

QUARTZ

HILL

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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:

- o 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 100 MW 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

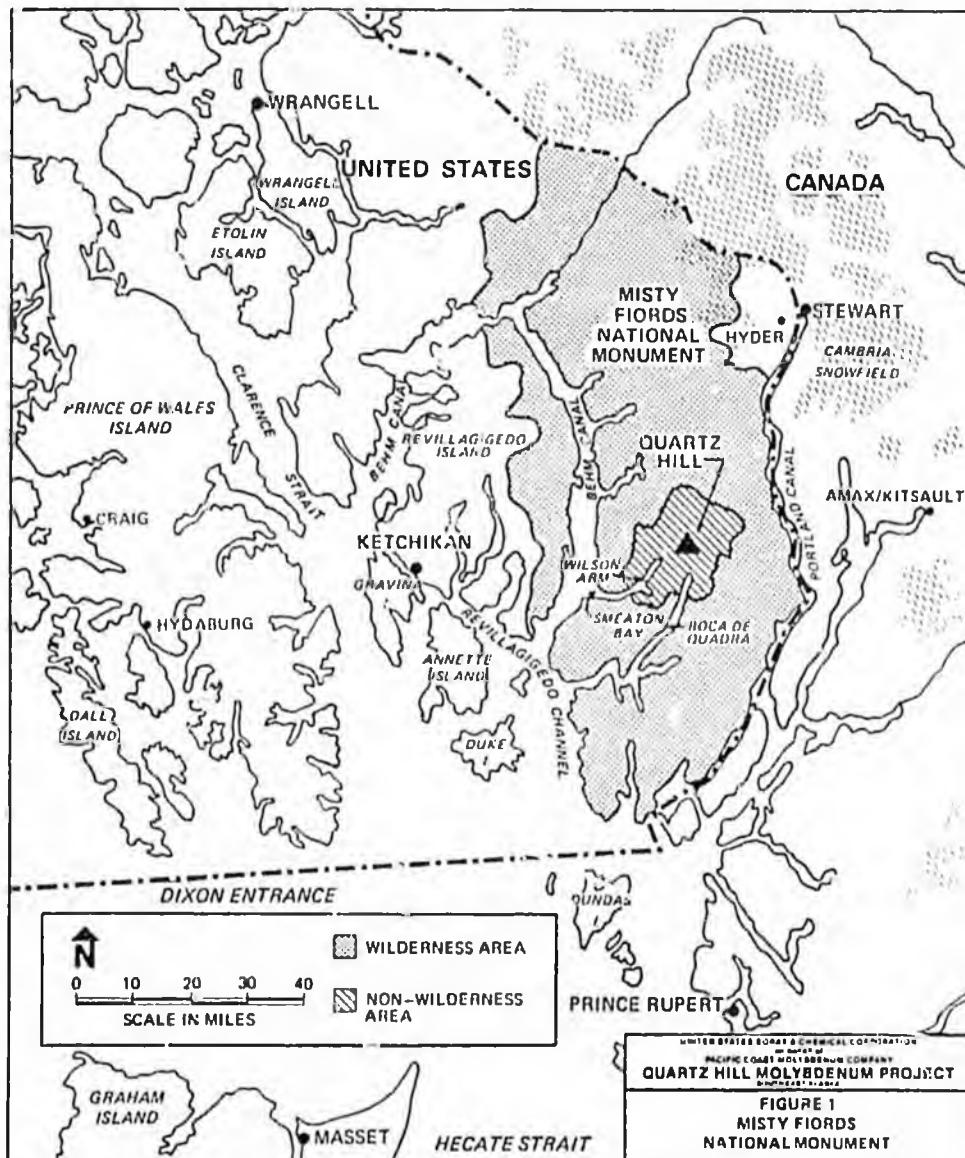
The preferred concept differs in several aspects from the alternatives described in the CAD; these differences reflect the administrative and regulatory decisions itemized in the Final EIS and the July 15, 1982 Record of Decision. However, several alternatives are still under consideration:

- o 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.
- o Concentrator location at:
 - Beaver Creek
 - Tunnel Creek
- o 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
- o 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.

