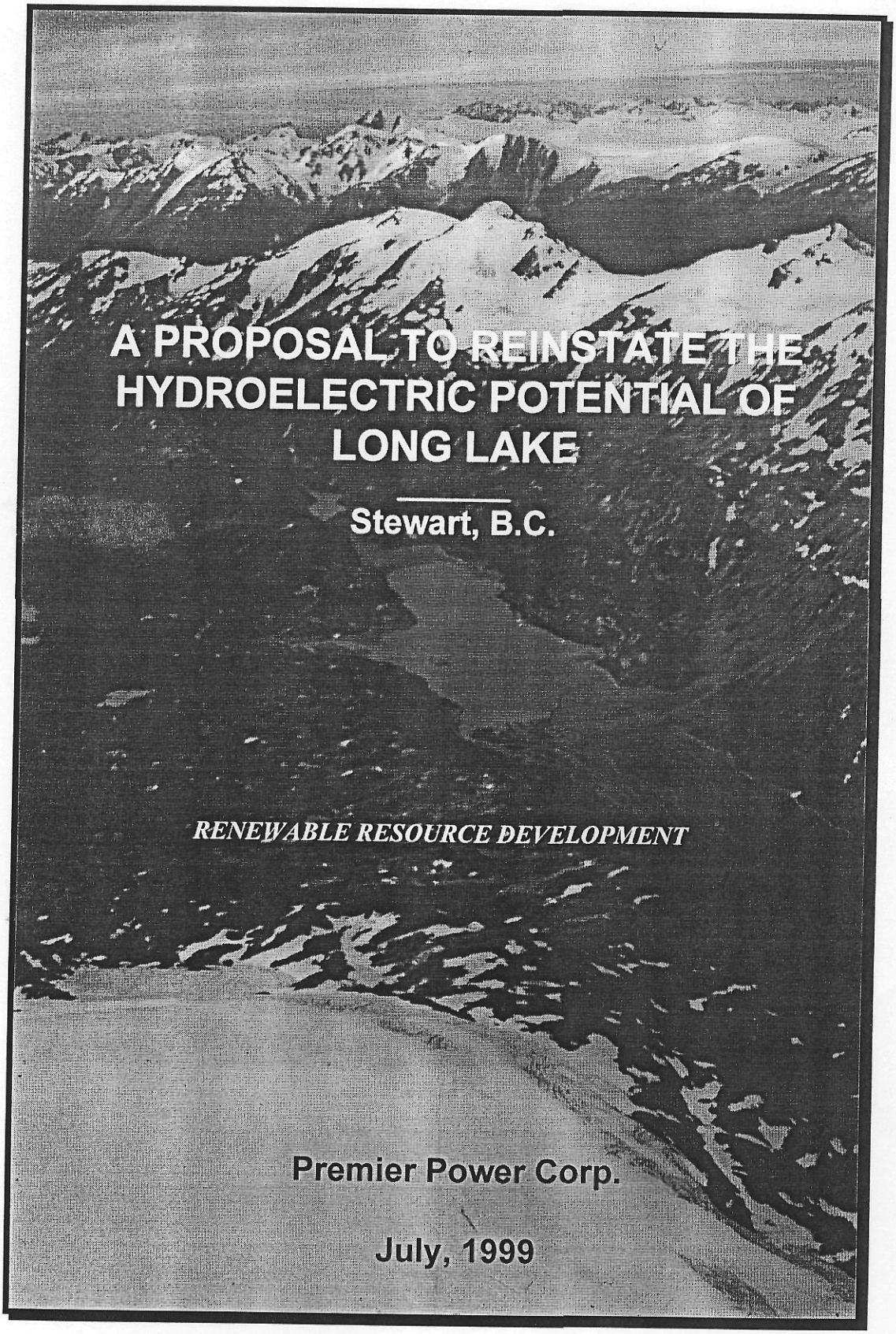
Tom Schroeder
(from: mayor,
Andy Burton-
Stewart.)
Aug. 4/99



A PROPOSAL TO REINSTATE THE HYDROELECTRIC POTENTIAL OF LONG LAKE

Stewart, B.C.

RENEWABLE RESOURCE DEVELOPMENT

Premier Power Corp.

July, 1999

A PROPOSAL TO REINSTATE THE HYDROELECTRIC POTENTIAL OF LONG LAKE

AND RENEWABLE RESOURCE DEVELOPMENT FOR STEWART, B.C.

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AND RENEWABLE RESOURCE DEVELOPMENT FOR STEWART, B.C.

1.0 Historic Development of Long Lake and Cascade Creek

Historically, mining operations at both Silbak Premier and Big Missouri generated power on-site from the hydroelectric potential of Long Lake and Cascade Creek.

1.1 Hydroelectric Development at Premier

From 1923 to 1956, operations at Silbak Premier used power from two interconnected run-of-river plants, one located on Cascade Creek (400 kW; 47 m head) and one on Fletcher Creek (450 kW; 438 m head) to supply power to the mines operated by the Premier Gold Mining Company and the Premier townsite (See Plates 1 and 2). The mines and the hydroelectric generating plants, which were backed up by auxiliary diesel, were subsequently taken over by British Silbak Premier Mines. At the time these two hydroelectric developments were the most northerly in British Columbia.

Statistics:

Fletcher Creek, Powerhouse No.1: Wood crib dam. 3530 feet of 8 and 10 inch diameter steel penstock (850 psi) over 1400 feet (438 m) head. 6 ft diameter pelton wheel, 450 kW, 2200 V belt driven turbine.

Cascade Creek, Powerhouse No. 2: Wood crib dam, pipes and flumes leading to 42 inch diameter steel penstock over 150 feet (47 m) head. Pelton wheel with 3 runners, 400 kW, 2300 V, direct connected to turbine.

Water Licenses:

Final Water License F004062, File No. 0029082
Issued December 31, 1923, and amend March 18, 1980.
Authorizes utilization of 10 cfs from Lesley Creek (lower) for power generation at the "Cascade Creek" plant (320 kW, 400 kVA, 500 hp).

Final Water License F0040623, File No. 0029082
Issued December 31, 1923, and amend March 18, 1980.
Authorizes utilization of 20 cfs from Cascade Creek (lower) for power generation at the "Cascade Creek" plant (320 kW, 400 kVA, 500 hp).

Final Water License F003494, File No. 0029081
Issued December 31, 1923, and amend March 18, 1980.
Authorizes utilization of 3 cfs from Fletcher Creek for power generation at the "Fletcher Creek" plant (380 kW, 475 kVA, 550 hp).

1.2 Hydroelectric Development at Big Missouri

In 1936, Cominco Ltd. developed storage on Long Lake (8,500 - 11,000 dam^3) and Divide Lake in order to generate electrical power for its Big Missouri mill and townsite at Joker Flats. The water was penstocked to a powerhouse located on Hogg Lake (1,900 kW; 156 m head). The turbines and generators originally came from Cominco's Anyox operations. They were eventually dismantled in about 1989 and put back into production in the Ft. St. John area of B.C. The storage dam at the outlet of Long Lake was a concrete arch gravity dam which raised the level of Long Lake by 22 feet, creating 7000 acre-feet (8,500 dam^3) of storage, and increased the average winter flow from 0.28 m^3/s to 1.13 m^3/s. The storage was maximized using 2 foot high flashboards.

Statistics:

Long Lake Dam: Concrete arch gravity dam, about 100 feet long, 40 feet high, 5½ feet thick at the base, and 2 feet thick at the crest. Free-overflow spillway 90 feet long.

Tunnel and Penstock: 840 feet long, 7 feet wide, 6 feet high from dam abutments, fitted with 822 feet of 32 inch diameter wood stave pipe. Wood stave pipe total length 1300 feet on 0.5% grade. Lower 1600 feet of penstock heavily banded wood stave connecting to two 26 inch steel pipes, each branching to two 18 inch diameter steel pipes which then fed one of four turbines.

Hogg Lake Powerhouse: 500 (156 m) head. Four 1700 hp double overhung pelton wheels. 400 rpm, with oil pressure governor, operating deflectors, manually operated needle valves. 2/938 kVA, 2300 V, 3 phase, 60 cycle Westinghouse generators.

Water Licenses:

Boliden Limited (formerly Westmin Resources Ltd.) filed a number of applications for various purposes to replace licenses previously held by Cominco Limited.

