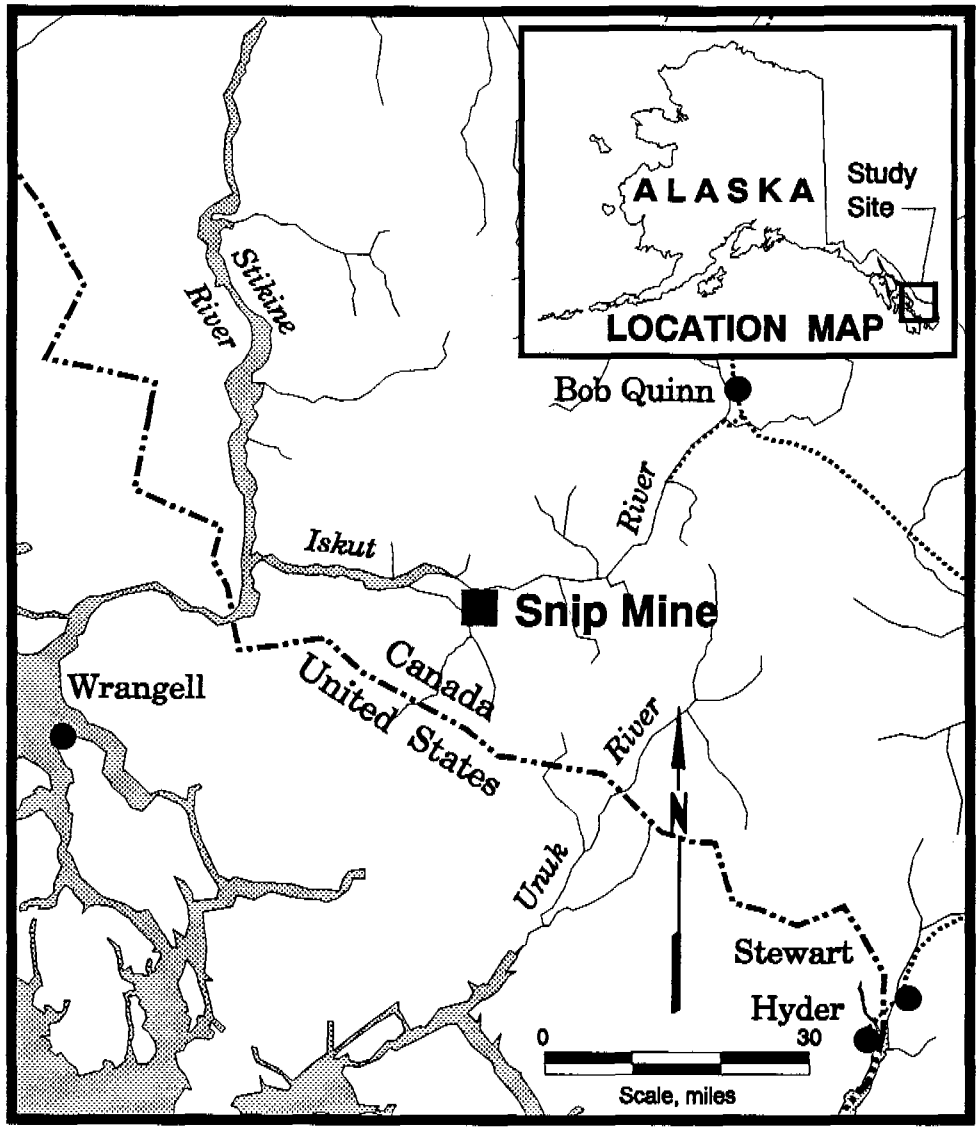
REGULATORY PROCESSES ASSOCIATED WITH METAL-MINE DEVELOPMENT IN BRITISH COLUMBIA:

- A Case Study of the Snip Mine -



U. S. DEPARTMENT of the INTERIOR
Manuel Lujan, Jr., Secretary

BUREAU of MINES
T S Ary, Director

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REGULATORY PROCESSES ASSOCIATED WITH METAL-MINE DEVELOPMENT IN BRITISH COLUMBIA: A CASE STUDY OF THE SNIP MINE

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REGULATORY PROCESSES ASSOCIATED WITH METAL-MINE DEVELOPMENT IN BRITISH COLUMBIA: A CASE STUDY OF THE SNIP MINE

By Harry E. Brownlow [1]

ABSTRACT

The United States Bureau of Mines contracted Norecol to prepare a report identifying the regulatory processes associated with metal mine development in British Columbia using the Snip Mine as a case study. The intent of this study is to assist industry and regulatory agencies in developing understanding as to differences in objectives, perspectives and operating methods. The case study will be incorporated into a larger report summarizing the comparative advantages and disadvantages of metal mine permitting in British Columbia and Alaska.

The purpose of the report is to identify the development schedule and permitting process at Snip which will assist the U.S. Bureau of Mines in suggesting improvements in environmental review and permitting processes for mine developments.

The report provides an abstract of the environmental assessment review processes in Canada and the Mine Development Review Process in British Columbia and provides an understanding of the linkages between policy, legislation, and environmental review.

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EXECUTIVE SUMMARY

The United States Bureau of Mines contracted Norecol to prepare a report identifying the regulatory processes associated with metal mine development in British Columbia using the Snip Mine as a case study. The intent of this study is to assist industry and regulatory agencies in developing understanding as to differences in objectives, perspectives and operating methods. The case study will be incorporated into a larger report summarizing the comparative advantages and disadvantages of metal mine permitting in British Columbia and Alaska.

The purpose of the report is to identify the development schedule and permitting process at Snip which will assist the U.S. Bureau of Mines in suggesting improvements in environmental review and permitting processes for mine developments.

The report provides an abstract of the environmental assessment review processes in Canada and the Mine Development Review Process in British Columbia and provides an understanding of the linkages between policy, legislation, and environmental review.

The purpose of the federal Environmental Assessment and Review Process (EARP) is to ensure that the environmental consequences of all proposals within federal jurisdiction are assessed for potential impacts during the project planning process. The objective is to identify all impacts during the project planning stage. Due to the changing nature of environmental assessment in Canada, the Snip project was not formally screened using the federal Environmental Assessment and Review Guidelines until after the project had received Approval in Principle. The project was in the permitting phase when it was screened by Transport Canada and the Department of Fisheries and Oceans although both of these agencies were involved in the Mine Development Steering Committee during the provincial review process.

The province of British Columbia has several review processes that have been developed for specific purposes. These include the Mine Development Review Process, The Major Project Review Process, and the Energy Project Review Certification Procedures.

The components of the Mine Development Review Process in British Columbia are 1) project design, 2) social impact assessment and mitigation, 3) environmental impact assessment and mitigation, and (usually) 4) economic analysis. The goal of project design is to work towards a technically sound and economically realistic mine design with respect to employee safety, resource recovery, and environmental protection.

The methods used to develop a comprehensive outline of the permitting process for the Snip Mine included:

- review of available file information, at the mine site, in the regional office in Smithers, B.C., in the Mine Development Assessment Branch in Victoria, B.C. and at the Norecol office;
- in person interviews with key company and agency personnel; and
- telephone conversations with agency personnel.

The chronology of key events developed from the file information, interviews and discussions describes the activities undertaken during the exploration, prospectus, Stage I Report, Stage I Addendum Report, and Stage III phases of the project.

There were numerous environmental issues identified throughout the review process. The key environmental issues identified early in the process were the ability to reduce cyanide levels in the process effluent to levels acceptable by the Department of Fisheries and Oceans and Environment Canada, the ability of the tailings impoundment to prevent seepage of groundwater containing significant concentrations of cyanide, the overall quality of the tailings pond supernatant, the impacts of effluent discharge, the development of contingency plans for the mine operation and the acid generation potential of the ore and waste rock from the mine.

The key environmental issues subsequent to the change in the mill location included protection of downstream fisheries resources due to the increased proximity of the mill, more permeable foundation soils, and lack of downgradient collection and treatment facilities previously provided by the tailings pond. There were also concerns regarding the management of minewater flows from the new adit.

Overall, the Mine Development Steering Committee (MDSC) was pleased with the approach and degree of cooperation exhibited by the proponent throughout the review and permitting process. The review agencies were also favourable in their description of the proponents approach to information requirements, the review process, and permitting requirements. One of the general comments regarding the project overall was that the proponent could have brought more information to the review and permitting process such as estimates of effluent quality, and more comprehensive baseline data.

The proponent's impression of the agencies performance was mixed. They were pleased with the approach and degree of cooperation exhibited by most of the agencies but were disappointed with the approach and the attention to detail exhibited by the environmental agencies that was perceived by the proponent to be without rationale or scientific basis.

