily involve those schools which have research programs designed to increase market outputs. Research would concentrate on tree regeneration and growth, increased range production, and processing wood products. Major breakthroughs would be anticipated in biotechnology and genetic engineering. Procedures would be developed for incorporating genetic gain into growth and yield predictions. There would be increased research on stimulation of early flowering and other techniques for increasing seed production from seed orchards.

A significant research effort would develop management guidelines for private nonindustrial landowners who own over 70 percent of the commercial timberland in the South.

There would be expanded research on tax, legal, and economic impacts of alternative intensive management practices. Emphasis would be on small-sized properties and sites. Research on the economic feasibility of new products and processes would also be accelerated.

Research would be greatly expanded in the South and East on processing systems to utilize small, low-grade hardwoods. New adhesive systems would be developed for reconstituted wood products with emphasis on the use of tannin and lignin components.

The development of multiresource evaluation techniques would be accelerated. Emphasis would be placed on ecological and sociological impacts of multiple-use alternatives.

Wilderness, wildlife habitat, watershed management, outdoor recreation, and urban forestry research would receive relatively little attention until late in the planning period. The increase in these programs would be directed toward evaluation and mitigation measures that would potentially occur with intensive management.

Table 2.6 displays a summary of Research program costs by opportunity area. Appendix table L.2C displays an expanded summary.

Table 2.6--Research Program Costs by Opportunity Area in Millions of Dollars--Alternative 2

Opportunity Area	1986	1990	2030
Timber	69.0	93.1	119.5
Range	4.5	6.6	8.6
Recreation	1.9	2.8	3.9
Wilderness	0.2	0.3	0.3
Wildlife/Fish	6.1	8.6	11.2
Water	8.6	11.7	14.8
Minerals	4.3	5.8	7.5
Protection	29.1	39.2	49.5
Total Research 1/	143.0	195.0	252.6

1/ Includes construction and administration costs.

The International Forestry Program is the same for Alternatives 2, 3, 4, and 9, and provides moderate funding oriented mainly to international trade and developing countries of the world. An Associate Experts program would be initiated to build a cadre of Forest Service experts on International Forestry. A science and technology exchange program and a management training course would also be initiated to provide much needed assistance and training by specialists, managers, and administrators of forestry programs in developing countries. The cost of the total International Forestry program for NFS, S&PF, and Research would be 5.3 million dollars for 1986, 6.2 million dollars for 1990, and 9.7 million dollars for 2030.

Alternative 3 (High Nonmarket)

EMPHASIZE ACHIEVEMENT OF HIGH OUTPUT LEVELS OF WATER, WILDLIFE AND FISH, RECREATION, WILDERNESS, AND OTHER NONMARKET RESOURCES. PRODUCTION OF MARKET OUTPUTS WILL BE AT ECONOMICALLY EFFICIENT LEVELS, CONSISTENT WITH THE NONMARKET EMPHASIS.

Alternative 3 emphasizes nonmarket resources and amenity values. Management for market outputs would be at levels economically and environmentally consistent with the emphasis on amenity values. Resource outputs, activities, and costs are displayed in tables 2.27, 2.28, and 2.29.

There are no long-term budget constraints on this alternative. In the near term, projected budget levels reflect a reasonable tie to the fiscal year 1982 level, and represent a program that can be implemented. In Alternative 3, adverse impacts on total local employment are avoided since market outputs are provided at economically efficient levels.

National Forest System

This alternative would provide approximately 9 percent less timber in 1986 than Alternative 1, and provides the lowest level of timber of any of the nine alternatives, except Alternative 5. About 7,000 miles of road (10 percent less than Alternative 1) would be needed to produce this level of timber in 1986. Sale offering in 1986 would be 10.2 billion board feet and would increase to 12.6 in 2030. Alternative 3 sale volume would include 211 million board feet of departure volume in 1986.

Grazing use in this alternative would be similar to the 1982 level, with 9.7 million AUMs in 1986. Permitted grazing would decrease by 3 percent, to 9.4 million AUMs in 2030. About 74 percent of the range allotments would be managed with a plan based on completed range analyses in 1986, increasing to 89 percent in 2030.

Recreation use would double from 229 million RVDs in 1986 to about 431 million RVDs by 2030. The thrust of this alternative is recreation-oriented and thus all forms of recreation opportunities that are appropriate to the National Forest role would be provided. More than 1,475 miles of National Forest trails would be constructed and/or reconstructed in 1986. About 96 percent of the RVDs would be provided at established management standards by 2030.

National Forest System lands in the National Wilderness Preservation System would increase more than 30 percent from 32 million acres in 1986 to 42 million acres in 2030. Wilderness estimates for this alternative are based on the premise that a major portion of wilderness study and further planning areas would be designated as wilderness.

This alternative meets or exceeds Forest Service management and recovery objectives for the endangered, threatened, and sensitive wildlife and fish species. Commercial harvest of anadromous fish increases from 107 million pounds in 1986 to 150 million pounds in 2030. Carrying capacity for species commonly hunted and fished would generally increase by 10 to 15 percent over current levels by 2030. Total wildlife use reported in all opportunity areas would rise from 41.4 million user days in 1986 to 60.1 million in 2030.

Water yield, water quality, and soil productivity would be maximized under this alternative. Higher quality water would be provided to meet increased recreation and fisheries activities.

Although mineral exploration and development would continue, increased emphasis would be placed on protection of surface resources and mitigation of adverse environmental impacts. Energy produced increases from 9.2 quads in 1986 to 10.1 quads in 2030.

Table 2.7 displays a summary of selected National Forest System program

outputs, activities, and costs. Appendix table L.3A displays an expanded summary.

Table 2.7--Selected National Forest System Program Outputs, Activities, and Costs -- Alternative 3

	Units of Measure	1986	1990	2030
Timber Offered	Billion Board Feet	10.2	10.7	12.6
Reforestation	Thousand Acres	373	384	401
Timber Purchaser Roads	Miles	6988	7386	7694
Permitted Grazing	Million AUMs	9.7	9.5	9.4
Recreation Use	Million RVDs	229	256	431
Wildlife/Fish Use	Million WFUDs	26	29	41
Energy Produced	Quads	9.2	9.5	10.1
Total NFS Costs	Millions of Dollars	2116	2383	2388

State and Private Forestry

State and Private Forestry programs would be about double the 1982 levels; outputs would be at a level halfway between Alternative 1 and Alternatives 4 and 8.

By 2030, multiresource planning and other technical assistance to private landowners would be provided on almost 5.5 million acres, a 57-percent increase over the Alternative 1 level. While assistance would generally be directed at the production of timber outputs to meet landowners' objectives, increased emphasis would be placed on the production of nonmarket outputs from State and private lands. Cooperative reforestation and timber stand improvement activities at the Alternative 3 level would produce 3.0 billion cubic feet of increased softwood timber annually by 2040 (table 2.31), which is almost double the increase expected under Alternative 1. More technical assistance for protection of soil and water resources would be provided as timber management activity is increased. Watershed improvement projects would be initiated in high priority areas.

A moderate increase in technical assistance to loggers and processors would encourage more complete and efficient use of wood. By 2030, an additional 217 million cubic feet of wood would be made available annually, a 64-percent increase from Alternative 1.

Forest pest management activities on both State and private and Federal lands, and cooperative fire protection activities, would be commensurate with the value of the resources and products protected.

Table 2.8 displays a summary of selected State and Private Forestry program outputs, activities, and costs. Appendix table L.3B displays an expanded summary.