File No. 0369226, Use of Long Lake and Cascade Creek for power generation.
File No. 6000315, Use of Cascade Creek for power generation; 100 cfs, 9400 kW.
File No. 6000311, Use of Lesley Creek for power generation; 30 cfs, 2800 kW,

2.0 Proposed Development of Long Lake

Since the District of Stewart was serviced by a limited amount of diesel power up until the late 1980's, Boliden Limited (formerly Westmin Resources Limited) were compelled to examined a number of alternative means of providing electrical power to the Premier Gold operations.

During the engineering and design phases of the project it was projected that the proposed operations would require an estimated average 4.5 MW and a peak 5.0 MW of economically reliable power. The two main alternatives considered were connection to the BC Hydro grid or developing local hydroelectric potential. On-site diesel generation was deemed much less economical and the extension of the BC Hydro grid into the Stewart area was uncertain. As a result on-site hydroelectric generations was deemed the best alternative at that time.

In order to provide at least 5.0 MW of firm power, a new and different configuration from those installed at the Premier Silbak and Big Missouri operations, would have been required, and storage on Long Lake would be essential to ensure firm winter flows. Various alternative configurations were investigated some of which provided up to 12 MW and sufficient excess capacity to supply the District of Stewart with its power needs.

All of the alternatives proposed essentially replicated or made use of the infrastructure installed by the pioneers in the 1920s and 1930s. All of the alternatives included:

- reinstating the dam on the outlet of Long Lake (either concrete or rockfill construction),
- increasing the storage capacity on Long Lake to between 4000 to 22,000 dam^3 in order to ensure firm winter flows of between 0.37 and 2.0 m^3/s,
- reinstating the storage dam on Divide Lake to provide an additional 5000 dam^3 of storage,
- refurbishing the intake structures and diversion tunnels,
- penstock alignment following the Premier haul road to the extent possible,
- powerhouse located in the vicinity of the Premier Gold mill.

The four main alternative configurations were presented in the Silbak Premier-Big Missouri Stage I Environmental and Socioeconomic Impact Assessment. However, these plans were placed in abeyance, when BC Hydro agreed to extend the grid from New Aiyansh and Alice Arm, through Cranberry Junction and Meziadin, and thence to Stewart. The new powerline from New Aiyansh precluded the requirement for diesel generation at Stewart and the construction of the Long Lake project.

The proposed reinstatement of the Long Lake development is still in its infancy. There are no preliminary or conceptual designs as of yet to review. However, any proposed development will seek to build upon past engineering and design, utilization of existing infrastructure, and to optimize the storage on Long Lake as much as possible.

This would entail constructing a concrete or rockfill storage dam on the outlet of Long Lake. The dam and associated spillway would be located in approximately the same location as the previous dam. Attempts would be made to avoid storage on Divide Lake by maximizing the available storage on Long Lake. Flows for power generation would be carried by pipeline through the existing tunnels and thence via a buried high pressure penstock to a powerhouse located in the vicinity of the Premier Gold mill, or near the location of the original powerhouses

near the junction of Cascade and Fletcher creeks. Electricity would be transmitted to the BC Grid at Stewart via the existing overhead pole line that follows the Granduc Road down the Salmon River valley.

3.0 Benefits of Hydroelectric Development

3.1 Sustainable Resource Development (Green Power)

Independent hydroelectric development is one means of bringing replacement investment and a secure tax base to Stewart. This form of sustainable resource development is not only regarded as 100% "Green Power", but also regarded 100% non-consumptive use of water, and 100% non-polluting means of generating electricity from a constantly renewable resource.

Based on the 1997 Kyoto protocol to the United Nations framework convention on climate change, a market is emerging for the sale of greenhouse gas credits. As such the demand for "Green Power" is increasing.

There are two generally accepted definitions of 100% "Green Power"; that which has been adopted in Canada under the Canadian Environmental Choice Program (Ecologo) based in Ottawa, Ontario, and that which has been adopted in the United States under the Certification of the Centre for Resource Solutions (Green-e) based in San Francisco, California.

The Canadian Environmental Choice Program definition of "Green Energy" and the US Centre for Resource Solutions definition of "Green Power" which was derived from the California Public Utilities Regulatory Policy Act (PURPA) differ somewhat. The Canadian definition is "the production of electrical energy from clean, renewable energy sources such as solar (Photovoltaic), wind, and run-of-river hydroelectric sources." They are further defined as a "premium, value-added product where electrical energy is produced from emissions-free sources". The US definition of "Green Power" is "at least 50% of the electrical supply must come from renewable electrical resources". Renewable electrical resources include solar, wind, biomass, geothermal, small hydroelectric facilities (<30 MW), and low-impact hydroelectric facilities. Any development on Long Lake-Cascade Creek would meet both the Canadian and US definitions for "Green Power" and thus eligible to seek certification under the EcoChoice program once the project is constructed.

3.2 Replacement Investment and Economic Stimulus to Stewart

The proposed reinstatement of the Long Lake hydroelectric development is not expected to result in any significant negative socioeconomic or environmental impacts on the Stewart area. Positive effects, include:

- replacement investment ($15 to $20 million) and expanded long-term municipal and regional district tax base (estimated $150,000 per year),

- economically justifiable means of preserving the power line to the Premier operations area and the access road to Big Missouri,
- provision of back-up electrical power to the community of Stewart in the event of a major disruption to the B.C. Hydro grid,
- local construction jobs, local materials sourcing, and local contracting, where practical,
- approximately 480 person-months of employment during construction,
- local maintenance contracts following start-up.

3.3 Reclamation of the Premier to Big Missouri Haul Road

The haul road between the Premier and Big Missouri mine sites is a private road that at one time linked the communities at Silbak Premier with that at Joker Flats. With the opening of the Premier Gold operations, Boliden Westmin upgraded the road for use as a mine haul road.

Boliden are required to reclaim approximately one-half of the width of the road. However, the proposed development on Long Lake and Cascade Creek will require that this road be kept open for its full dual carriage width in order to accommodated the installation of the buried penstock and future access to the intake works in the area of Long Lake. Reliable access is critical in order to conduct both periodic and emergency maintenance at the intake structures and their control facilities.

It addition to having a full width road for penstock installation and maintaining access for heavy equipment to the Big Missouri area, there are significant advantages to retaining the road in its present un-reclaimed condition apart from re-seeding the margins. Among these are future access to recreational and scenic areas, preservation of access to exploration targets and mineral claims in the Big Missouri area, and avoidance of cost of decommissioning and re-building it again at some time in the future. Consequently, it is recommended that the requirement to reclaim the road be amended accordingly.

3.4 Site Specific Transboundary Water Quality Criteria

Acid mine drainage from the Premier Gold 6-Level has been ongoing since the 1920's and was historically released untreated to Cascade Creek until Boliden Westmin inherited the situation in the late 1980's. When Boliden Westmin constructed the Premier Gold operations, they incorporated a lime treatment process, with dual settling pond system to rectify the contamination problem. However, with closure of the Premier Gold operations, the company faced an on-going obligation for water treatment in perpetuity at significant cost. Boliden Westmin are currently investigating alternatives to in-perpetuity treatment for the long-term control of acid mine drainage from their 6-Level adit and in the long-term protection of site-specific water quality criteria at the international border.

Without on-going treatment, there is insufficient available dilution in Cascade Creek during the winter low flow period to ameliorate the high copper, lead, and zinc concentrations in 6-Level

mine water. However, concentrations of copper, lead, and zinc in Cascade Creek near the international border are close to being in compliance with BC Water Quality Criteria for protection of aquatic life during high flows (May through September).

By providing storage on Long Lake, a large portion of high summer flows would be retained for release at a constant rate to a point in Cascade Creek above the international border during the winter low flow period. Thus hydroelectric development on Long Lake and Cascade Creek could indirectly provide the necessary available dilution in Cascade Creek year-round to help ameliorate the effects of 6-Level mine water on the water quality of Cascade Creek at the international border. Re-balancing the mean annual discharge in Cascade Creek may go along way to meeting site-specific water quality criteria in Cascade Creek at the point of compliance below Logan Creek.

3.5 Affects on Future Mining in the Premier Operations Area

The proposed development of the Long Lake-Cascade Creek system would not have any direct adverse impact on future mining in the area. Most of the penstock alignment would fall within the existing access road corridor. However, there would be a requirement for future mine development to protect the buried penstock and areas around the intake works and powerhouse.

Conversely, the proposed development of the Long Lake-Cascade Creek system provides added incentive in attracting future mining to the area, including the retention of:

- an established power grid to the immediate mine site area (3 Phase, 4160 V),
- the access road to Long Lake and Big Missouri areas,
- the microwave telecommunications system between Premier and Stewart.