The advantages of the Mine Development Review Process for the proponent are its flexibility, early identification of critical issues, early identification of permitting requirements, and no direct charge by the government.

The advantages of the review process for the agencies include: early identification of project plans, an opportunity to coordinate information requirements and information exchange, and an opportunity to outline long term scheduling requirements.

The disadvantages of the process related to the proponent are that the proposed development schedule must be altered to accommodate unknown requirements from government agencies, the cost of the requirements influence the overall internal budget for the project, the proponent must accommodate government requests by perhaps locating and hiring experts to respond to specific technical issues like slope stability relative to avalanche potential, acid rock drainage, or fisheries resource conflicts.

The disadvantage of the process for the agencies is an increased workload.

The incentives for the proponent are that the process and subsequent permitting allows the mine to operate legally and if concerns regarding the operation arise over the life of the mine, the proponent has a complete agency review to use in defence of operating techniques.

The incentives for the agencies are more experience with various mine operations an therefore more effective review on future projects, the agencies will also develop a considerable body of information that may provide a basis for future policy development and land use planning. The review process also allows other agencies to plan for future requirements regarding indirect and cumulative impacts of mining operations.

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1.1 Background

The United States Bureau of Mines contracted Norecol Environmental Consultants Ltd. to prepare a report identifying the regulatory processes associated with metal mine development in British Columbia using the Snip Mine as a case study. The intent of this study is to assist industry and regulatory agencies in developing understanding as to differences in objectives, perspectives and operating methods. The case study will be incorporated into a larger report summarizing the comparative advantages and disadvantages of metal mine permitting in British Columbia and Alaska.

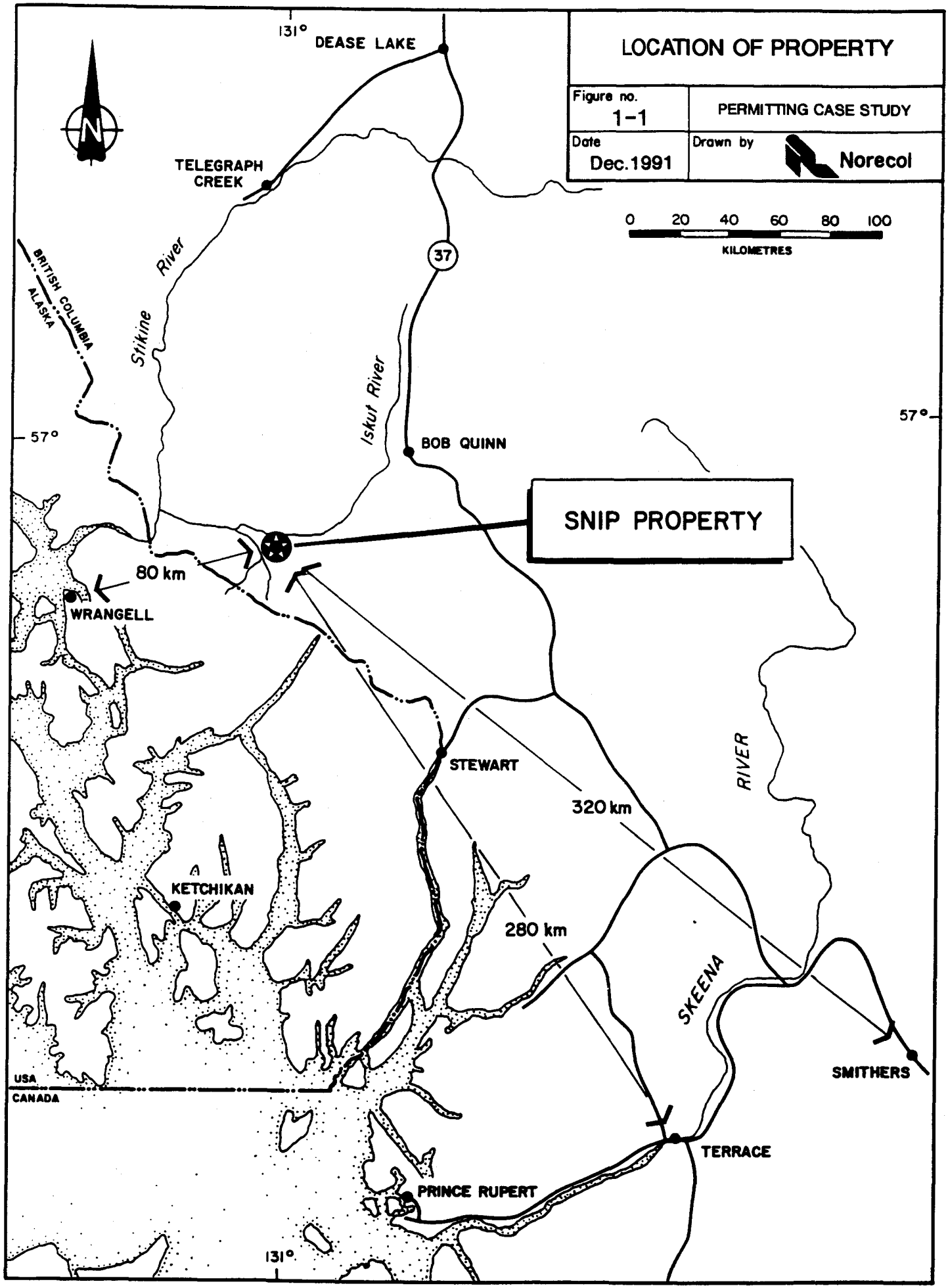
The Snip Mine is a relatively remote operation on the Iskut River in northwestern B.C (Figure 1-1). It is operated by Cominco Metals under a 60/40 joint venture agreement with Prime Resources Ltd. Access to the site is by air or, in special circumstances, by hovercraft. The mine has been operating since January, 1991 at a rate of approximately 350 tonnes per day. The mill produces approximately 12.5 tonnes per day of gold concentrate which is transported to market by hovercraft down Iskut River to Wrangell, or by Bristol aircraft to Wrangell, Alaska.

The property is owned by Cominco and was developed jointly by Cominco and Prime Resources. The property consists of seven staked mineral claims totalling 67 units which cover an area of 1675 hectares. The claims were originally staked by Cominco in November, 1980. From 1981 to 1985, geological mapping, soil geochemical sampling and trenching were undertaken. From 1986 to 1988, the surface drilling program consisted of 109 holes totalling 22,405 metres and the underground drilling program consisted of 147 holes totalling 11,275 metres.

The mine is operated using an underground cut and fill procedure with access from three portals 180 m, 300 m, and 130 m. Ore haulage is on the 130 m level. The mining rate is approximately 300 tonnes per day. At 300 t/day the life of the mine is expected to be 13 years.

The mill process is a simple gravity flotation process with recoveries estimated at 90 to 95%. Mill tailings are disposed of in a tailings impoundment and also used as backfill in the mine.

The mine operates year round with a workforce of approximately 80 located at the site.


LOCATION OF PROPERTY
Figure no. 1-1
PERMITTING CASE STUDY
Date Dec.1991
Drawn by Norecol
0 20 40 60 80 100
KILOMETRES
131°
DEASE LAKE
TELEGRAPH CREEK
Stikine River
37
BRITISH COLUMBIA
ALASKA
Iskut River
57°
BOB QUINN
SNIP PROPERTY
80 km
WRANGELL
STEWART
320 km
RIVER
KETCHIKAN
280 km
SKEENA
SMITHERS
USA
CANADA
TERRACE
PRINCE RUPERT
131°

1.2 Purpose and Objectives

The purpose of the report is to identify the development schedule, environmental assessment and permitting process at Snip which will assist the U.S. Bureau of Mines in developing an environmental review and permitting process that streamlines mine developments in Alaska. The objectives of the report are:

- to identify the environmental and permitting regulatory structure and process as it pertains to the Snip Mine;
- to conduct a case study of the environmental and permitting process associated with the Snip Mine, both from the developer's and regulator's perspective;
- to describe the advantages and disadvantages of the specific approach used by the mine developer to acquire permits; and,
- to identify major incentives and disincentives to metal mine development in British Columbia demonstrated in the Snip Mine case study.

This report is not intended to find fault with the participants or attach blame for delays or lack of adequate information. It is intended to further define the scope of work required to gain approval-in-principle and mine operating permits given the existing legislative, topographic, and political conditions at the time. Recognizing that any human process contains human strengths and weaknesses, this report hopefully will also provide incentive to build understanding within the industry and regulatory agencies regarding their differences in objectives, perspectives and operating methods. Hopefully, this report will lead to greater understanding and efficiencies in this process.