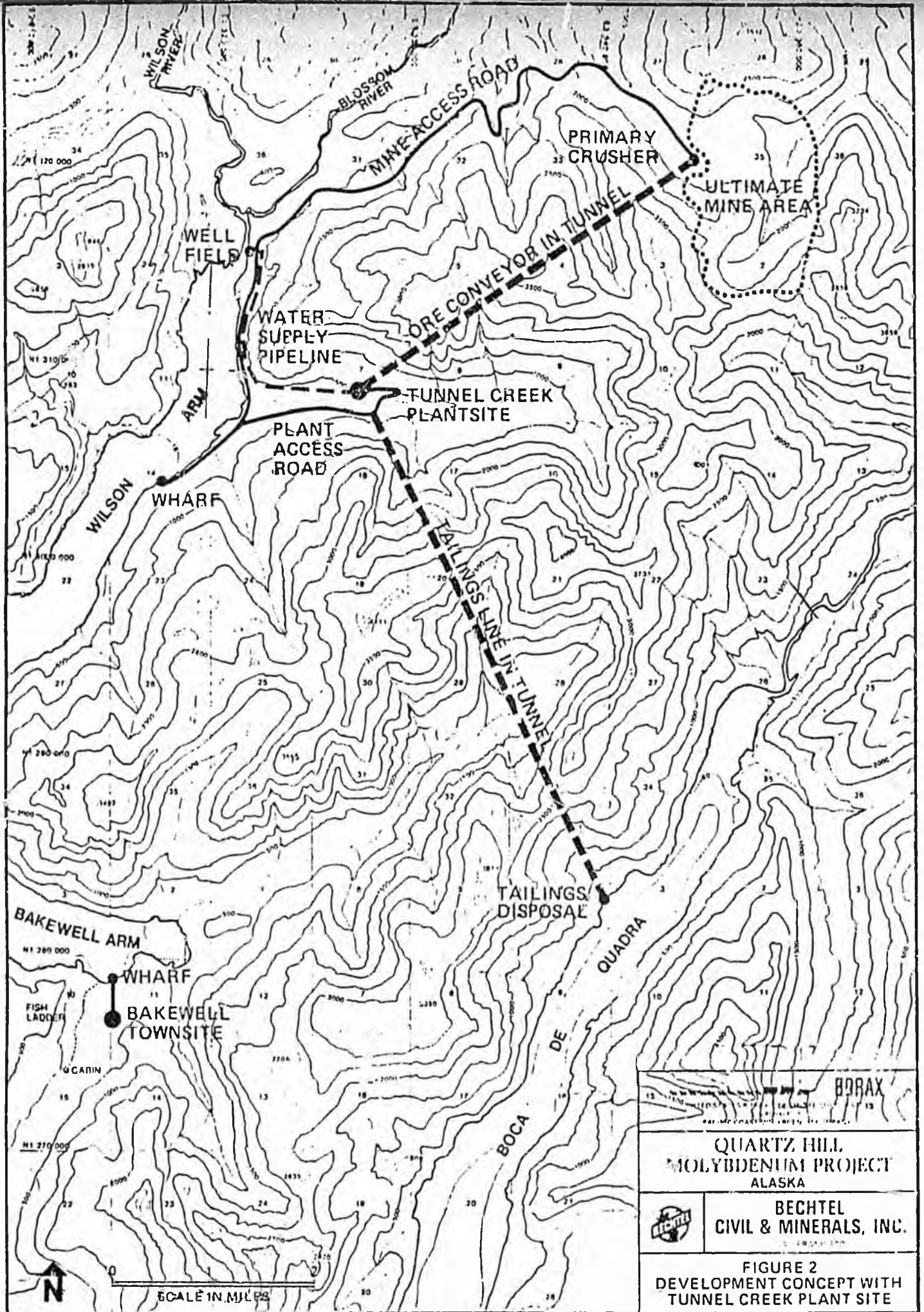


FIGURE 2
DEVELOPMENT CONCEPT WITH
TUNNEL CREEK PLANT SITE



QUARTZ HILL

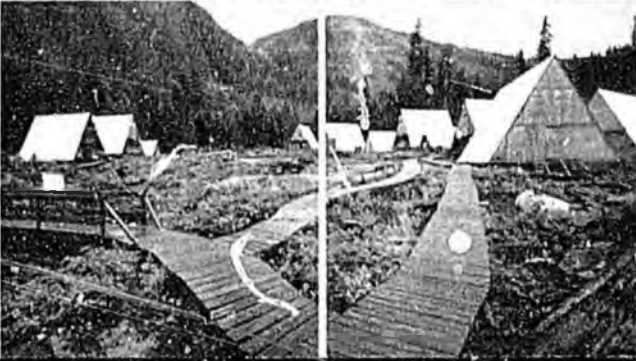
A Mineral Milestone for Alaska



Quartz Hill

WELCOME TO
QUARTZ HILL
POPULATION 251

COEUR D'ALENE, IDAHO 1879
CLIPPAK, COLORADO 1769



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

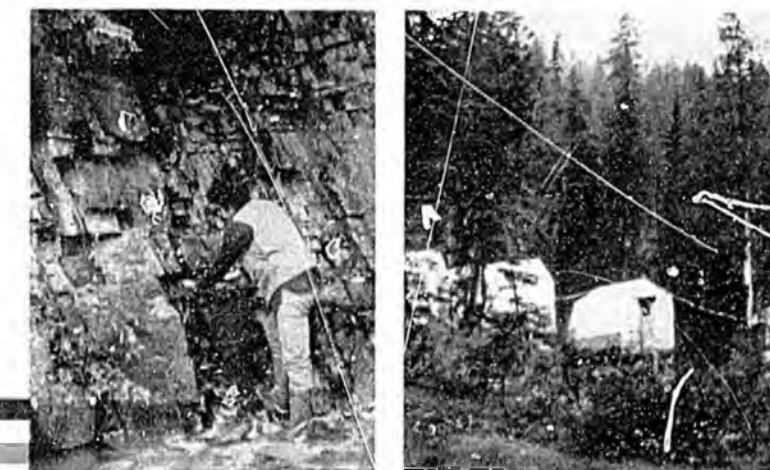
mine. It must be emphasized, however, that although the actual development plans for the Quartz Hill Molybdenum Project are preliminary and subject to change, the commitment to develop and operate the molybdenum mine is not. U.S. Borax and its affiliate Pacific Coast Molybdenum Company intend to be a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



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.



QUARTZ HILL MOLYBDENUM DEPOSIT . . . in S.E. ALASKA

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

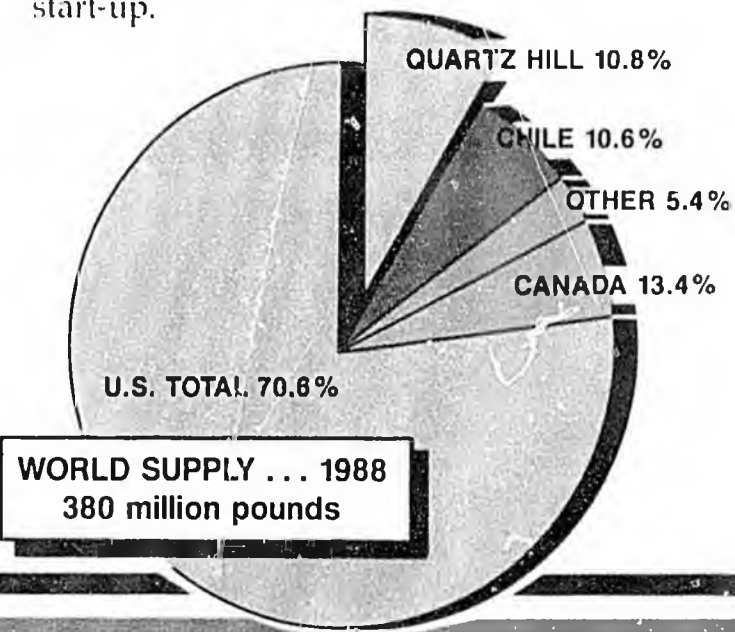
The area of the ore deposit, discovered and claimed in 1974 by

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.



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.

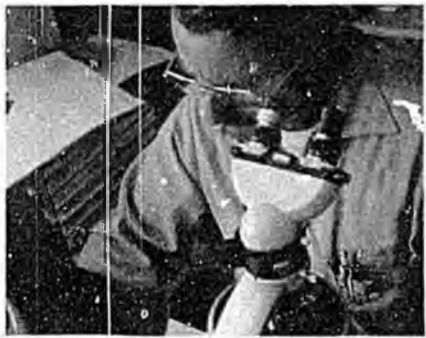
Within one year after passage of ANILCA, the U.S. Forest Service was to issue a draft Environmental Impact Statement (EIS) dealing with the surface access road and bulk sampling phase of the Quartz Hill Molybdenum Project. The draft EIS was issued on December 3, 1981 and a supplement thereto was issued 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

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).

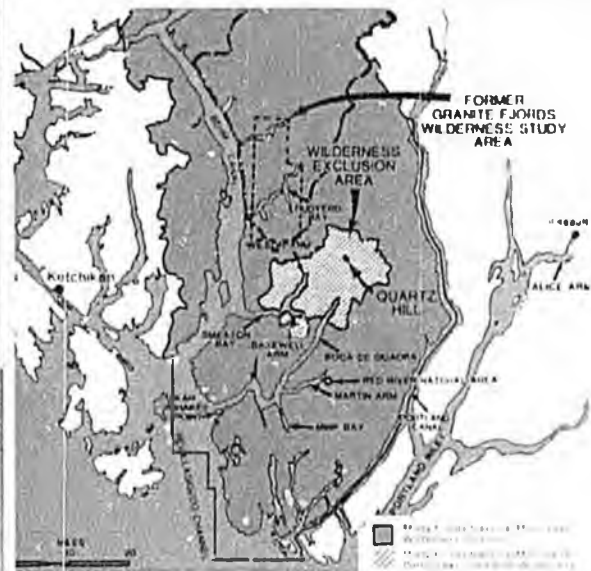
Because of problems and environmental impacts associated with the disposal of the tailings on

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.