3.6 Other Potential Benefits

At the present time, Boliden Westmin and Premier Power Corp. are contemplating entering into an agreement whereby the proposed Long Lake development would provide Boliden Westmin with a reliable long-term income stream in exchange for use of existing infrastructure. This income stream could be used to provide the necessary long-term funding for on-going treatment of 6-Level mine water.

The Long Lake development could be designed to provide the District of Stewart with a source of back-up electrical power in the event of a major disruption to the BC Hydro grid, between New Aiyansh, Meziadin, and Stewart. This would require participation of BC Hydro to reconfigure the existing substation accordingly.

The BC Hydro line into Stewart is currently under utilized. The Long Lake development, which would be the only generating plant in the immediate area, has the potential of maximizing the use of this line and serving BC Hydro's potential regional demand and regional growth in the near term.

4.0 Regulatory Review Process

4.1 British Columbian and Canadian Environmental Assessment Acts

The proposed development will involve the use of a Provincial resource (water) and involve International Boundary Waters. As a result it will be subject to both the BC and Canadian environmental review processes (BCEAA and CEAA). Under the two Acts, the project proponents will be required to conduct the necessary environmental and socioeconomic baseline studies and submit an Environmental Impact Assessment, before approval is granted for a Water License and Energy Project Certificate. The proposed development will require all necessary land tenures, rights-of-way, licenses to cut, dam safety approvals, building permits, etc.

The lead agencies are expected to be the Ministry of Energy & Mines and the Ministry of Environment, Lands, & Parks based in the Smithers since it a hydroelectric development. Because of the International Boundary Waters aspects, they will be required to interface with, and receive in-put from, the federal Departments of Environment and Fisheries & Oceans. These groups are all familiar with the Premier Gold operations area.

4.2 International Boundary Waters Implications

Cascade Creek crosses the Canada-USA border almost immediately below the Premier Operations area. As a result, it is expected that the proposed hydroelectric development will be subject to both the International Boundary Waters Treaty Act and the International Rivers Improvement Act, in addition to various other transboundary agreements and bilateral accords, including the Navigable Waters Protection Act.

4.3 Projects Under 50 MW Threshold and Requirement to Show Beneficial Use

The British Columbia review process has recently been modified (June 1999). The Provincial review of hydroelectric projects below a 50 MW threshold have now been placed under the new Comptroller of Water Rights review process. This process is essentially the same as that of the BCEAA. Although an Energy Sales Agreement is no longer required, the Water Management Branch (Comptroller of Water Rights) will only allocate water on the basis of an applicant's ability to demonstrate "Beneficial Use." Beneficial Use implies that the project will not impact on any other rights including the environment, land owners, First Nations, fisheries, and downstream international users.

4.4 Energy Sales Agreement

The water rentals for a proposed are onerous and by far the single largest operating cost. British Columbians are by far the single largest beneficiaries of renewable resource development, particularly hydroelectric development. If the proponent does not have an Energy Sales Agreement or

market in which to sell the power ahead of development, the simple privilege of holding a Water License becomes a significant financial liability. Water rental rates are currently $2.417/MWh and $3.45/kW installed capacity.

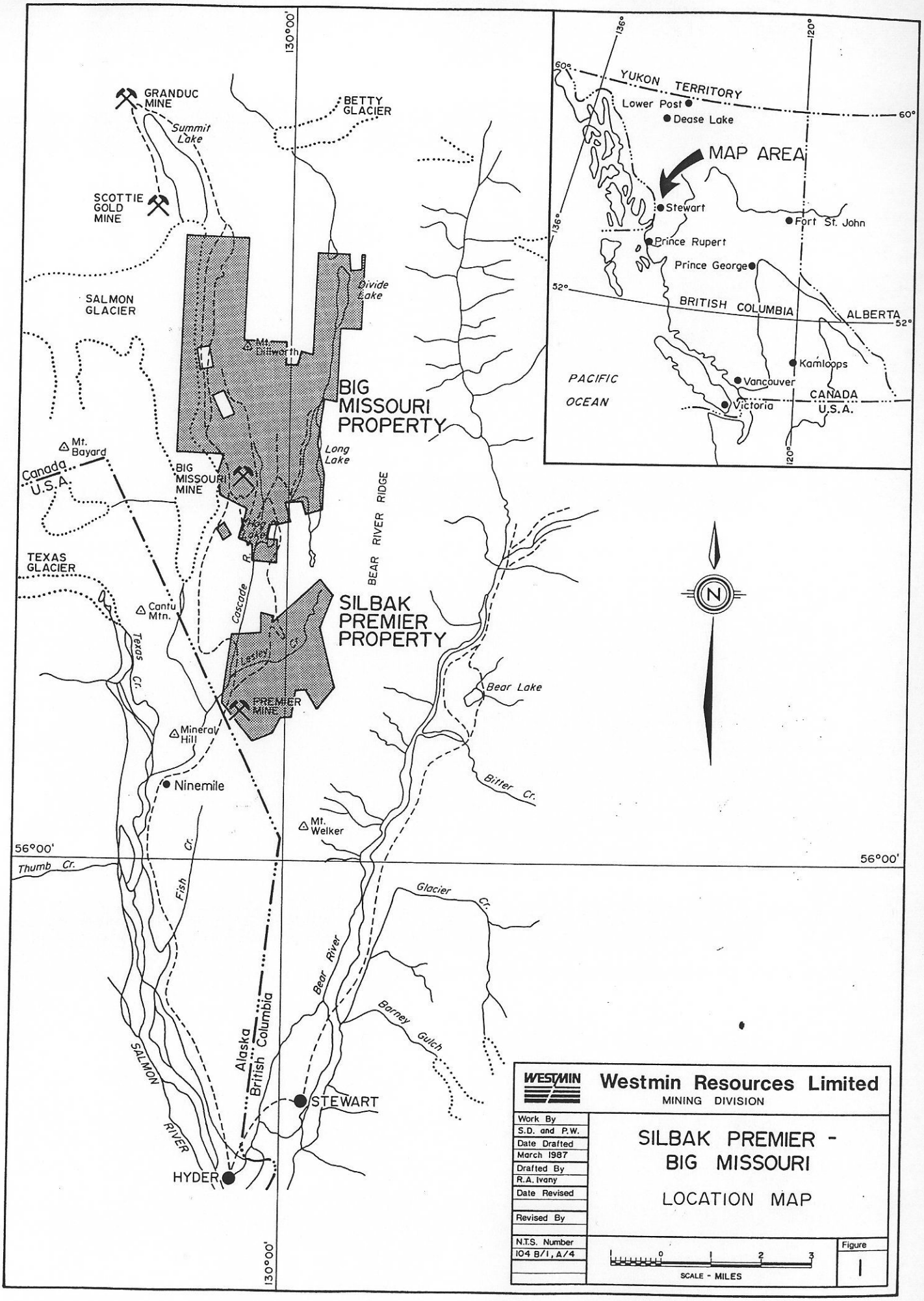
Current spot market prices for electricity range from $0.020/ kWh to $0.025/kWh. BC Hydro's avoided cost for electricity are reported to range from $0.025/kWh to $0.035/kWh. Commercial prices for electricity in British Columbia are in the order of $0.035/kWh. Markets in the US Northwest range somewhat higher, but wheeling costs in the order of $0.005/kWh can off-set any potential gains obtained from selling into US markets. The value of electricity is also dependent on the shape of power. Firm power is normally given a higher value than strictly run-of-river power.

Financing a hydroelectric project is dependent on securing a long-term Energy Sales Agreement at prices that can guarantee debt repayment and provide a reasonable return on investment. In order to secure a long-term Energy Sales Agreement, the price and shape of power has to be attractive to the potential buyers, most of which are large Utilities in Western Canada or the US Northwest.

4.5 Protected Areas and First Nations Aspects

Although the Premier Gold operations area falls within the traditional land claims area of the Nisgaa (Nishga) Tribal Council, the development is located well outside the recently completed Nisgaa Land Settlement Agreement area. Apart from one small Indian Reserve located across the Bear River from Stewart, there are no fee simple or settlement lands belonging to the Nisgaa Tribal Council in the Stewart area. However, under the Nisgaa Land Settlement Agreement, the Nisgaa still retain a role in the review of projects that have a wildlife aspect (Nisgaa Land Settlement Agreement, Chapter 9, Sections 2 and 6, Appendices J and K).

Although the proposed development area adjoins the Tongas National Forest, Misty Fjords National Monument in Alaska, is does not fall within any existing or proposed federal or provincial Parks, Ecological Reserves, Conservancy Areas, Recreational Areas, Protected Areas, or Study Areas.