1.3 Participants

The degree of participation in the case study was dependent on personnel availability and knowledge of the mine development or permitting history. Obviously, not all of the agency or Cominco staff involved in the project could participate in interviews or conversations. A list of primary contacts was prepared at the outset of the project and a framework for discussion was sent to each person.

A list of secondary contacts was generated as a result of the first set of interviews. The secondary list was developed to confirm information or trace missing information.

ENVIRONMENTAL AND PERMITTING REGULATORY STRUCTURE AND PROCESS

2.1 Introduction

The purpose of this section is to provide an abstract of the environmental assessment review processes and permitting in Canada and the Mine Development Review Process in British Columbia and to provide an understanding of the linkages between policy, legislation, and environmental review.

2.2 Environmental Assessment in Canada

Environmental assessments in Canada began in 1973 when the first Environmental Impact Assessment (EIA) process known as the federal Environmental Assessment and Review Process (EARP) was established by the federal government. This was followed by comprehensive environmental legislation at the federal and provincial level and by the end of the decade most Canadian jurisdictions had either EIA legislation or policies accompanied by integrated review procedures (FEARO 1988). Many members of the private sector, including Cominco Ltd. in the mining industry, have created a position responsible for the environmental components of development into their corporate structure. Other associations, groups and societies have organized to speak collectively on environmental issues and support the principles of EIA.

The development of policy based on the theme of sustainable development has resulted in increased interaction of EIA with other decision making processes. In British Columbia, Manitoba and the northern territories, EIA is addressed mainly within the context of resource planning. In Alberta, EIA is intimately tied to the review process of the Energy Resource Conservation Board. To avoid duplication of hearings and to assure more integrated decisions, Ontario passed the Consolidated Hearings Act (1981). This Act permits the creation of a joint board from members of the Environmental Assessment Board and the Ontario Municipal Board to hold hearings that could be required under 12 different statutes which pertain to environmental and land use questions (FEARO 1988).

The Canadian experience has grown from the experience gained in the United States after the implementation of the National Environmental Protection Act (1970) and from other jurisdictions undertaking EIA in the 1970's. The central elements in the decision paths of an environmental assessment are therefore, not surprisingly, similar. There are essentially four levels of assessment:

1) initial screening indicates the project has no environmental dimension and is considered environmentally benign;

2) screening indicates a requirement for a more systematic study of environmental impact potential;

3) project involves important environmental consequences, specific environmental studies must be done and is subject to technical review with specialist expertise and public input; and

4) Public hearings are required as determined by a review body decision, by Cabinet, or by Minister depending on the recommendations of the review body.

Standardization of the EIA process has been enhanced by frequent cooperation and interaction on proposals when more than one jurisdiction (agency) has an interest. The practice of requiring the proponent to do the environmental studies is accepted by almost all because it is recognized to be less costly and more administratively manageable. The proponent is responsible for providing an environmental assessment to the interested agencies, both federal and provincial.

In the early days of impact assessment, a very widespread complaint about documents such as the EIS was that they were too long, they contained encyclopedic descriptions, had no focus, presented feeble analysis and gave few, if any substantial prediction of impacts. Such a document was expensive for the proponent to prepare, almost impossible to read and a weak basis for decision-making. This led to the concept of scoping - i.e. identifying genuinely important issues, and then directing data collection, analysis and prediction towards these issues (FEARO 1988, Veenstra 1989).

2.2.1 Federal Government

The purpose of the federal Environmental Assessment and Review Process (EARP) is to ensure that the environmental consequences of all proposals within federal jurisdiction are assessed for potential impacts during the project planning process. The objective is to identify all impacts during the project planning stage. The objectives of EARP also include mitigation of impacts by the use of Best Practicable Technology, and where applicable, compensation.Proposals within federal jurisdiction include those that are initiated by a federal department, those that impact an area of federal responsibility, and those which have received a financial commitment from the federal government.

The Federal Environmental Assessment Review Office (FEARO) is responsible for the administration of the EARP. The Executive Chairman reports directly to the

Minister of Environment. The office is responsible for preparing policy and process information required by the Minister.

An Environmental Assessment Panel from 3 to 7 participants is appointed by the Minister for each development proposal. Panel members are chosen for their objectivity, credibility and knowledge of the project.

Figure 2.2.1-1 illustrates the procedure followed for a proposal in the federal EARP.

In Canada, federal involvement in environmental regulation has been justified under subsections of Section 91 of the Constitution Act. The Constitution Act, previously referred to as the British North America Act listed powers granted to the federal and provincial governments under sections 91 and 92, respectively. In addition, the federal government has the authority to legislate regarding "peace, order and good government" as well as for any matter not specifically given to the provinces. Canadian governments tend to provide general regulatory powers in legislation but leave much of the actual procedure to be followed to the discretion of those empowered to make environmental decisions (The Canadian Institute 1988).

The oldest and perhaps the strongest piece of environmental legislation in Canada is the Fisheries Act which prohibits the deposit of deleterious substances to any waters frequented by fish and the harmful alteration of fish habitat. This act also allows the federal government to regulate the flow of water as long as it is related to the protection of the fisheries resource.

The federal government has recently introduced the Canadian Environmental Assessment Act which commits the government to a goal of achieving an appropriate balance between economic development and the preservation and enhancement of environmental quality. This will provide an effective means of integrating environmental factors into planning and decision making processes in a manner that ensures that present needs are met without compromising the ability to meet the needs of future generations (Minister of the Environment 1990).

There are a number of Acts, in addition to those listed above, that will trigger an environmental assessment of a development project. Appendix 2.2.1-1 lists more than one hundred and fifty authorities from eighty Acts and regulations administered by seventeen federal departments and agencies. Those that have been, or are directly relevant to the Snip Mine include:

- the Canada Wildlife Act regarding the protection of waterfowl along the hovercraft route;

FEDERAL ENVIRONMENT ASSESSMENT AND REVIEW PROCESS

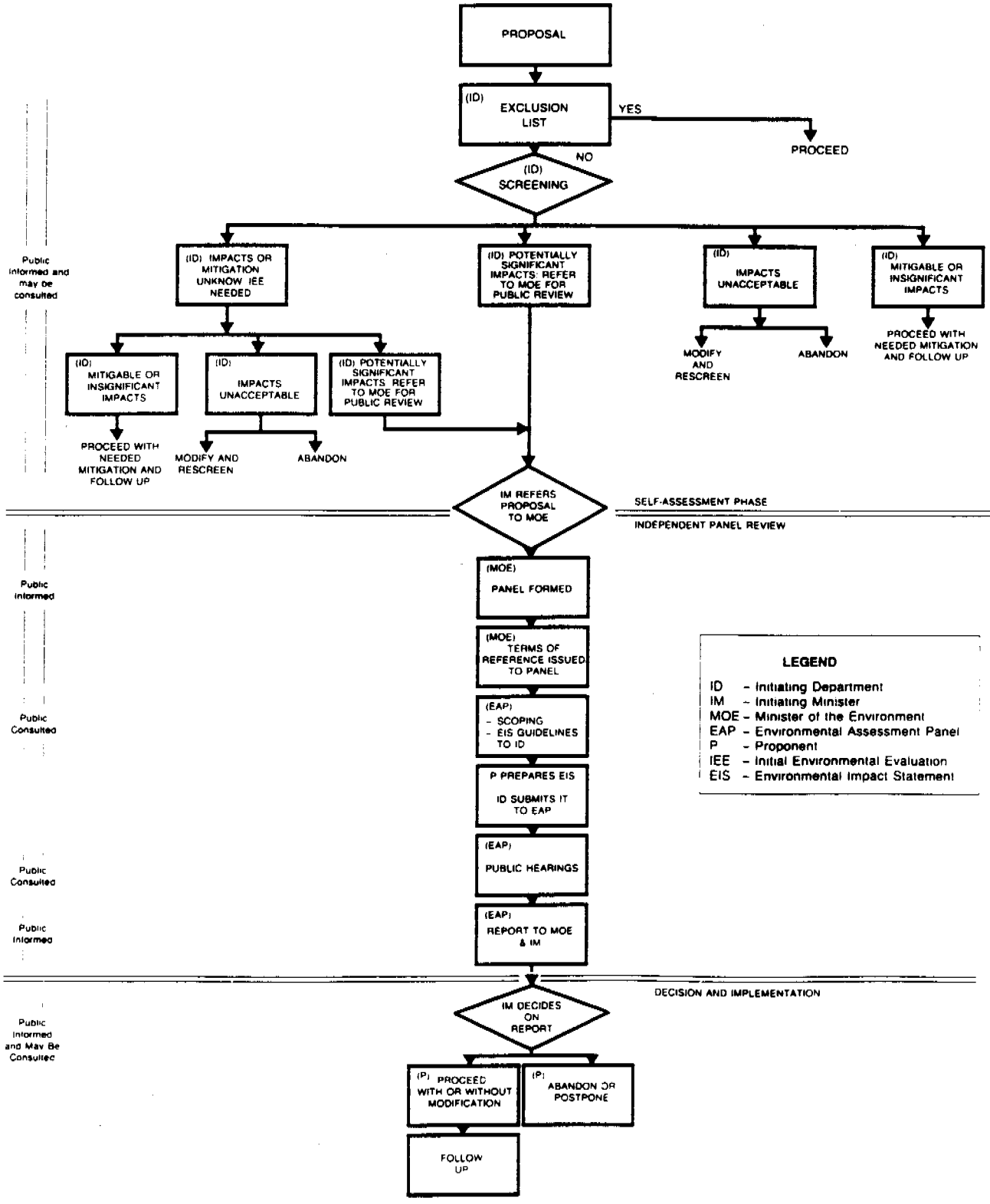


Figure 2.2.1-1

- the Fisheries Act regarding the protection of downstream fisheries resources during construction of stream diversion channels and operation of a gold mine and mill; and

- the Navigable Waters Protection Act regarding the operation of a hovercraft on the Iskut and Stikine rivers.