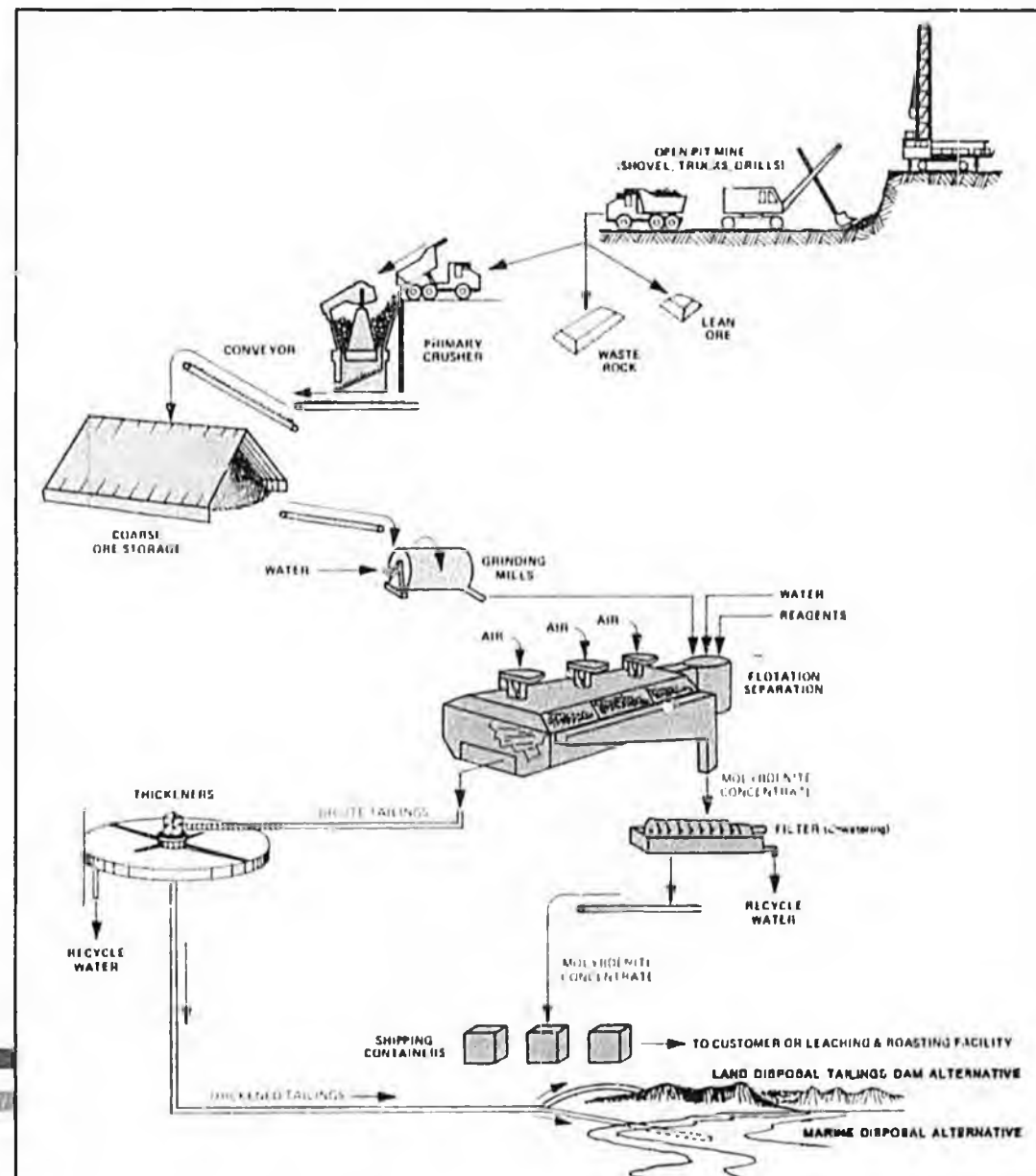
A 9-mile long pipeline or pipelines would gravity-transport the tailings from

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.



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



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:

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



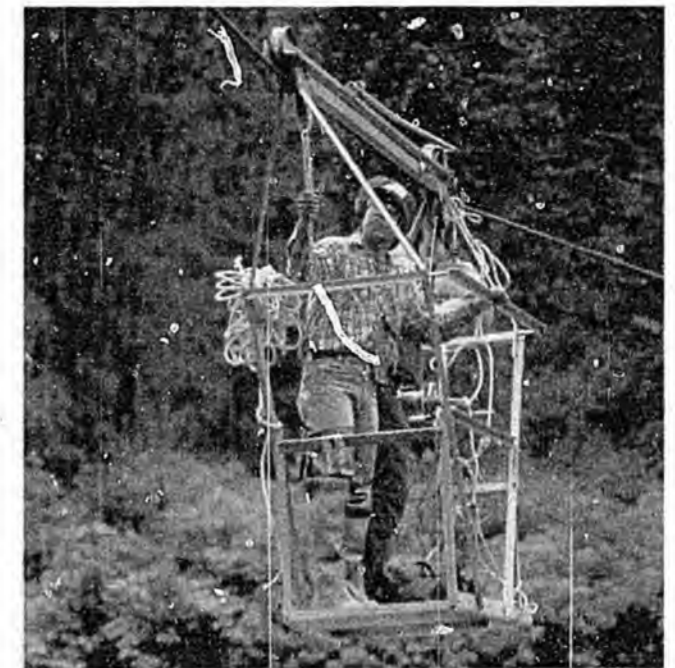
Meteorology

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.



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.



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.



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 peo-



ple, 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 bor-

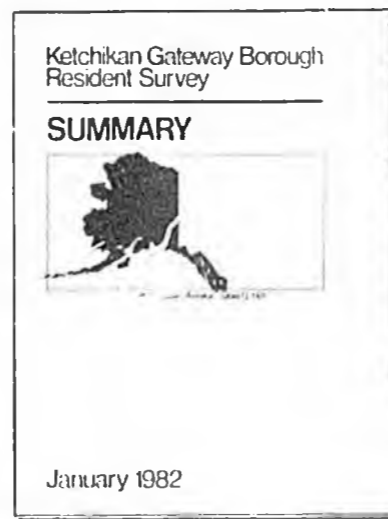


ough's primary source of employment today involve timber (pulp and lumber), retail trade, and governmental services, commercial fishing (salmon, herring, crab), and tourism (Ketchikan is a favorite stopover for Alaskan cruise ships).

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. 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.



USBORAX

we are involved in Alaska!



ALASKA

... a land of superlatives:

- ① 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.
- ② A single glacier, the Malaspina, located at the northern end of Alaska's panhandle, is larger than the state of Rhode Island.
- ③ 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.