GRANDUC MINE
Summit Lake
SCOTTIE GOLD MINE
BETTY GLACIER
SALMON GLACIER
Divide Lake
Mt. Dilworth
BIG MISSOURI PROPERTY
Long Lake
Mt. Bayard
Canada U.S.A.
BIG MISSOURI MINE
Hog Lake
BEAR RIVER RIDGE
TEXAS GLACIER
Cantu Mtn.
Cascade Cr.
SILBAK PREMIER PROPERTY
Texas Cr.
Lesley Cr.
PREMIER MINE
Bear Lake
Mineral Hill
Ninemile
Bitter Cr.
Mt. Welker
56°00'
Thumb Cr.
Fish Cr.
Glacier Cr.
Bear River
Barney Gulch
Alaska British Columbia
SALMON RIVER
STEWART
HYDER
130°00'
YUKON TERRITORY
Lower Post
Dease Lake
60°
MAP AREA
Stewart
Fort St. John
Prince Rupert
Prince George
52°
BRITISH COLUMBIA
ALBERTA
Kamloops
PACIFIC OCEAN
Vancouver
Victoria
CANADA U.S.A.
136°
120°
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Westmin Resources Limited
MINING DIVISION
Work By
S.D. and P.W.
Date Drafted
March 1987
Drafted By
R.A. Ivany
Date Revised
Revised By
N.T.S. Number
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SILBAK PREMIER - BIG MISSOURI
LOCATION MAP
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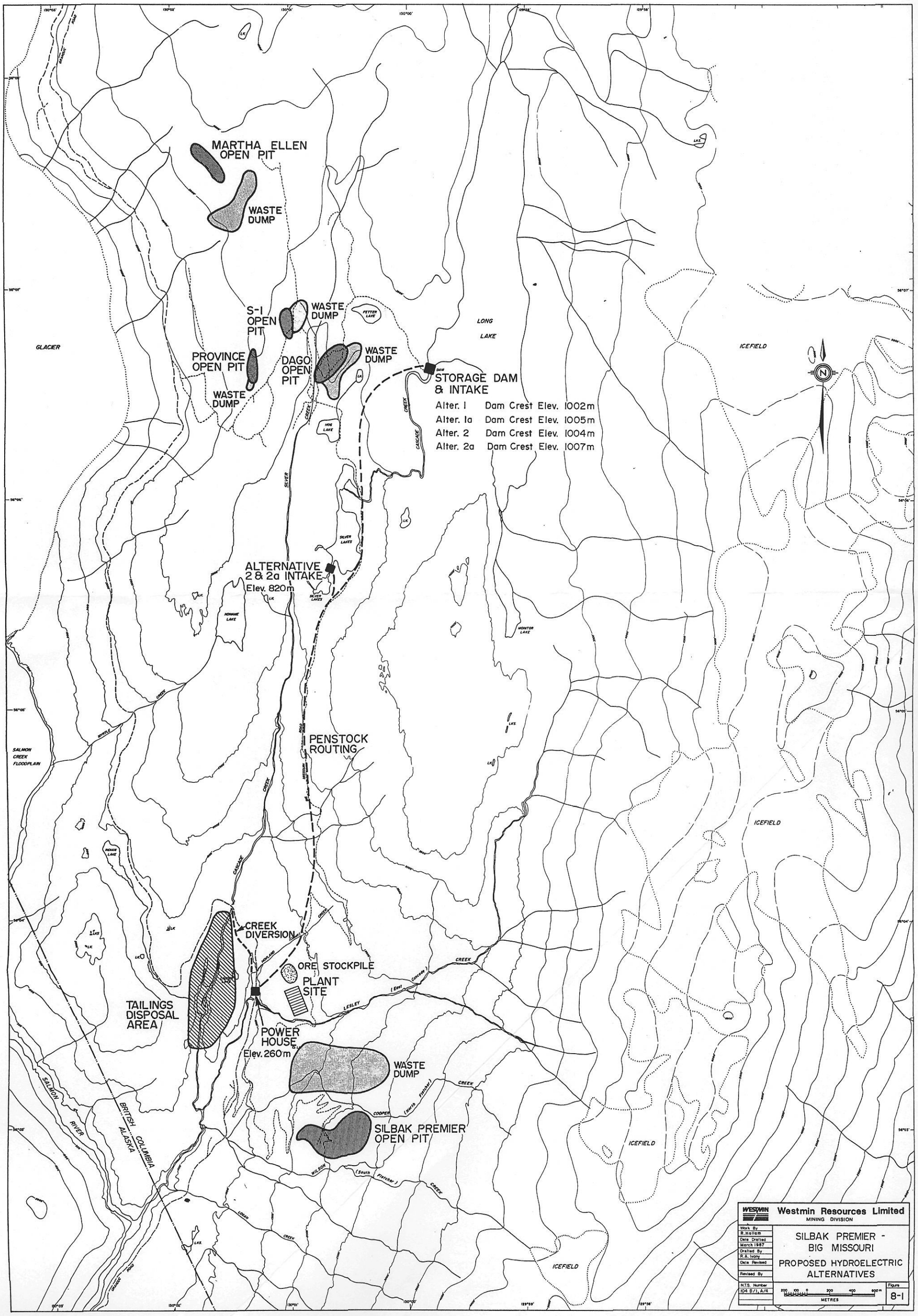
SCALE - MILES
Figure
1


MARTHA ELLEN OPEN PIT
WASTE DUMP
S-1 OPEN PIT
WASTE DUMP
PROVINCE OPEN PIT
DAGO OPEN PIT
WASTE DUMP
WASTE DUMP
STORAGE DAM & INTAKE
Alter. 1 Dam Crest Elev. 1002m
Alter. 1a Dam Crest Elev. 1005m
Alter. 2 Dam Crest Elev. 1004m
Alter. 2a Dam Crest Elev. 1007m
ALTERNATIVE 2 & 2a INTAKE Elev. 820m
PENSTOCK ROUTING
CREEK DIVERSION
ORE STOCKPILE
PLANT SITE
TAILINGS DISPOSAL AREA
POWER HOUSE Elev. 260m
WASTE DUMP
SILBAK PREMIER OPEN PIT
GLACIER
LONG LAKE
ICEFIELD
SALMON CREEK FLOODPLAIN
SALMON RIVER
BRITISH COLUMBIA
ALASKA
N
Westmin Resources Limited
MINING DIVISION
Work By R. Hallam
Date Drafted March 1987
Drafted By R.A. Ivany
Date Revised
Revised By
SILBAK PREMIER - BIG MISSOURI
PROPOSED HYDROELECTRIC ALTERNATIVES
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METRES
Figure 8-1

PLATES

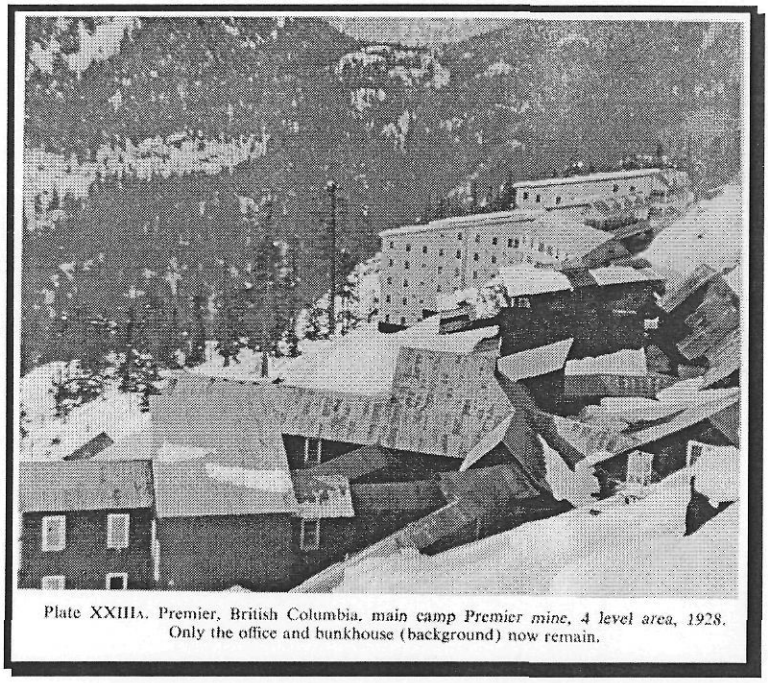

Plate XXIIIA. Premier, British Columbia, main camp Premier mine, 4 level area, 1928. Only the office and bunkhouse (background) now remain.