2.2.2 Province of British Columbia

The provincial governments in Canada have primary authority for environmental regulation under Section 92 of the Constitution (Europa 1990). The provinces have the power to regulate local works and undertakings and any matter of local or private concern. They have additional powers to regulate exploration for non-renewable resources and development, conservation and management of non-renewable natural resources and forestry resources.

The provincial Forest Act and the provincial Mines Act respond directly to environmental issues related to harvesting and management of timber and licensing of mines within the province of British Columbia.

British Columbia has enacted a variety of environmental legislation dealing with specific issues including:

- The Waste Management Act which regulates any pollution into air, in water or on land and provides for wastes designated as "special" or hazardous.

- The Water Act which regulates the use and diversion of water within the province.

- The Environmental Management Act which allows the province to deal with environmental emergencies and to establish inquiries in environmental matters. It also establishes the Environmental Appeal Board which responds to grievances against any environmental aspects of permits or contravention of the Acts.

The province of British Columbia has several review processes that have been developed for specific purposes. These include the Mine Development Review Process, The Major Project Review Process, The Cowichan Estuary Review Process, Order in Council 908 regarding the Fraser River Estuary, and the Energy Project Review Certification Procedures.

2.2.2.1 Mine Development Review Process

The Mine Development Review process was initiated in 1976 to deal specifically with coal projects and was expanded to include hardrock mining in 1978. The components of the Mine Development Review Process in British Columbia are 1) project design, 2) social impact assessment and mitigation, 3) environmental impact assessment and mitigation, and (usually) 4) economic analysis. The goal of project design is to work towards a technically sound and economically realistic mine design with respect to employee safety, resource recovery, and environmental protection. Social impact assessment examines the proposal in the light of impacts on local residents, manpower and training requirements, service requirements and infrastructure development (roads, rail, port, transportation, housing, etc.). Environmental impact assessment examines the potential effects on water, air, fish, animals, vegetation, competing uses such as recreation, etc. Part of this assessment is development of mitigation plans to minimize impacts and manage any residual impacts. The goal of economic analysis is to determine whether project economics justify public sector funding support and whether project benefits to the public outweigh social and environmental impacts.

The procedure of the Mine Development Review Process (now referred to as the Mine Development Assessment Process) is illustrated in Figure 2.2.2-1. There are four overall objectives of the mine review process:

1) To provide proponents with "one window" on government for the purposes of project review and approval, embracing all levels of government (federal, provincial, municipal).

2) To organize expeditious project reviews, based on effective coordination and custom-tailored government requests for project details and impact assessments.

3) To stage these requests so that they are set at a level of detail consistent with the company's own progress with project planning.

4) To ensure the consistent application of government policies and regulations to project reviews and approvals.

Proponents are encouraged by the government to make early contact with the public and formal public review and input are solicited by government at several stages in the review process: on submission of a project description; on submission of an Impact Assessment Report; and at federal government review. The latter is required for all major projects.

The Mine Development Review Process lead agency in British Columbia is the Ministry of Energy, Mines and Petroleum Resources; other provinces in Canada have ministries of environment as lead agency. The process provides a planning framework for mine developments but does not provide an overall framework for planning of industrial developments within the province or country as a whole.

B.C. MINE DEVELOPMENT REVIEW PROCESS.

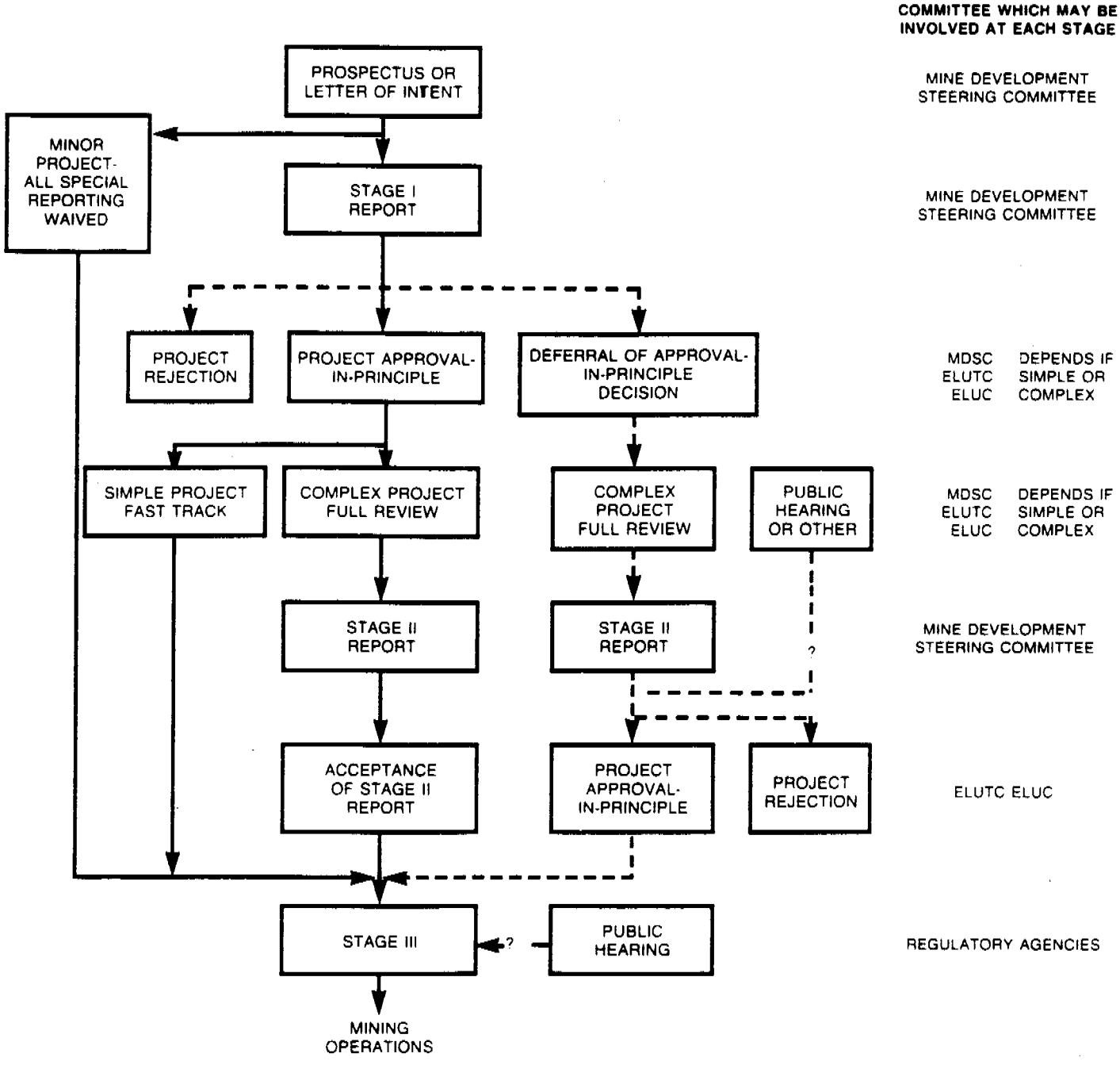


Figure 2.2.2-1

CASE STUDY

3.1 Methodology

The methods used to develop a comprehensive outline of the permitting process of the Snip Mine included:

- review of available file information, at the mine site, in the regional office in Smithers, in the Mine Development Assessment Branch in Victoria and at the Norecol office;
- in person interviews with key company and agency personnel; and
- telephone conversations with agency personnel.