U.S. BORAX
We are involved in Alaska



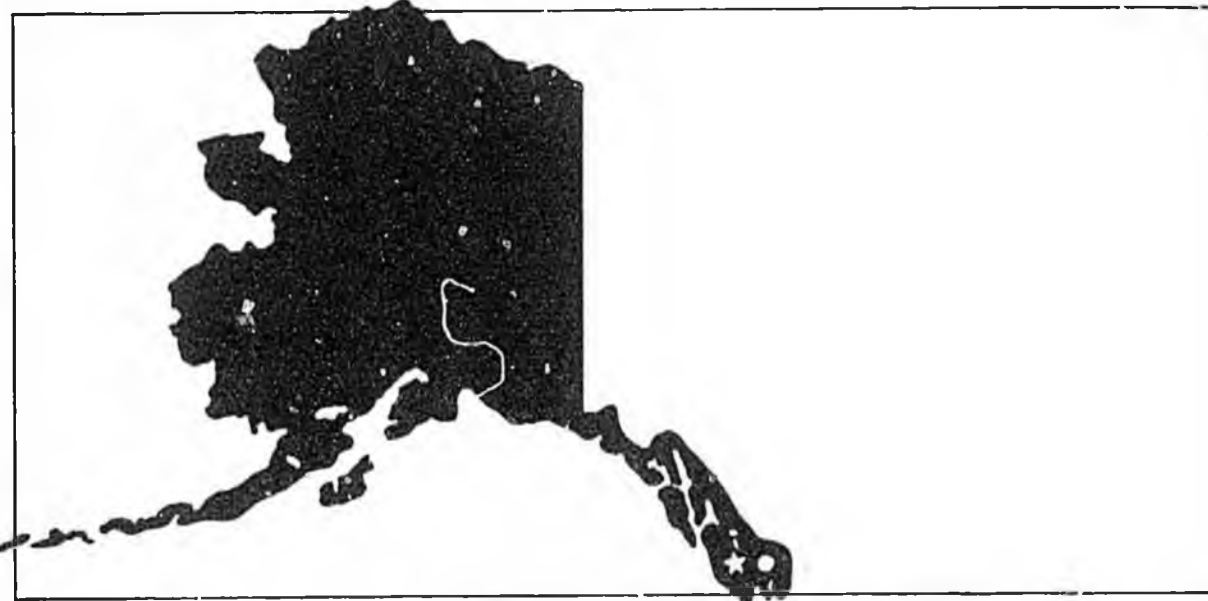
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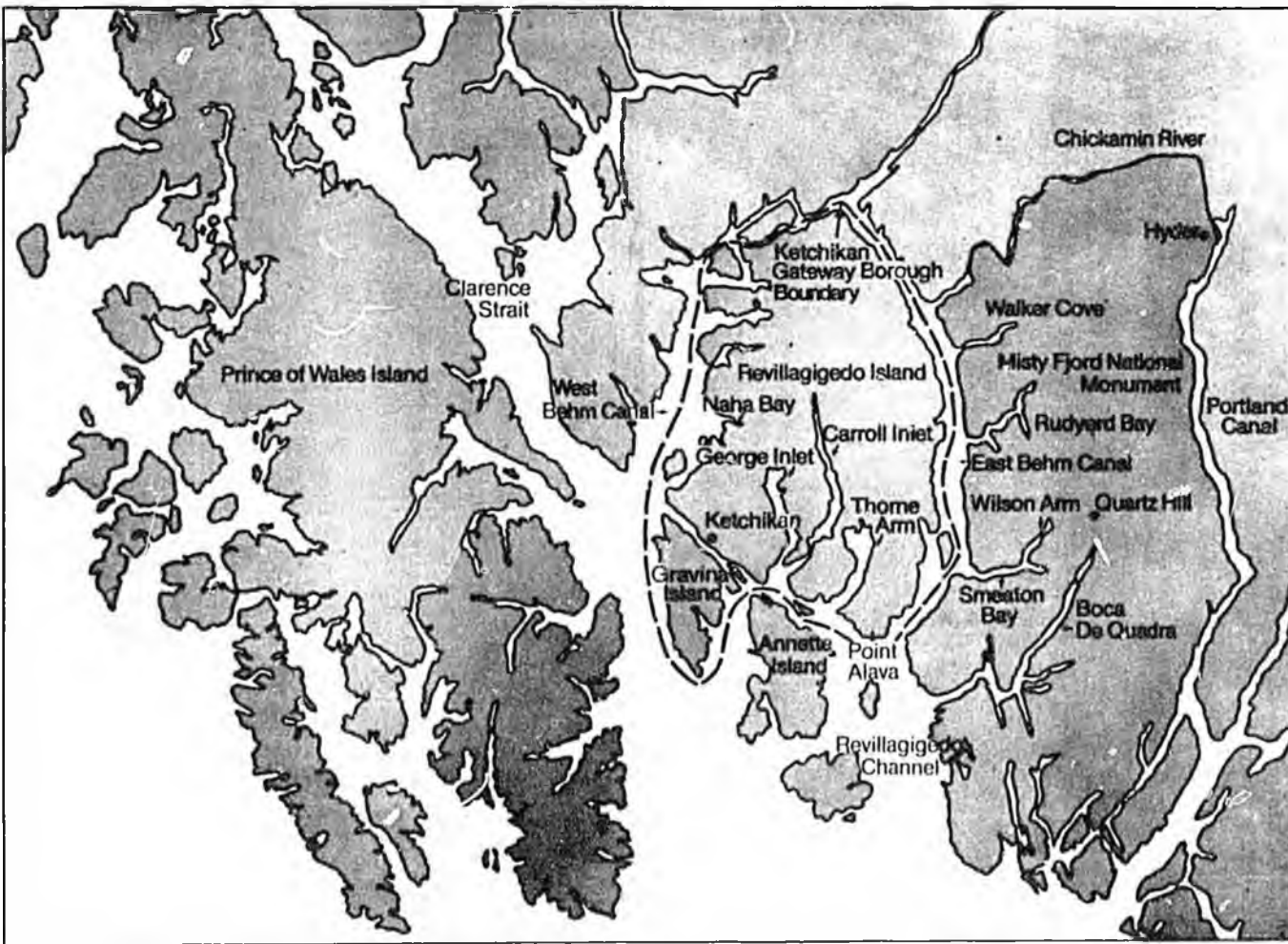
Ketchikan Gateway Borough Resident Survey

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 house-

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.

holds 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.

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 op-

portunities. 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.

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

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.

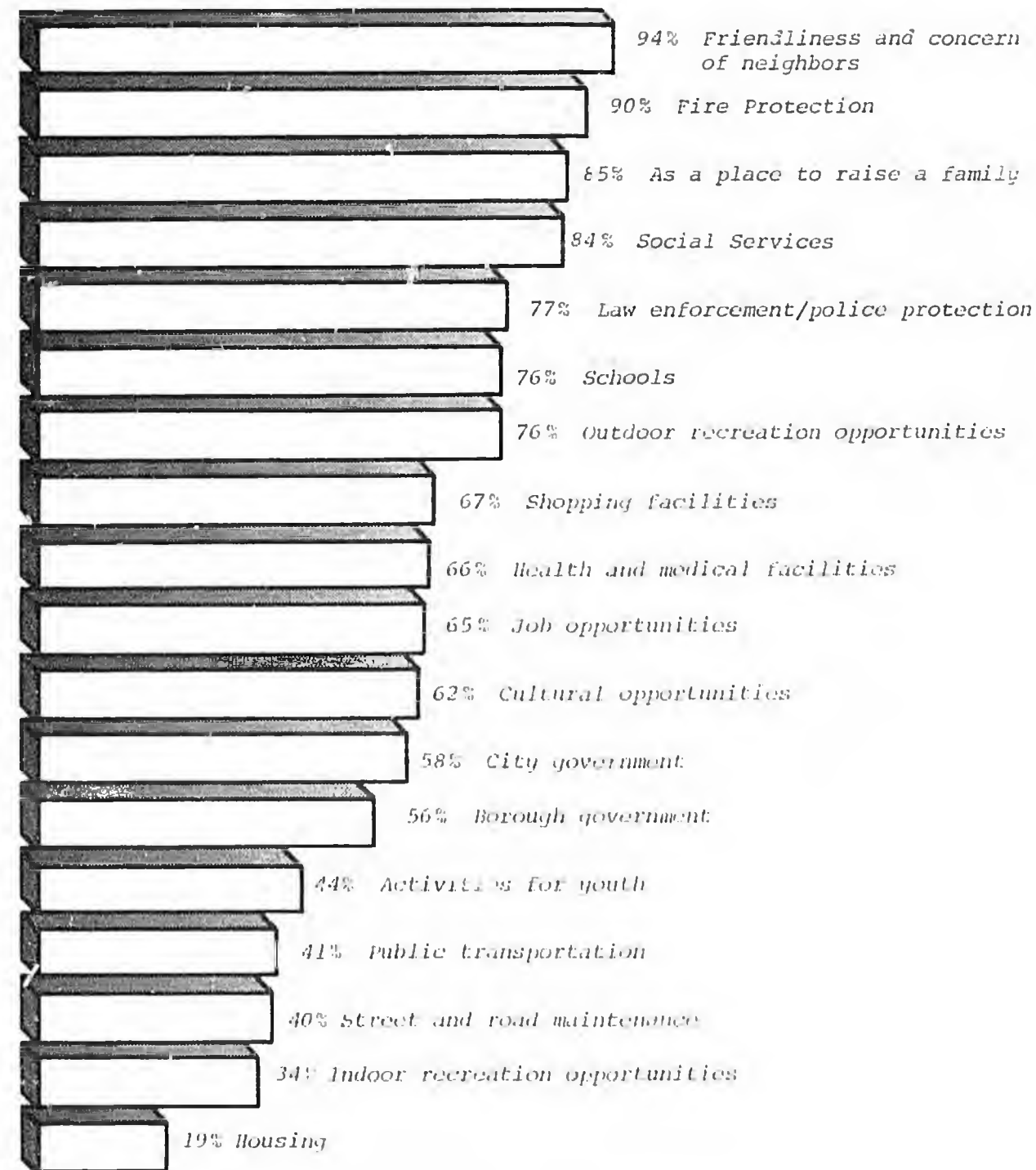
In addition, the area's law enforcement/police protection, job opportunities, cultural opportunities, shopping facilities, health and medical facilities are all generally regarded as positive. The City and Borough government also received a majority of positive ratings, but they also received a substantial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

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.

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 serv-

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.