Plate 1. The Community of Premier, B.C., Circa 1928

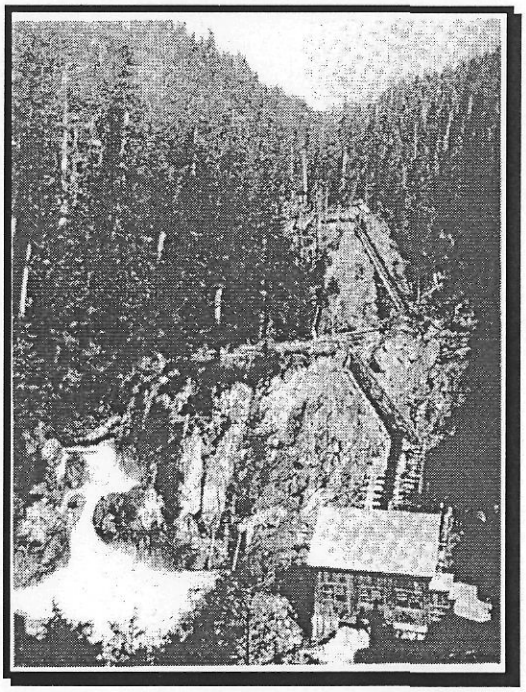

Plate 2. Premier Powerhouse No. 2 on Cascade Creek, Circa 1928

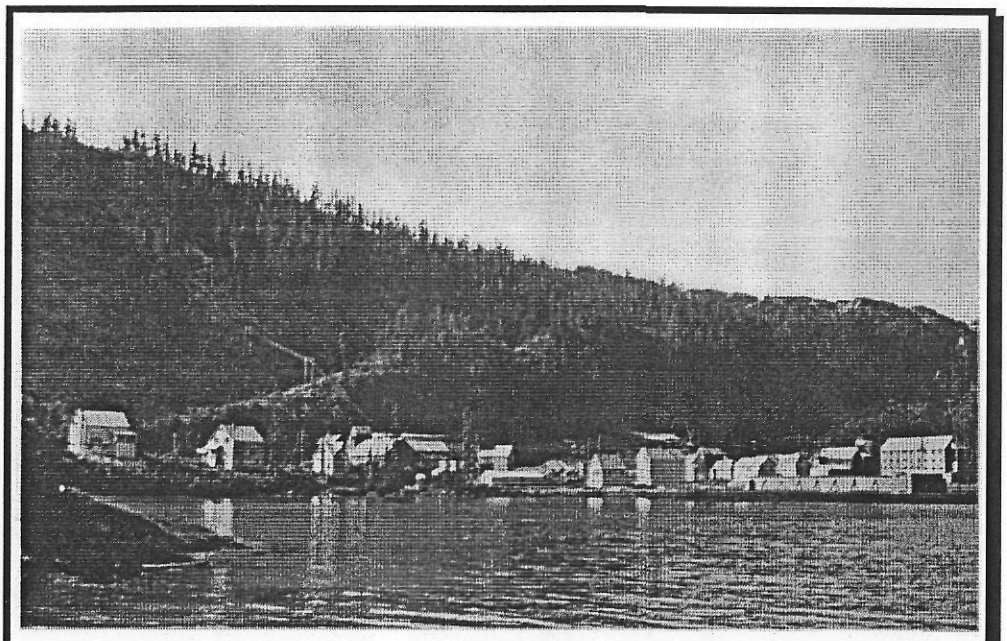

Plate XXIVA. Big Missouri camp, Hog Lake, 1939. Only a few remnant foundations survive today.

Plate 3. The Community of Big Missouri at Joker Flats, 1939

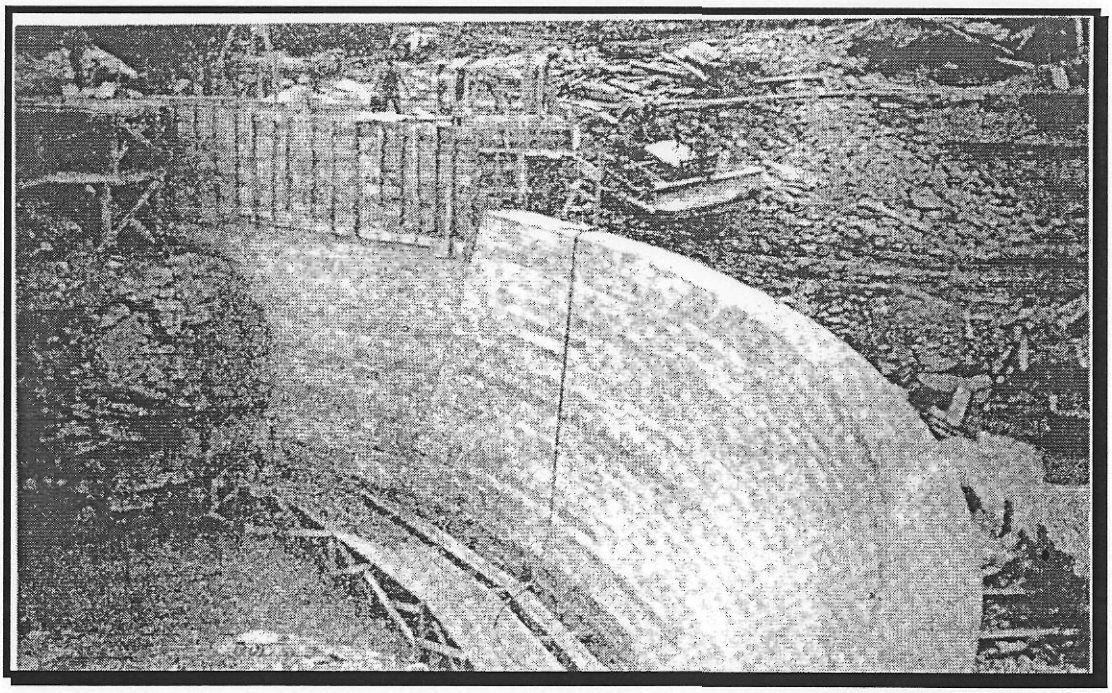

Plate 4. Concrete Dam at the Outlet of Long Lake Under Construction, 1936

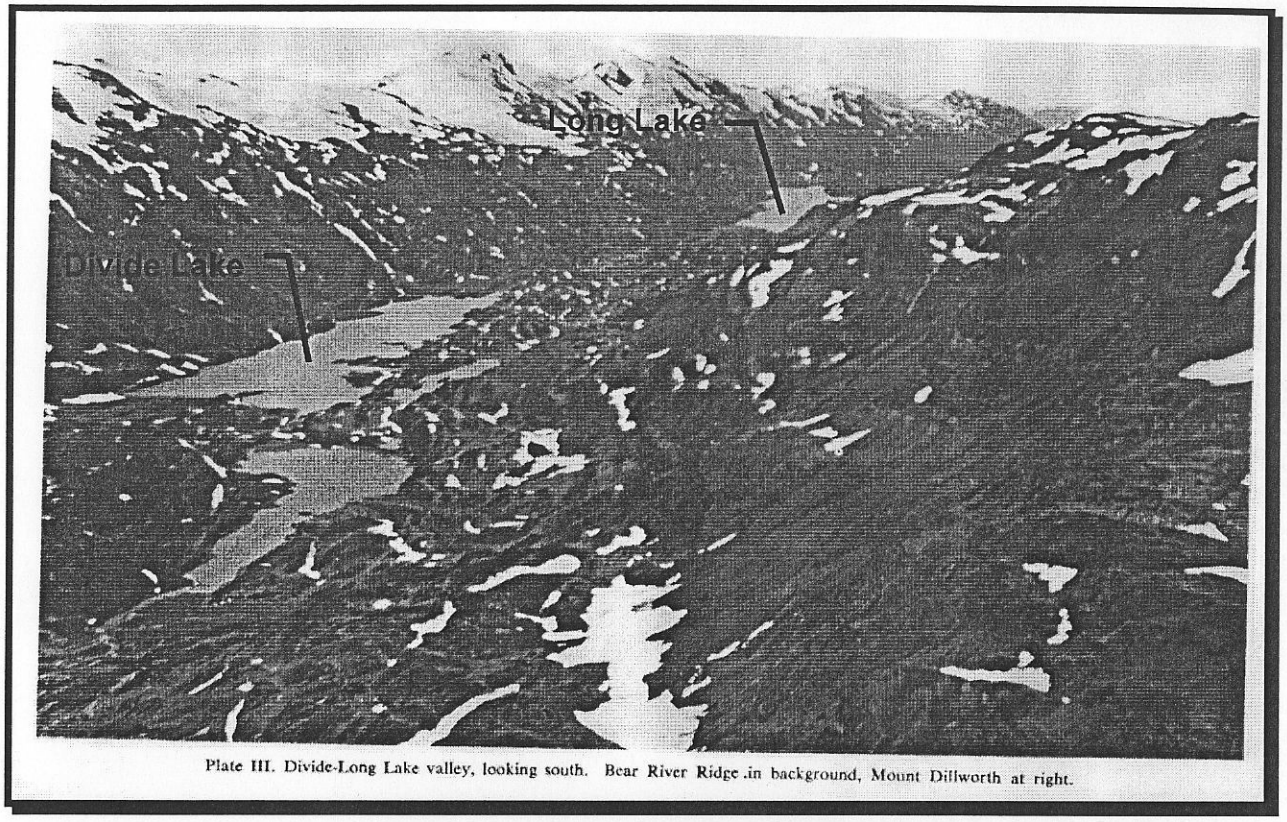

Plate III. Divide-Long Lake valley, looking south. Bear River Ridge in background, Mount Dillworth at right.