The primary source of information was the files in each of the four offices mentioned. They were used to establish a chronology of events, to determine the level of effort required during each phase of the mine development, and the relative involvement of the various participants. The information included in the files and therefore in the report is limited to documentation of events and does not include the contents of the various reports and addendum information. To completely understand the rationale for various project related decisions it is necessary to review each of the documents. In addition, the basic business decisions made by the proponent are not a matter of record but are an influence on the overall progress of the project.

The interviews proved to be a valuable source of information regarding the overall approach to the project but it was difficult for all participants to recall specifics. Each interview participant was provided with an outline of the scope of objectives in advance. On average, the interviews required approximately 4 hours. Records of the interviews were prepared at Norecol and returned to each interview participant for confirmation, correction or additional comments. The interview records were then used to supplement case study information.

Scheduling conflicts sometimes precluded in person interviews and in these situations telephone conversations were used to provide supplementary information.

3.2 Chronology of Key Events

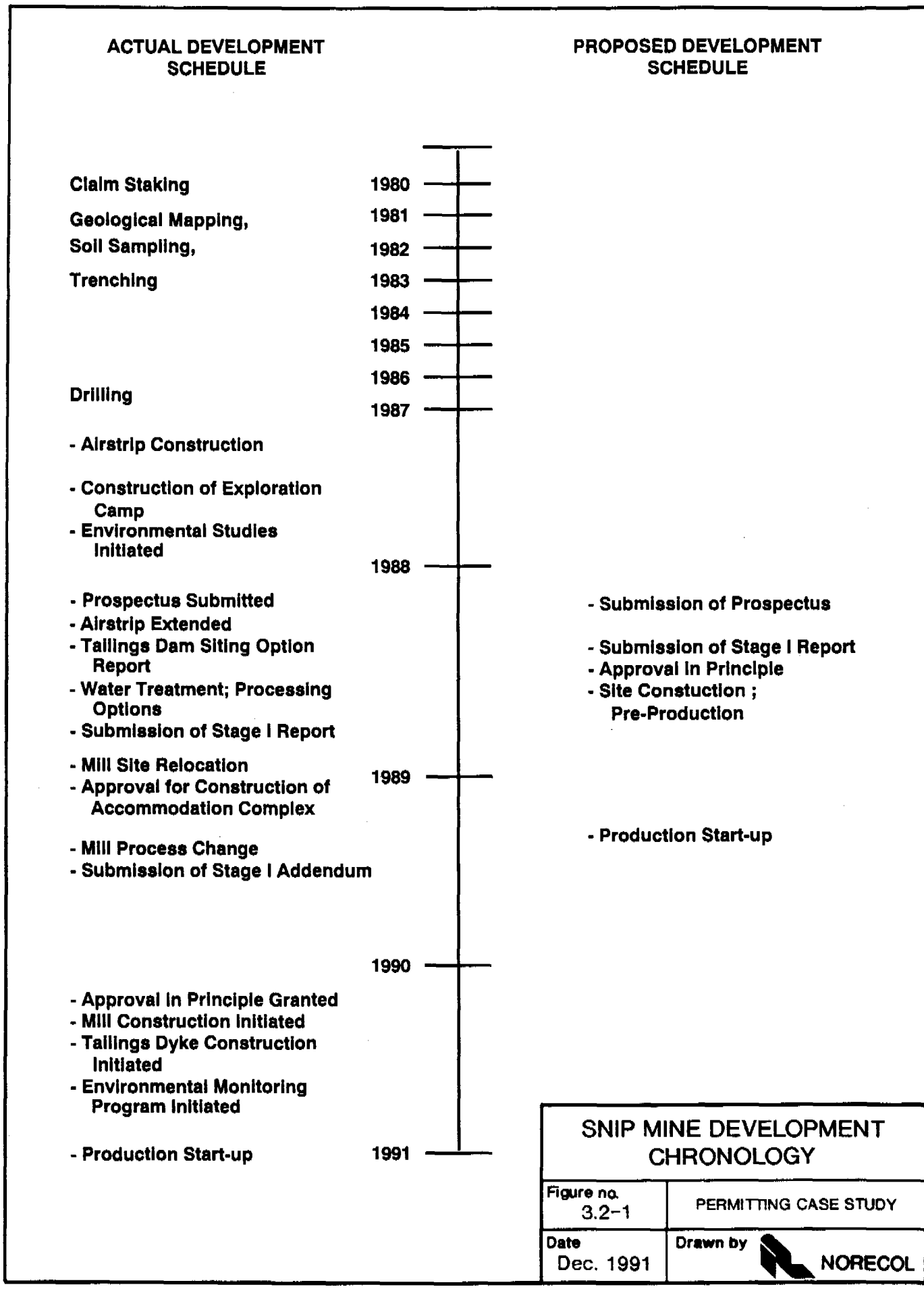
An important component of all projects is the establishment of a critical path. This path forward should identify all the events or items dependent on the timely completion of previous events or items. The environmental and permitting components have developed an increasingly higher profile over the past few years in British Columbia and have commanded greater attention by developers when constructing the project schedule and the resultant critical path. The objective of this section is to describe the chronology of events in the development of the Snip Mine and to identify the areas of concern. Figure 3.2-1 provides a quick reference regarding the timing of events during the exploration and development of the mine.

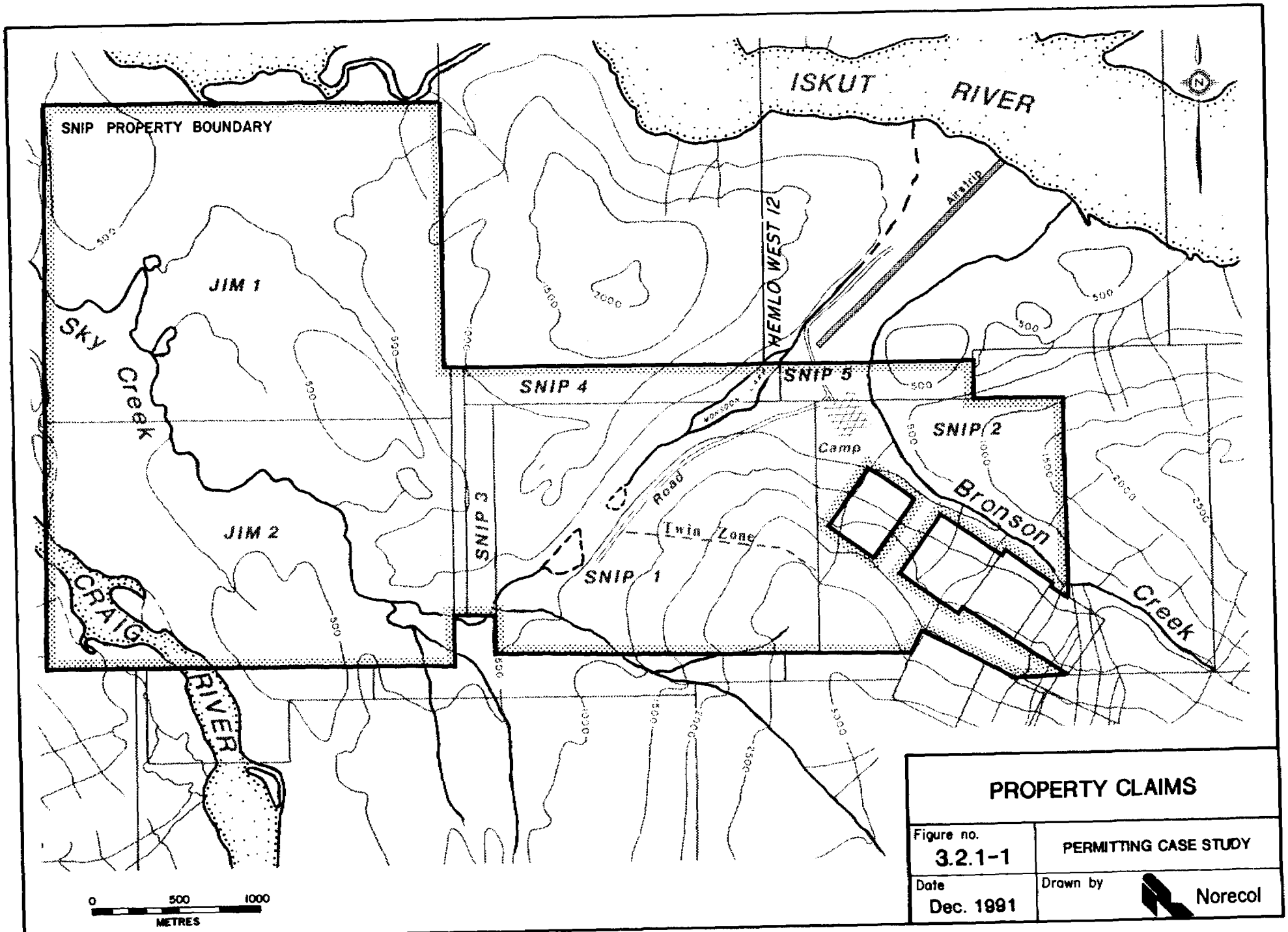
3.2.1 Exploration

The exploration phase of the Snip Mine began in November, 1980 when the Snip claims were originally staked by Cominco Exploration, a division of Cominco Ltd. From 1981 to 1985, geological mapping, soil geochemical sampling and trenching were undertaken. During 1986 and 1987, 85 drill holes totalling 15, 354 m were completed. Access to the site was by fixed wing to Snippaker Strip and by helicopter to the mineral claims (Figure 3.2.1-1).