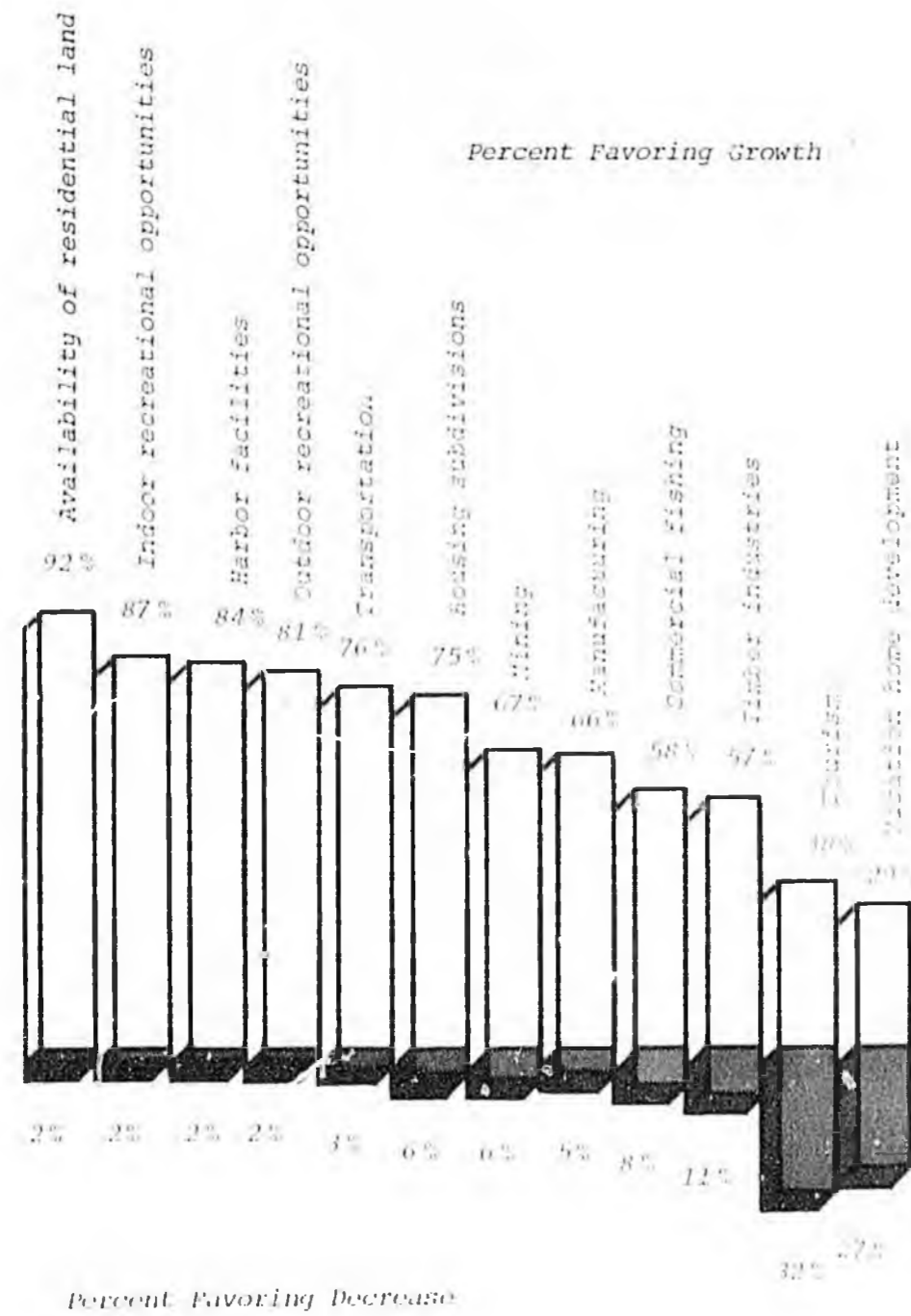
Increases in single family detached housing development is supported by most residents, and a large majority would like to see more apartment and single family attached housing developments. Only mobile home developments received less than majority support.

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.

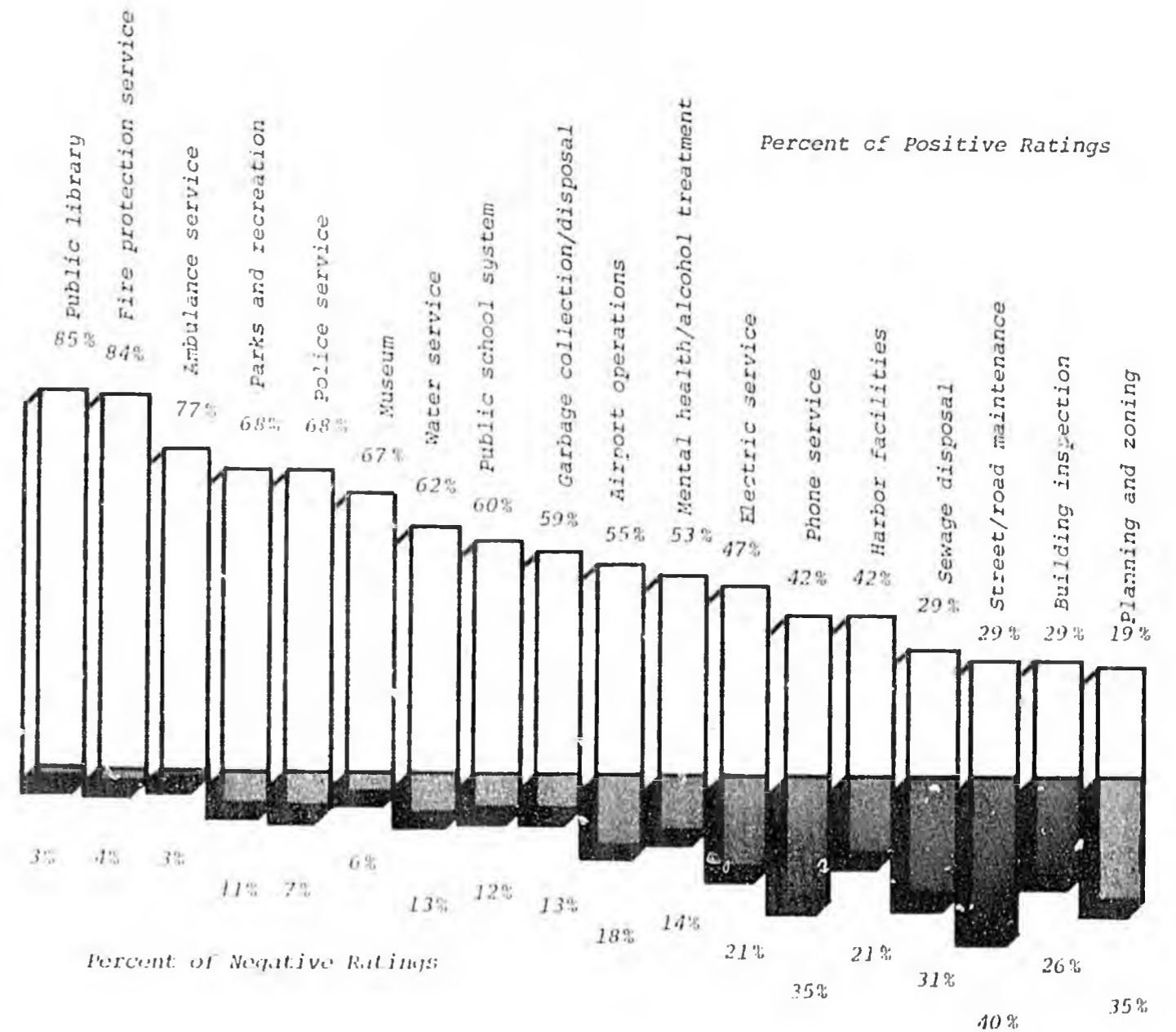
ice for the taxes they are paying. Thirty percent said they were receiving less service than expected, and five percent felt they were receiving more than expected.

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

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

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.