Plate 5. Divide Lake Looking South. Long Lake in Background. Circa 1937.

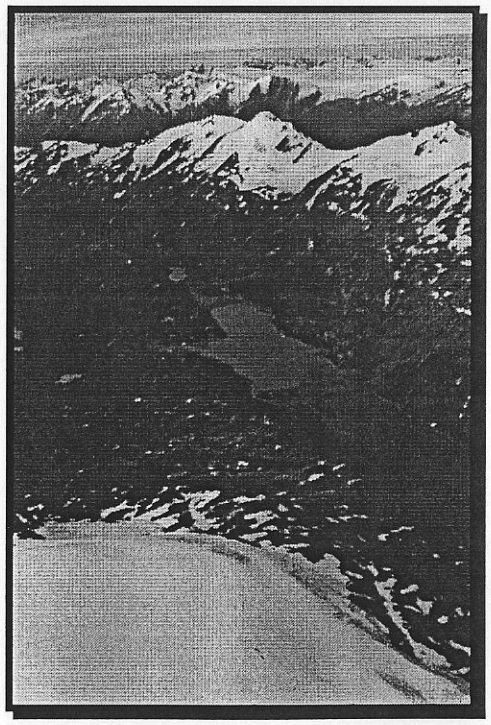

Plate 6. Long Lake Loooking North. Divide Lake in Background. Circa 1980.

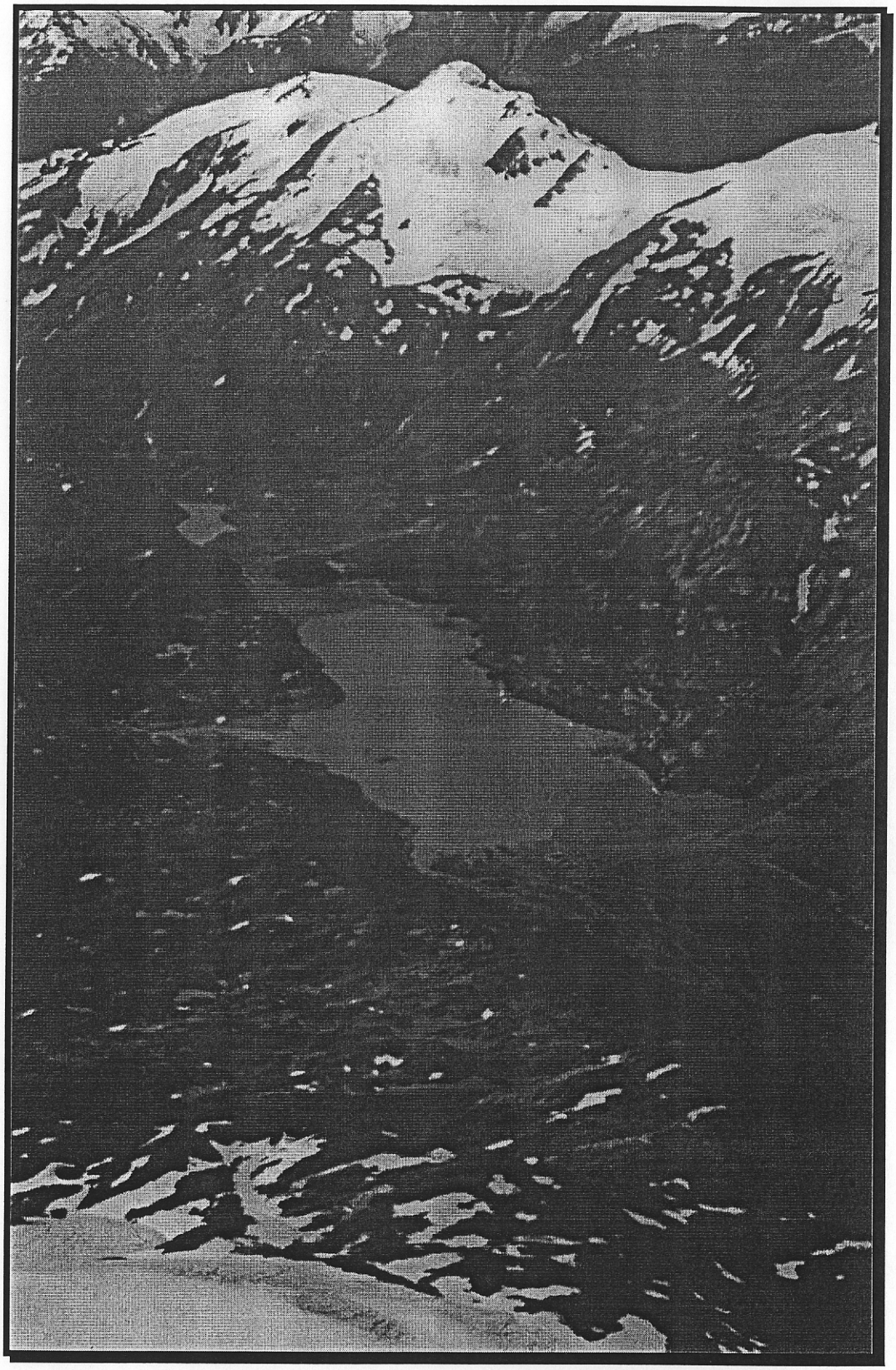

Plate 7. Long Lake Showing Former Lake Level, Circa 1980.

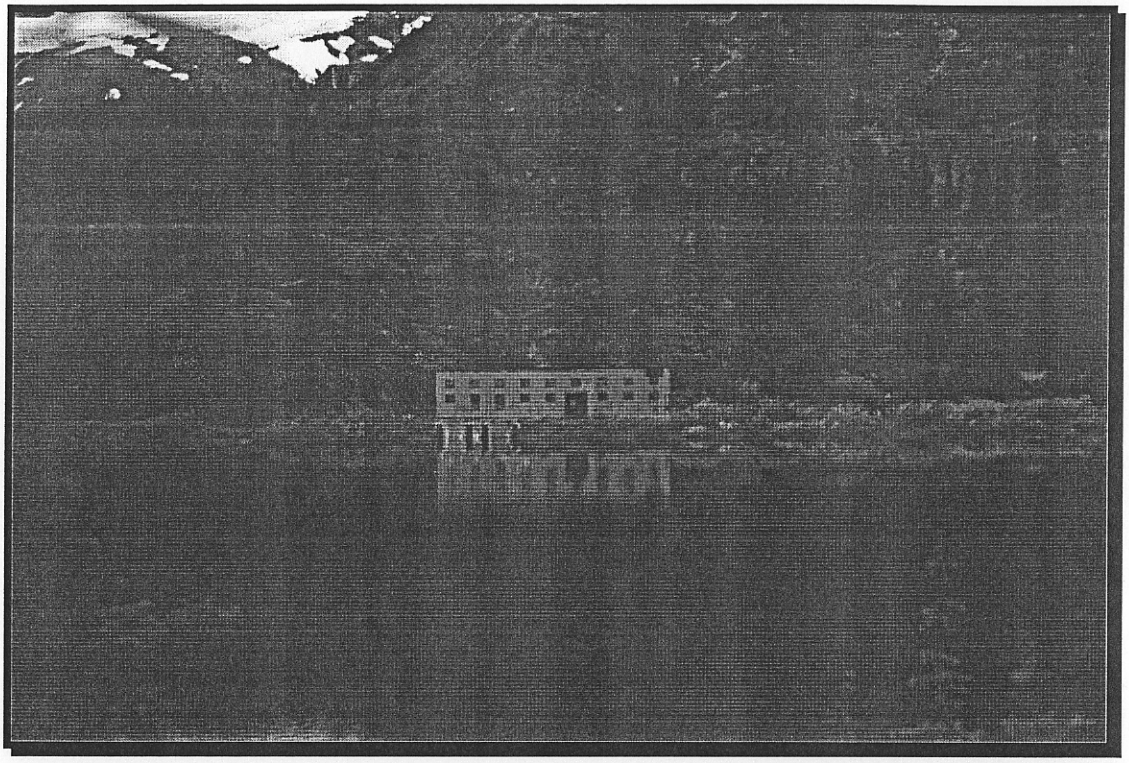

Plate 8. Big Missouri Power House on Hogg Lake, Circa 1987.