During the exploration of mineral claims, the project was operated in a routine manner consistent with guidelines established by the province for mineral exploration in British Columbia. At the beginning of each annual exploration program a Notice of Work was submitted to the District Inspector and Resident Mining Engineer in the regional office of the Ministry of Energy, Mines and Petroleum Resources explaining the area to be explored, methods of exploration, equipment to be used on site, number of workers, and the reclamation plan. Approval of the Notice of Work was generally very quick and any financial bond required for the early exploration work was covered by a province wide bond covering all of Cominco's exploration properties in B.C. Free Use permits were issued by the Ministry of Forests in the region to allow clearing of drill pads. According to the Forest Act, an agreement in the form of a free use permit shall be entered into only with an owner of crown grant of a mineral claim, authorizing the use of Crown timber on land described in the grant as a mining operation conducted on that land.

An application for construction of an airstrip was submitted to the Ministry of Forests in February 1987 and the exploration division retained environmental consultants to study the environmental impacts resulting from airstrip construction. A $10,000 site specific bond was required from the Ministry of Energy, Mines and Petroleum Resources in June, 1987. At this stage of exploration the research group of the parent company was outlining the potential environmental issues related to water rights, permitting and Stage I requirements to the exploration group in preparation for mine development.


ACTUAL DEVELOPMENT SCHEDULE
PROPOSED DEVELOPMENT SCHEDULE
Claim Staking
Geological Mapping,
Soil Sampling,
Trenching
Drilling
- Airstrip Construction
- Construction of Exploration Camp
- Environmental Studies Initiated
- Prospectus Submitted
- Airstrip Extended
- Tailings Dam Siting Option Report
- Water Treatment; Processing Options
- Submission of Stage I Report
- Mill Site Relocation
- Approval for Construction of Accommodation Complex
- Mill Process Change
- Submission of Stage I Addendum
- Approval in Principle Granted
- Mill Construction Initiated
- Tailings Dyke Construction Initiated
- Environmental Monitoring Program Initiated
- Production Start-up
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
- Submission of Prospectus
- Submission of Stage I Report
- Approval in Principle
- Site Constuction ; Pre-Production
- Production Start-up
SNIP MINE DEVELOPMENT CHRONOLOGY
Figure no. 3.2-1
PERMITTING CASE STUDY
Date Dec. 1991
Drawn by NORECOL


SNIP PROPERTY BOUNDARY
ISKUT RIVER
HEMLO WEST 12
Airstrip
JIM 1
JIM 2
Sky Creek
SNIP 4
SNIP 5
SNIP 3
SNIP 2
SNIP 1
Camp
Road
Twin Zone
Bronson Creek
CRAIG RIVER
500
1000
1500
2000
2500
0
500
1000
METRES
PROPERTY CLAIMS
Figure no.
3.2.1-1
PERMITTING CASE STUDY
Date
Dec. 1991
Drawn by
Norecol

A Special Use permit was issued by the Ministry of Forests in September 1987 to cover the operation of a portable sawmill on the site. A special use permit is issued where a person wishes to use or manage a portion of Crown land in a provincial forest for purposes including timber production, and he has not entered into an agreement that permits him to use or manage this portion of Crown land in that manner.

During the 1987 exploration program the Waste Management Branch (provincial Ministry of Environment) informed the camp of the requirements for work camps in remote locations regarding disposal of solid waste and sewage effluent.

Free use permits were issued in February 1988 to authorize movement of heavy equipment to the Bronson Creek site from Highway 37. The 3 machines covered in the permit included a Caterpillar crawler D8L, a Catarpillar tractor crawler D7G, and a Catarpillar tracked back-hoe 300.

Burning permits were issued on a monthly or biweekly basis depending on weather conditions and the amount of slash remaining after clearing activities.

An exploration camp of woodframe construction had been built at the site during 1987 and 1988. It consisted of one office, one cookshack, mens and womens dry, recreation building, a food storage building, a core shack, two sample preparation buildings, a first aid building, a sample storage building and 18 sleeping cabins. The frame construction, plumbing, electrical and septic systems were all built to standard B.C. building codes. Additional installations on site included one satellite telephone dish, core racks, two water wells, a vehicle maintenance building and an airport warehouse building.

A 950 m airstrip was constructed at the site in 1987 and extended to 1450 m in April, 1988. The federal Department of Fisheries and Oceans had indicated by correspondence to the exploration division that they had serious concerns regarding the proposed protective berm adjacent to Bronson Creek and the diversion of Monsoon Creek related to the extension of the airstrip. The approvals for the diversion of Monsoon Creek related to the construction of the airstrip were received from the Water Management Branch on March 9, 1988. A separate approval was required for the bank armouring of Bronson Creek. Both approvals were issued with conditions related to the DFO concerns.

The exploration division retained environmental consultants to conduct baseline environmental investigations at the site in June and September, 1987. The initial report included preliminary information regarding hydrology, water quality, and fisheries in the vicinity of the exploration project.

3.2.2 Mine Development

The section on mine development has been divided into 4 sections each defining a particular period of government review or permitting.

3.2.2.1 Prospectus Submission

A Prospectus for the project was submitted to the Mine Development Steering Committee for review in January, 1988. The company's proposed schedule at that time included the following key dates:

Submission of Prospectus Report	January, 1988
Submission of Stage I Report	July, 1988
Approval in Principle	October, 1988
Site Construction and Preproduction	November, 1988
Production Target Date	July, 1989

Correspondence from the Engineering and Inspection Branch (provincial Ministry of Energy, Mines, and Petroleum Resources) dated February 23, 1988 indicates that the schedule could be a source of difficulty. Based on the timing of the Prospectus, the Branch considers a suitable projected scheduling for an Approval-in-Principle decision would be the fall of 1988. The Branch goes on to say that inadequate response to prospectus review comments particularly in the provision of field data, may cause up to one years delay in project development.

The conceptual development schedule for the Snip Mine was conceived by the company (proponent), a division of a larger parent company, but the design and implementation of the schedule and the confirmation of events or items on the critical path was coordinated by a consulting engineering firm, also a division of the parent company. The engineering firm was retained to conduct the mine, mill, tailings pond, and accommodation complex engineering. The geotechnical engineering was contracted by the proponent to an outside consulting engineering firm specializing in mining, the environmental investigations and compilation of the submissions to the Mine Development Steering Committee were contracted to environmental consultants and the mine construction was contracted to a construction contracting consultant. All of these companies had offices in Vancouver, B.C.

As discussed in Section 2.2.2.1, the initial document required for mine review is the Prospectus. The exploration division of the parent company retained the environmental consultants to prepare the Prospectus. This document included a project description, a discussion of geology and ore reserves, mine planning and operation, and environmental aspects. Fifty copies of the Prospectus were submitted to the Mine Development Steering Committee on January 29, 1988.

The first Section of the Prospectus included a fact sheet (Appendix 3.2.2-1) which outlined the design, construction and operating highlights of the project. The Fact sheet identified the project as an underground mine that would mill 500 tons of ore per day in a conventional cyanidation or combination gravity/cyanidation mill using an operational workforce of 125 with on site accommodation for 65 during production. The operation would be serviced by fixed wing from Smithers or Terrace B.C., or Wrangell, Alaska. The mine life was estimated at 7 years.

The exploration division presented the project to the Northwest Regional Subcommittee of the Reclamation Advisory Committee on February 29, 1988 in Smithers. The meeting was requested by the project geologist and attended by representatives from the provincial Ministry of Environment regional office, Fish and Wildlife Branch, and Waste Management Branch; the provincial Ministry of Energy, Mines and Petroleum Resources District Inspectors and Resident Engineers; the federal Department of Fisheries and Oceans; and the environmental consultants. The information available suggests that this was the first formal meeting including the agencies and the proponent.

Although the review comments had not yet been compiled and issued to the proponent, the major concerns identified at the meeting included: metallurgy, effluent quality, the discharge point for the effluent, and seepage from the tailings impoundment.