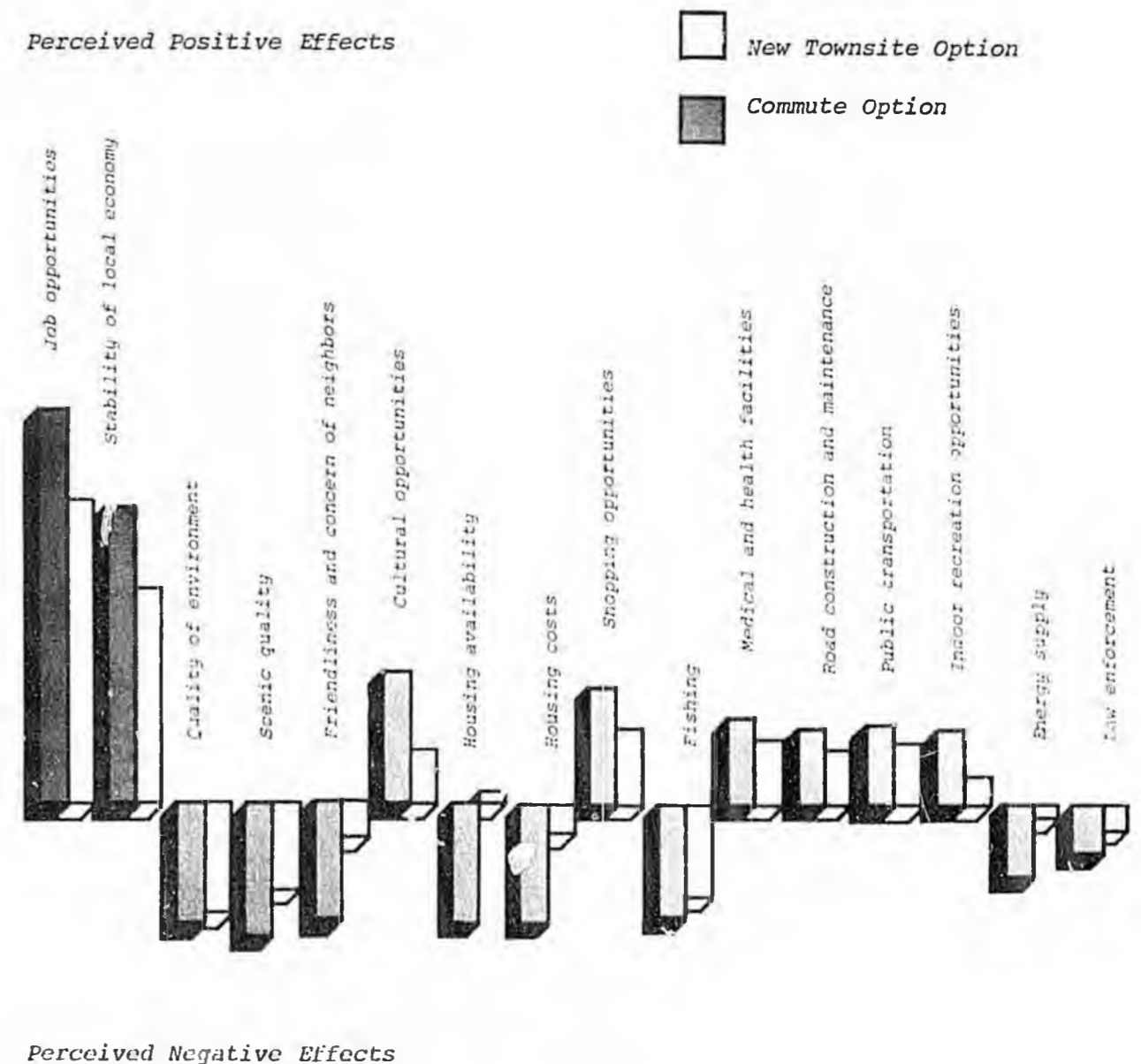
The dominant sources of information about the project have been newspapers, radio and word of mouth. Other sources, including television, U.S. Borax, and the U.S. Forest Service, lagged far behind.

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.

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 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

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

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.

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 relieving 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

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 seri-

ous 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-

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.

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

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,

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.

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

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

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.

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

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

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 --

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.

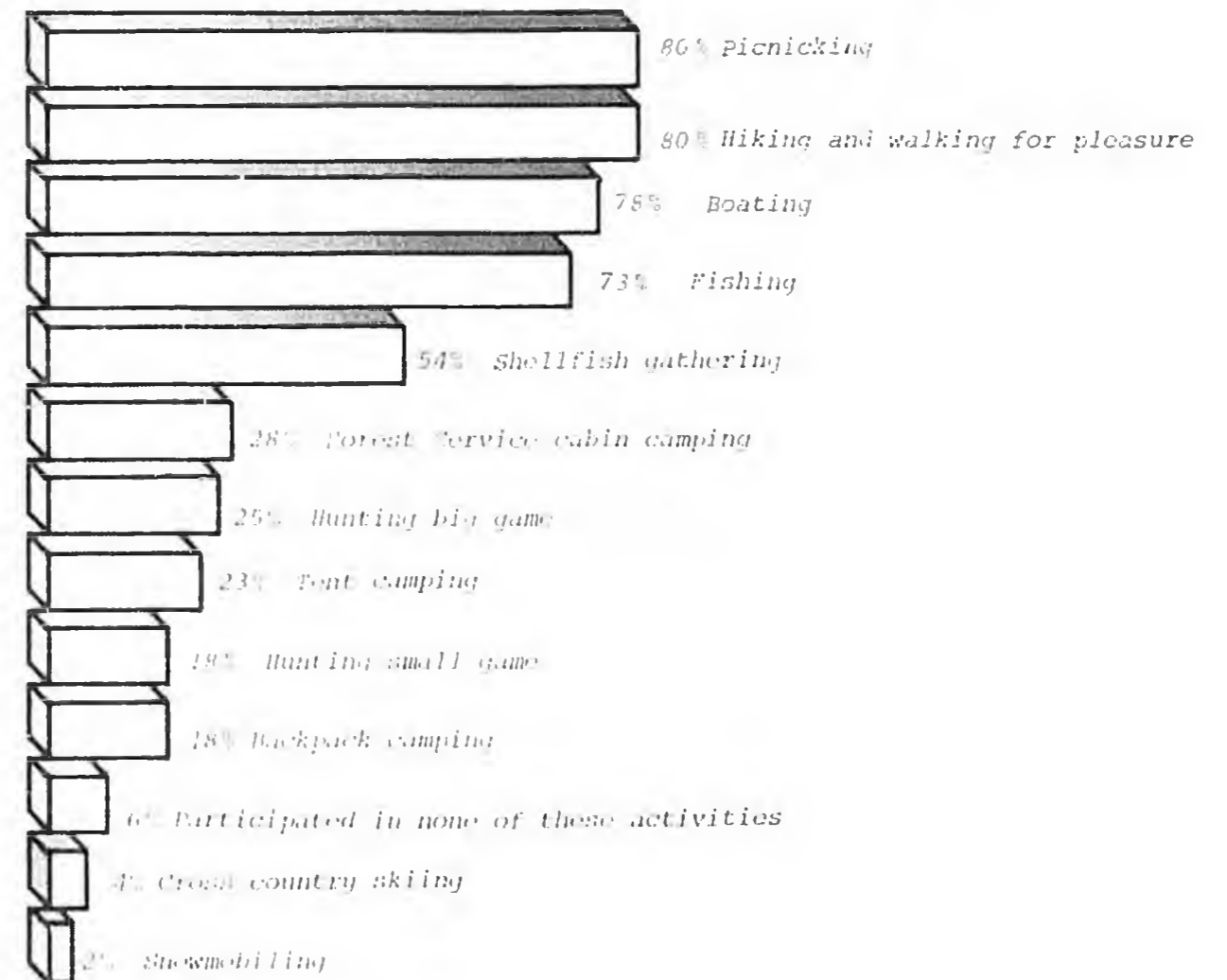
cabins, and hunting, either big game or small game.