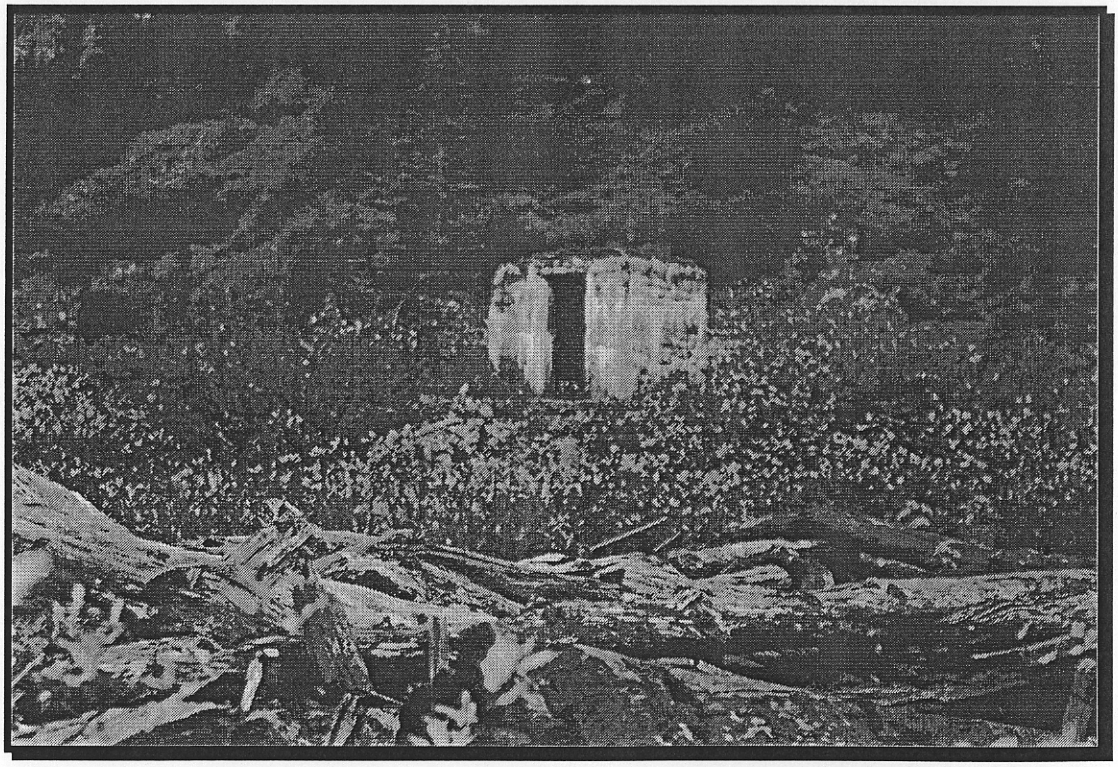

Plate 9. Remnants of Big Missouri Gold Safe, Circa 1987.

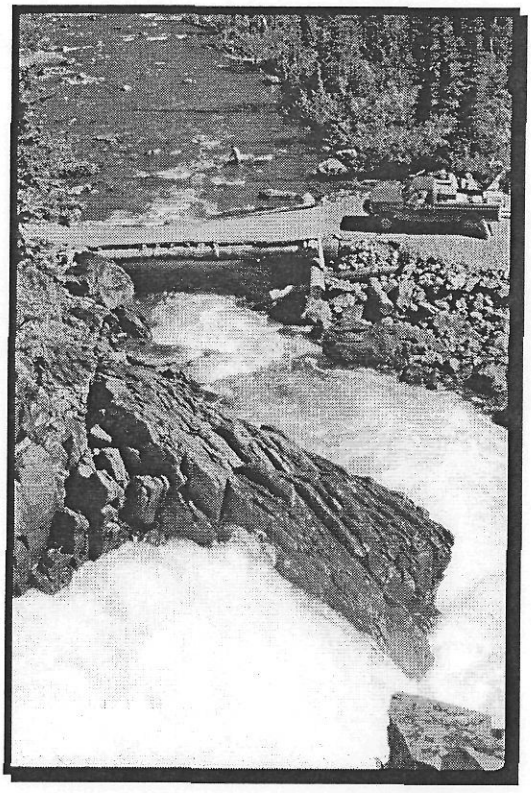

Plate 10. Cascade Creek Above Hogg Lake, Circa 1987.

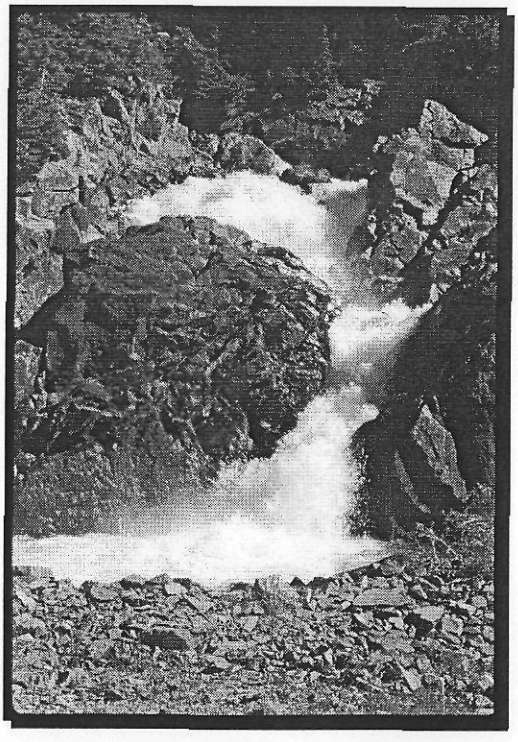

Plate 11. Cascade Creek Immediately Above Hogg Lake, Circa 1987.

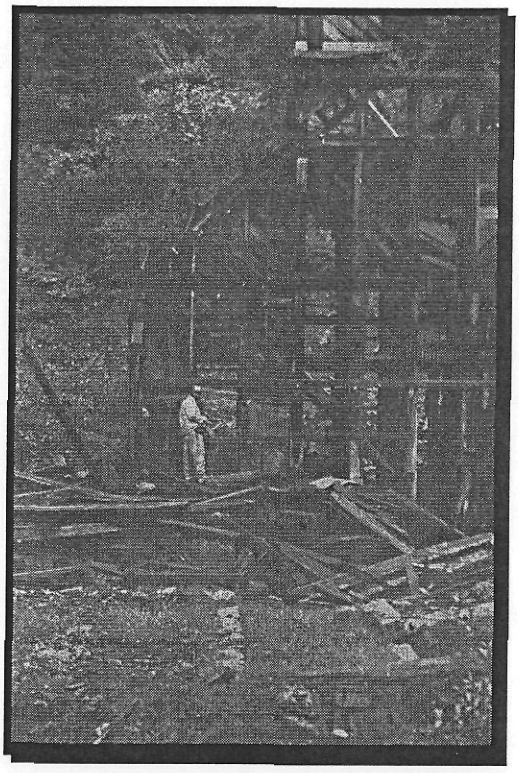

Plate 12. Remnants of Big Missouri, Circa 1987.

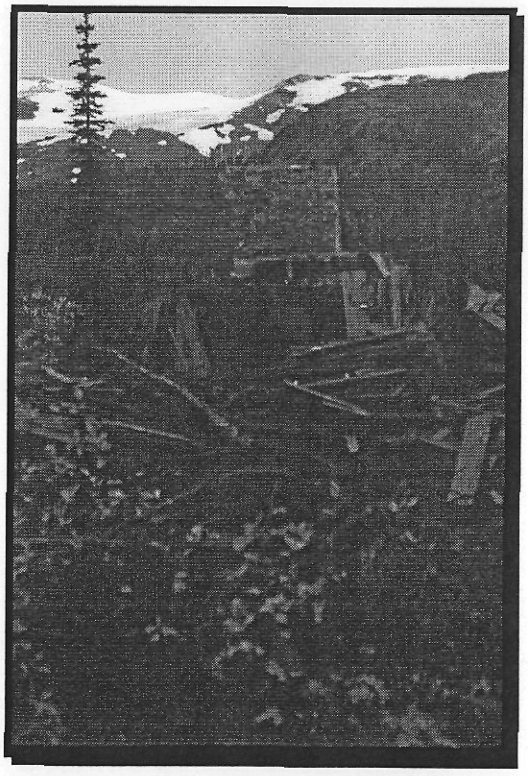

Plate 13. Remnants of Big Missouri, Circa 1987.