The components of the proposed environmental monitoring program were outlined at the meeting and included:

- climate monitoring at the tailings pond site and at the camp;
- hydrology monitoring program on Monsoon Creek, Sky Creek, Bronson Creek, and Triangle Lake;
- groundwater quality;
- bimonthly surface water quality sampling;
- fisheries studies;
- stream sediment collection and characterization;
- acid generation studies;
- soils (verification of existing mapped information);
- vegetation (habitat assessment);

- wildlife observations and identification of habitat use; and,
- heritage studies.

The location of the Stage I sampling sites and observation points are indicated in Figure 3.2.2-1. The proposed program was based on typical agency requirements and designed by the proponent and the environmental consultants.

It was understood from the meeting and through informal direct contact with key agencies, that the project would be required to proceed with a Stage I Report and if all the information requirements were adequately addressed and there were no major policy or technical concerns, the project would likely be granted Approval in Principle after review of the Stage I Report.

Formal comments regarding the Prospectus review were sent to the exploration division from the MDSC on May 27, 1988. A list of participating agencies who submitted comments is included in Appendix 3.2.2-2. The review comments formally outlined the various concerns of the review agencies, identified information requirements, and were intended to serve as the terms of reference for the Stage I Report.

As an appendix to the Prospectus comments, the Ministry of Energy, Mines and Petroleum Resources included "Guidelines for Approval of Main Surface Haul Roads Regularly Used for the Transportation of Mineral or Waste at Mines" (Section 6, Mines Act), "Guidelines for the Design, Construction, Operation, and Abandonment of Tailings Impoundments", Guidelines for Mine Dumps", "Mine Reclamation Guidelines" and "Information Regarding Application for a Reclamation Permit - Producing Mines".

The technical comments from the key ministries and agencies were also included in an appendix. These appendices included Ministry of Environment comments and Stage I information requirements (Appendix 3.2.2-3), letters and Stage I information requirements (Appendix 3.2.2-4) from Environment Canada (these include the requirements from the Department of Fisheries and Oceans and correspondence from the relevant agencies in Alaska), and comments from the Regional District of Kitimat Stikine and the City of Terrace.

Environment Canada submitted their comments regarding the prospectus review and Stage I information requirements on April 5, 1988. The comments indicated that the project had implications for the Canada-U.S. Boundary Waters Treaty and the Federal International Rivers Improvement Act because of the potential for water quality and quantity impacts on the transboundary water of the Iskut-Stikine River. Direct transboundary impacts were considered unlikely by Environment Canada. Under the International Salmon Treaty, each party is to receive benefits equivalent to the

AQUATIC SAMPLING SITES

Figure no.	PERMITTING CASE STUDY
3.2.2-1	
Date: Dec. 1991	Drawn by: Norecol

Scale 1:50000

500 0 1000 2000 m

LEGEND

- Water Quality ●
- Hydrology
  - Staff Gauge ◇
  - Spot Discharge Measurement ◆

Twin River

ISKUT RIVER

I1

I2

Raven Creek

CRAIG RIVER

S2

S3

S4

M1

M3

M4

B1

Airstrip

Monsoon Creek

Monsoon Lake

Camp

Triangle Lake

Sky Creek

Boundary Lake

Bronson Creek

0001

0002

0004

0006

0008

1000

2000

3000

4000

5000

6000

production of salmon originating in its water. Thus, it is essential that the salmon stocks and their habitat and water quality be protected.

The Prospectus for the Snip Project was only partially reviewed by the Ministry of Environment (MOE). The requirements related to the Water Management aspects of the project were summarized but comments from the Waste Management Branch, and Fisheries and Wildlife Management were unavailable due to staffing shortages. The potential concerns and proposed studies outlined in the prospectus were considered appropriate by the MOE and, in conjunction with the information requirements from Environment Canada, should form the basis of the Stage I environmental assessment.

Regarding access to the mine, the Engineering and Inspection Branch stated that if there were serious intentions to develop road access from Alaska essentially for project start-up, it should be fully addressed in the Stage I report since it will be necessary to develop terms of reference in this regard. The use of a hovercraft was not likely a consideration for access at this time.

An application for test pit excavation was submitted to the Ministry of Energy, Mines and Petroleum Resources (MEMPR) in March 1988 to determine suitability of tailings sites and on May 27, 1988, the Tailings Impoundment Siting Option Report was completed by the engineering consultants. The geotechnical and capital cost review in the report completed for various Snip tailings impoundment areas was strongly influenced by environmental constraints. The geotechnical investigation completed to date included test pits and seismic bedrock profile determination. The environmental constraints evaluated included water management considerations and assessment of significant environmental risks.

Two preliminary reports regarding water treatment and processing options were completed in May and June, 1988. This work was conducted by the research group of the parent company. The water treatment report forecast pond water quality, estimated tailings pond water balance, the water treatment process, and mini-pilot plant testwork. This report was revised to incorporate new information in July 1988. The mill processing options described a cyanidation circuit and a Merrill Crowe process operating at 500 tons per day.

Environment Canada had an opportunity to review the three reports regarding tailings pond siting options, mill processing and water treatment. In their response dated August 8, 1988 they identified some key concerns including the ability to adequately treat the effluent from the pond, and optimistic estimations of cyanide concentrations in the process.

3.2.2.2 Stage I Report Submission

The Stage I Report was submitted to the Mine Development Steering Committee (MDSC) on August 24, 1988. The proponent chose at that time to waive the opportunity for a review of a draft submission by the MDSC for two reasons. First, the proponent was confident that the terms of reference for the report were thoroughly addressed. Second, that time was critical to the project and an early approval-in-principle was essential in order that construction can be started in the fall and the goal of starting operations in the fall of 1989 can be achieved.

The Stage I Report was a comprehensive document written in four volumes. Volume 1 included the Environmental Assessment, volume 2 included the Appendices to volume 1, volume 3 outlined the socio-economic impacts, and volume 4 included a detailed hydrogeological assessment of the site. The submission of the report was very close to the proposed schedule outlined in the prospectus. At this point the project was approximately one month behind schedule in the review process.

The Stage I Report indicates that the project will be developed and operated using air access only. Project development includes an underground mine, mill, tailings disposal, waste rock disposal, service and maintenance facilities, a power plant and on-site accommodation. Preliminary indications are that the workforce and supplies will be transported from Vancouver and the Smithers area. Fuel would be shipped from the Vancouver area to Wrangell, Alaska and then by air to the site.

The Stage I environmental studies for the project were conducted using data collected intermittently from June 1987 to August 1988. The Stage I Report provided a description of the proposed development plan, and documentation of environmental conditions and potential impacts from the project, with the exception of hydrogeological studies which were submitted at a later date. Conceptual mill and mine designs were presented in the report. The Stage I report did not respond to all of the information requirements listed by the various agencies after the Prospectus review. Reasons for this approach included development schedule requirements, disagreements on the relevancy of the information requirements and changes in the project design.

Project construction was scheduled for September, 1988 to September, 1989 with production startup in the last quarter of 1989. Some of the concepts outlined included: a tailings pond sized to hold a maximum of 25 years production at 300 t/d, and mine waste rock stored adjacent to the tailings pond for at least the first five years and subsequently at a nearby borrow pit site. The ore reserves had been upgraded from the prospectus fact sheet to 1.43 million tons but the average grade had been re-evaluated at 21.9 g Au/tonne. Plans called for a 300 t/d mill with potential to increase to 500 t/d as indicated in the prospectus. The mine life at this rate was estimated at 13 years. Although testwork had indicated some potential for acid

generation, the proposed mining and waste management strategies made acid drainage unlikely. The proposed milling operation was direct cyanidation and gold recovery using a Merrill-Crowe recovery circuit.

The environmental impacts of the mine on the land surface were considered to be minimal and all mine disturbance areas could be reclaimed and returned to productive land use. There were a number of sources of potential impacts to surface water and groundwater in the project area including discharge of treated water from the tailings impoundment to Iskut River, seepage from the tailings impoundment to Sky and Monsoon creeks, drainage from the mine portals or rock dumps, and contamination of water from sewage. Predictions based on available hydrological information and mass balance calculations indicated that Ministry of Environment criteria for aquatic life in receiving water would be met at the proposed discharge points from the operation. Seepage to groundwater was to be controlled by cutoff walls at the tailings dykes. The climatic conditions in the area created a positive water balance in the tailings pond. Therefore, to reduce the volume of effluent discharged from the pond, the mill would recycle the maximum amount of water possible.

The agency review of the Stage I report was coordinated by the MDSC in Victoria. To facilitate rapid distribution of the report, the proponent undertook the distribution of the reports according to the list prepared by the MDSC. The requested turnaround time for the review by all participants was 12 weeks. Thus the comments were to be finalized and returned to the MDSC by November 10, 1988.