Not surprisingly, on and around Reville 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.

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.

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. Thir-

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.

teen 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

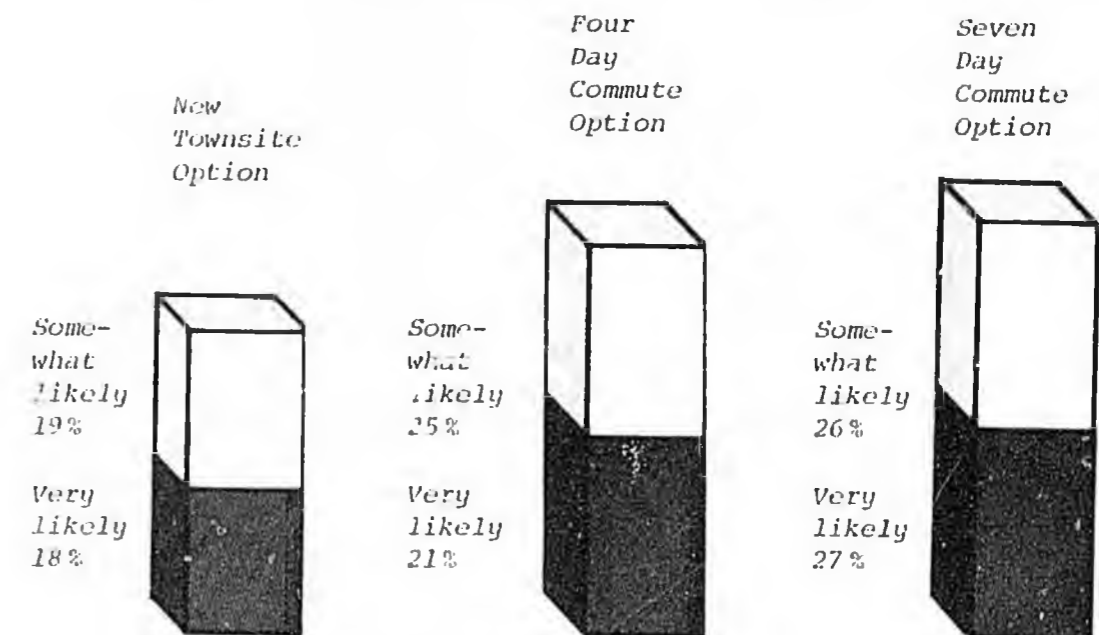
After being told that U.S. Borax intends to provide local and on-site training for persons interested in working at the mine, the residents were asked to indicate their likelihood of applying for a job at the mine or mill under three different conditions.

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 3 $\frac{1}{2}$ 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.

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

(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

	<u>Mine Output Tons/day</u>	<u>Installed Capacity MW</u>	<u>Operating Rate MW</u>	<u>Capital Cost million</u>	<u>Fixed Cost Per kWh Generated</u>
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:

	<u>Fuel(1) Oil</u>	<u>Fuel Cost Per kWh</u>	<u>Operating & Maintenance per kWh</u>	<u>Total Operating Cost per kWh</u>
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.

	<u>Mine Output Tons/day</u>	<u>Installed Capacity MW</u>	<u>Fixed Cost per kWh</u>	<u>Operating Cost per kWh</u>	<u>Total Cost per kWh</u>
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.

(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

<u>Year</u>	<u>-2</u>	<u>-1</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6 and thereafter</u>
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