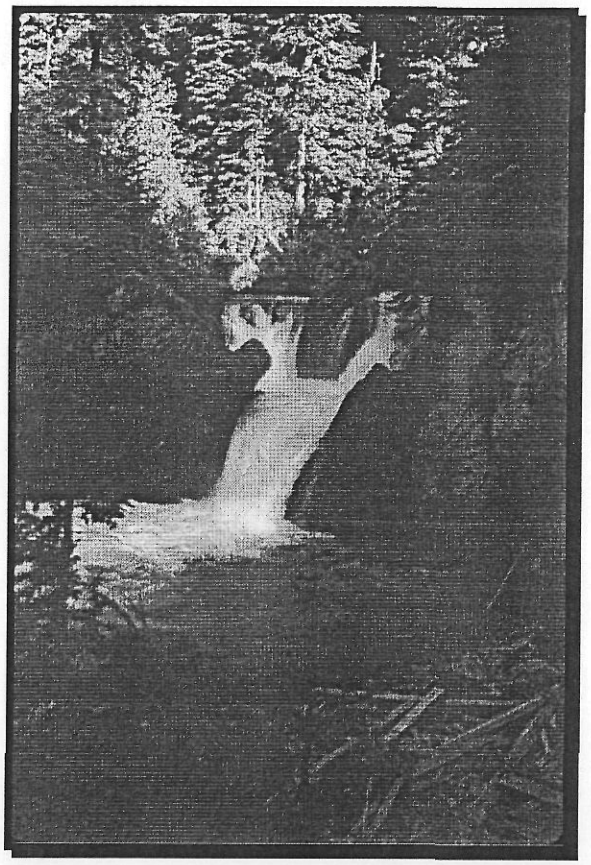

Plate 14. Cascade Creek Below Falls at Powerhouse No.2, Circa 1987.

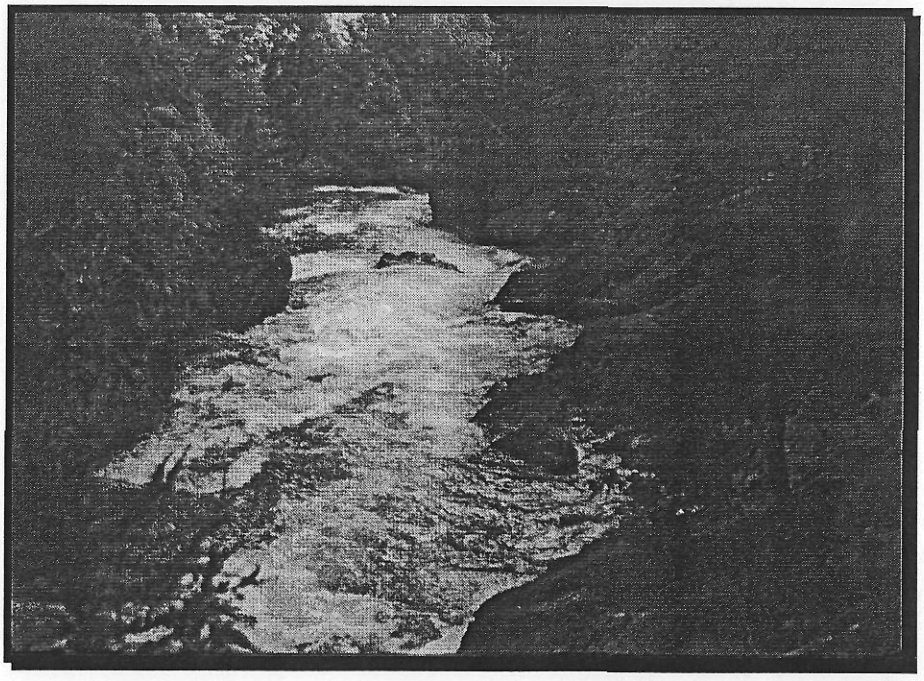

Plate 15. Cascade Creek Below Falls Near Canada/US Border, Circa 1987.

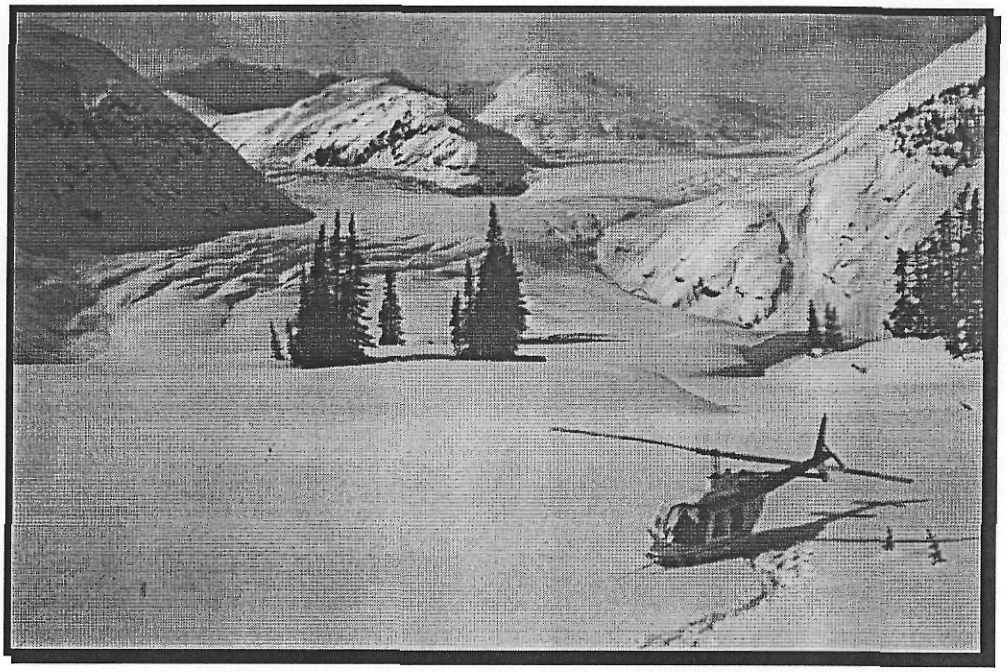

Plate 16. Snow Survey in Long Lake Area, Circa 1987.

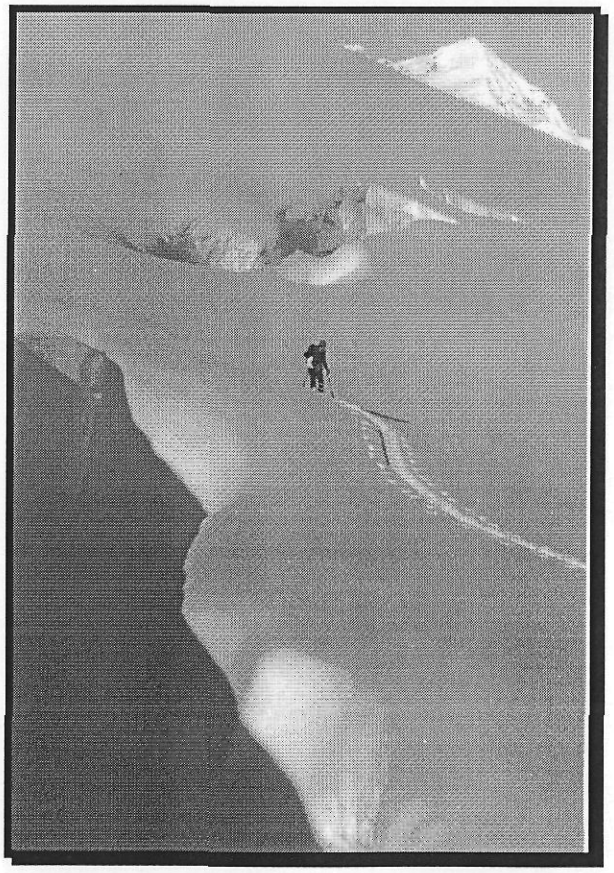

Plate 17. Snow Survey in Long Lake Area, Circa 1987.