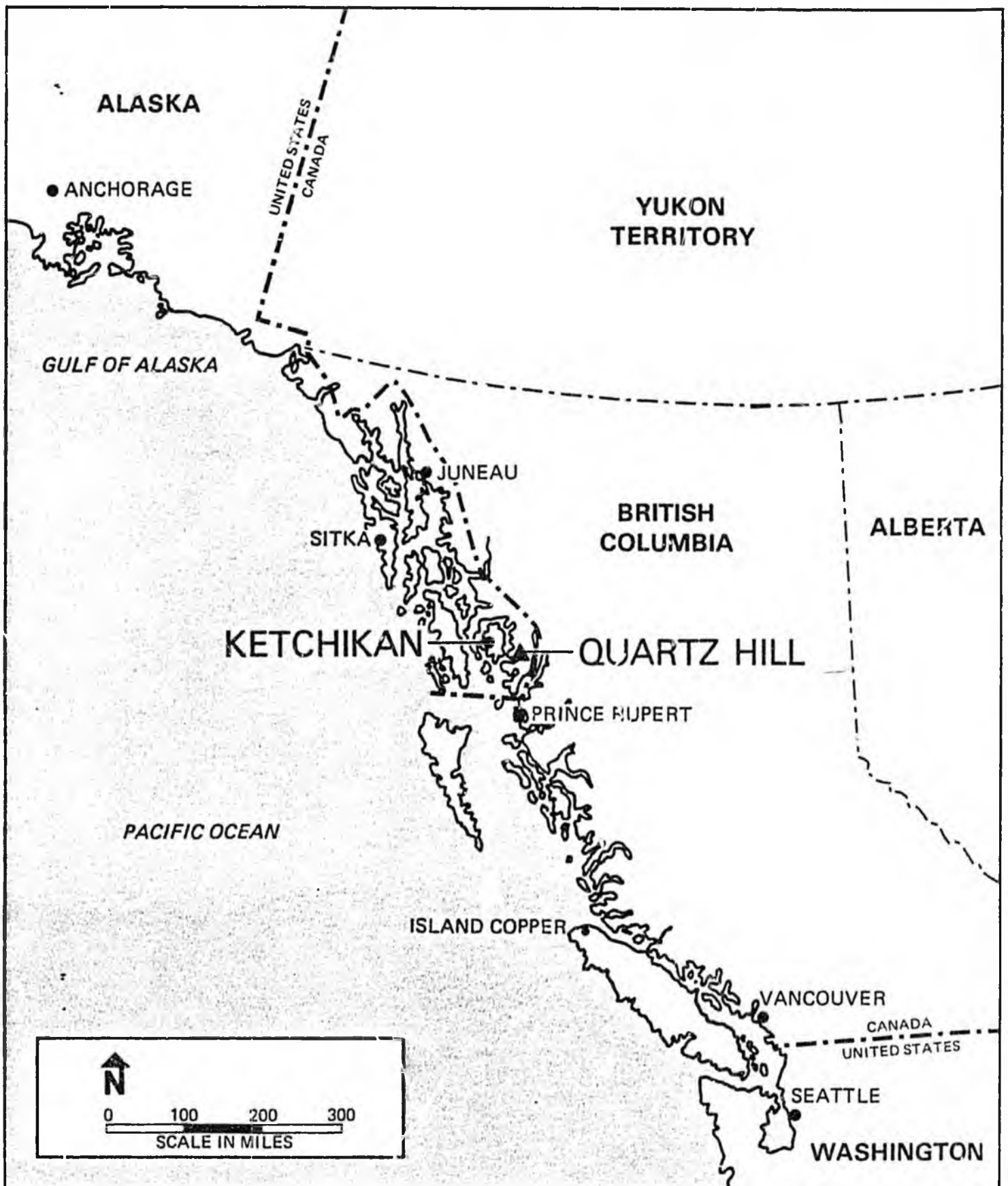
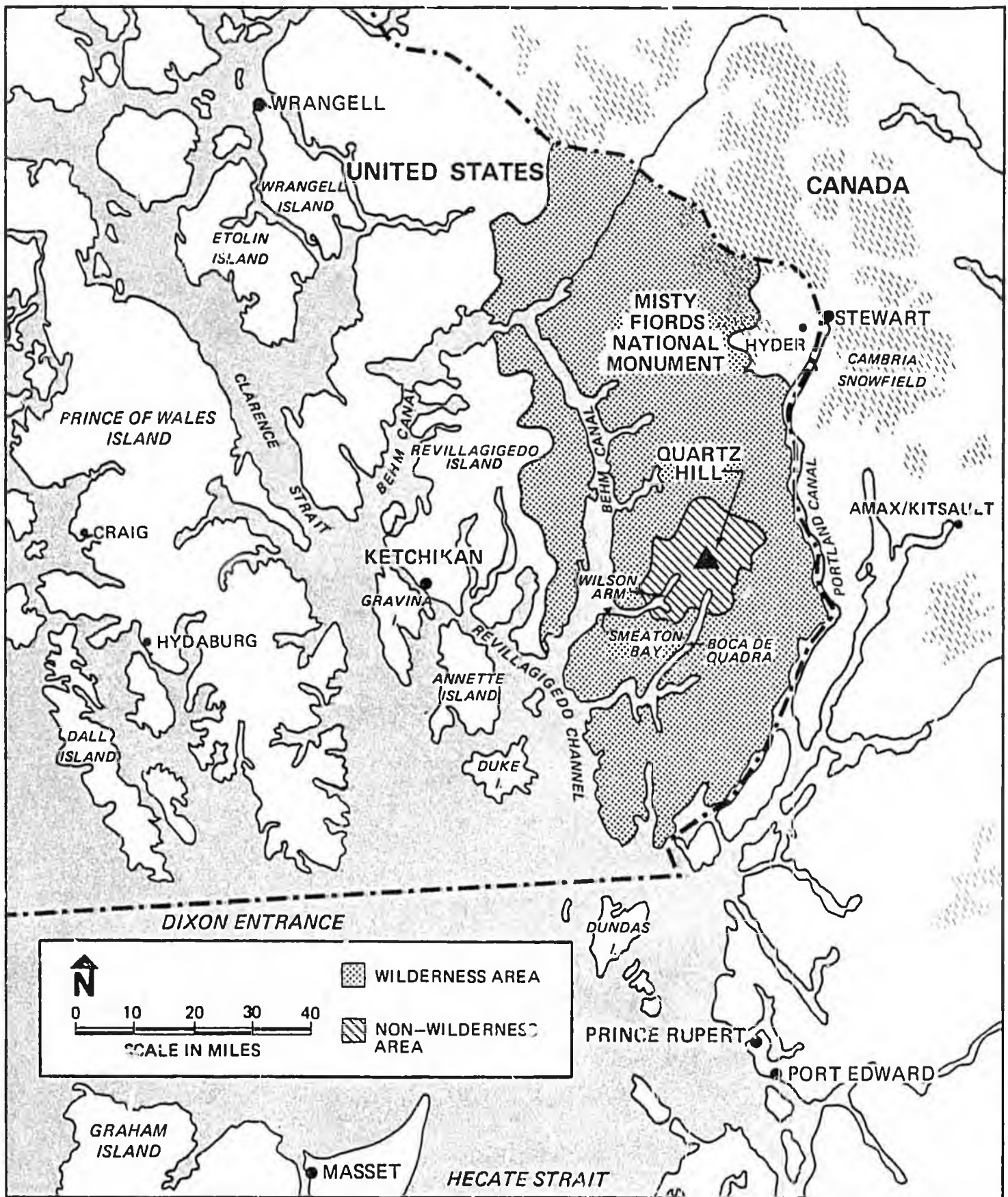
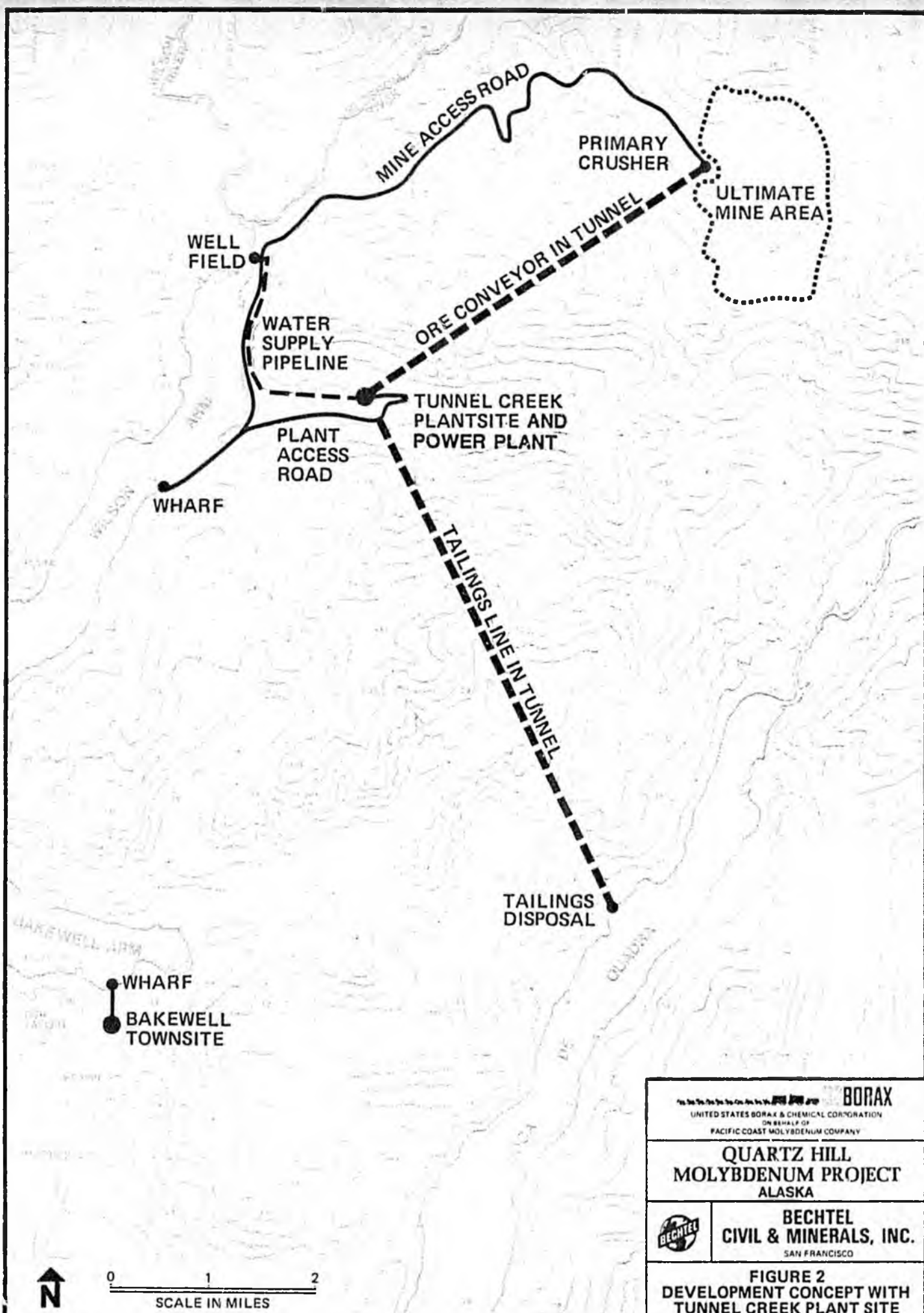


FIGURE 1-2 MISTY FIORDS NATIONAL MONUMENT



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.



 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	

FEB 28 1983

USBORAX

February 24, 1983

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

Dear Bettye:

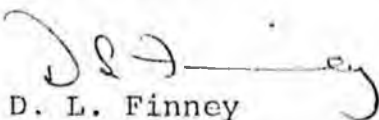
I would again like to thank you for making it possible for us to brief you and the other Resource Committee members on our Quartz Hill Project. As we move into development of the total project Environmental Impact Statement, we consider it especially important to keep all interested persons aware of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


D. L. Finney
Ketchikan Manager
Quartz Hill Project

DLF:es
cc Senator Ziegler
Bill Miles



Alaska State Legislature

Senate

JAN 18 1983

Official Business

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 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



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 Johansen, 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.