During the agency review of the Stage I report exploration work at the site continued. The conceptual designs for the components of the mine, mill, and accommodation complex continued. The baseline environmental monitoring program at the site also continued.

A preliminary review of the Stage I report was conducted at a meeting on October 15, 1988. The meeting was attended by the proponent and Ministry of Environment staff in Smithers.

The final report on the Tailings Dam Design was completed by the geotechnical consultants on October 26, 1988.

The federal review of the Stage I submission was completed and sent to the MDSC on November 10, 1988. Their review indicated that several aspects of the project required further clarification and resolution prior to approval-in-principle. The key areas included: evaluation of effluent discharge impacts, definition of acid generation potential, control of tailings pond seepage and contingency planning for excess mine water flows.

Applications were submitted in November, 1988 by the proponent to: the Ministry of Health regarding approval of kitchen facilities design in the accommodation complex; to the Ministry of Energy, Mines and Petroleum Resources regarding permission to proceed with the construction of the accommodation complex; to the Waste Management Branch regarding an approval to proceed with the construction of the accommodation complex and the location of the permanent incinerator; and to the electrical safety branch, the office of the fire commissioner, and the gas inspection branch regarding the application to proceed with the construction of the accommodation complex.

The application to clear the borrow pit area to be used as a gravel source for the airstrip was approved by the Ministry of Forests within two weeks but the application for clearing of the accommodation area was held in abeyance until further notice from the MEMPR.

Late in November the proponent informed the MDSC of the change in mill location from that indicated in the Stage I Report to a location on Bronson flats. The reasons for this were primarily safety. There was a risk of avalanche at the 180 portal where the mill was originally located and the road maintenance from the accommodation/office area to the mill would be difficult 6 months of the year. It was determined that access to the mine would be accomplished by underground portal at a point closer to Bronson flats thus avoiding the safety risk and maintenance challenges.

The change in the location of the proposed mill at the end of the review period created some scheduling difficulties. The Environment Canada review of the Stage I report was complete and this change would mean rescheduling of other work to review the potential impacts of the new mill location and accommodate the Snip schedule, or extending the review period to include comments on the new mill location.

During the review period there were efforts by both the agencies and the proponent to understand all potential environmental issues and permitting requirements. The Water Management Branch and the proponent conducted a meeting in Smithers on November 30, 1988 to clarify the water balance and the requirements for stream diversions during construction and operations.

Recommendations for approval-in principle were received from all Branches of the MEMPR including the Head of Reclamation, the Head of Geotechnical Engineering, the District Geologist and the Chief Inspector of Mines. Some of the concerns raised by the MEMPR included avalanches into the impoundment, reliability of synthetic liners and location of the emergency spillway on the dyke. In mid November the request for bonding by the ministry was increased to $100,000 making the total security $110,000.

The MDSC indicated in early December that most review comments were in and that there are still some issues that require resolution prior to approval-in-principle. It will not be possible to obtain approval-in-principle in one month because of the outstanding issues, for example the review of the mill site location change is yet to be completed. To accommodate the proponents schedule, the MDSC indicated that interim approvals may be granted for some aspects of project development.

The Ministry of Environment, Planning and Assessment Branch indicated by memo dated December 12, 1988 to the chairman of the MDSC that they had completed an interim review and could not support an approval-in-principle at that time. In part, the Ministry's delayed response to the November 10 deadline for agency comments was a result of their impression that the company (proponent) would be addressing the ministries concerns in the very near future. To date, the company had not provided the information requested i.e. the results of the water balance modelling which had been done, and the implications for water quality; a re-evaluation of the assumptions regarding available dilution in Iskut River; and additional detail on acid generation potential.

Approval was granted by the MEMPR to construct a camp accommodation and kitchen facility at the Snip minesite on December 9, 1988. Approval to occupy the camp was contingent on the submission of the following permits to the MEMPR in Smithers: Refuse permit (Waste Management Branch), Fire prevention system (Fire Commissioner's office), Electrical Inspection, permit for operating a kitchen facility (Ministry of Health), and Gas Inspection.

A Stage I review status meeting was held in Victoria on December 9, 1988 to review the recent changes in planning and to confirm a date for completion of the extended Stage I review. This meeting was attended by the proponent, the engineering consultants, the geotechnical consultants, the proponent's mill process research group, the environmental consultants, Environment Canada, the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Environment, and chaired by the MDSC. The positions and concerns of both the proponent and the agencies were outlined. The current schedule for the project calls for production to be initiated during the last quarter of 1989. The proponent considered the schedule to be achievable if approval-in-principle was given within the next month.

The proponent submitted the Tailings Dam Report prepared by the geotechnical consultants for agency review on December 14, 1988. Copies of the report were sent to the MDSC, Inland Waters (federal), and the Water Management Branch in Smithers.

A follow-up letter from the proponent regarding critical construction activities in the Snip project schedule was sent to the MDSC on December 23, 1988. This correspondence indicated which construction items on the schedule were critical to the

completion of the entire project within the scheduled time frame for start-up in the last quarter of 1989.

The Ministry of Environment provided formal Stage I review comments to the MDSC by memo dated December 29, 1988. The major concerns of the ministry at this time were: 1) Tailings pond seepage, 2) Tailings pond effluent quality, 3) Contingency planning, 4) Impacts of effluent discharge, and 5) Acid mine drainage.

Approval was granted to clear the accommodation site at the minesite on January 16, 1989.

Environment Canada (EC) submitted their review of the mill site location change on January 5, 1989. In the opinion of EC, the change to the Bronson Creek floodplain significantly increased the potential risk to the fisheries resource due to increased proximity to the resources, more permeable foundation soils, and lack of downgradient collection and treatment facilities previously provided by the tailing pond. The construction of a new mine adit at the 130 m level also increases concerns raised regarding the management of mine water flows both during the operation and after mine closure. Therefore, Environment Canada presented to the proponent an updated list of items that required clarification prior to approval-in-principle. The list included: spill contingencies; tailings, reclaim, backfill and mine water pipelines; containment of Bronson Creek; and environmental supervision.

Many of the outstanding issues identified by the key agencies were reviewed by the proponent during December, 1988 and January and February, 1989. Responses to some of the issues and concerns were distributed to the MDSC and the agencies concerned to expedite their approval since the schedule for the Stage I review and the project had slipped. The responses included letters to the Waste Management Branch in Smithers regarding fish sample collections in Monsoon Lake, to the MDSC regarding avalanche and soil hazards review, and to the MDSC regarding additional information on acid generation potential from the "sulphide zone". All of these issues were raised in the Stage I report review comments. Rather than compile all the response information into a separate document, the proponent and the consultants agreed that all responses to information deficiencies identified in the review comments should be distributed to the MDSC and the concerned agencies as the information became available.

One of the unresolved issues in February 1989 was the estimates of peak flows. Due to the change in mill site location which could have been within the 200 year floodplain of Bronson Creek, further evaluation was required and appropriate protective works were to be constructed. The tailings pond dyke location and construction methods were also outstanding issues. The Sky Creek diversion estimates of 20 and 23 m^3/s were determined to be too low by the Water Management Branch in Victoria. MOE estimated 100 year return period for Sky Creek sites

upstream and downstream from the dyke are 53 and 40 m^3/s, respectively. All of the water management issues and permitting for the Water Management Branch was now being done from the Victoria office because of the work overload at the office in Smithers.

On February 6, 1989 Environment Canada had completed its review of the Tailings Dam Design and Seepage Estimate. There was a concern regarding the issue of seepage losses from the tailings pond adversely affecting the local fisheries resources. Still of concern were the permeability values used in the seepage calculations, the groundwater budget, the upstream synthetic liner, the stability design criteria, the continuity of the silt layer, the cyanide level in the pond, cyanide degradation, "effective" seepage rates, the compliance point, dilution of groundwater, contingency planning and recovery of seepage if required, and abandonment.

A second Stage I review status meeting was held on February 12 and 13, 1989 to review responses to agency comments and to identify, and resolve if possible, any outstanding environmental issues. This meeting was held in Vancouver and attended by: the proponent; the geotechnical, environmental and engineering consultants; the Water Management Branch in Smithers, the Waste Management Branch in Smithers, Environment Canada; and the Department of Fisheries and Oceans.

Over the two days of meetings the scope of work regarding several of the key issues was narrowed and a deadline of February 24, 1989 was established for review of information submitted by the proponent regarding Iskut River stability, acid generation information, tailings dam design modifications, avalanche review, contingencies for water treatment and water treatment options. To try and accommodate the Snip development schedule, the MDSC indicated that the Snip Project was now one of the MDSC top priorities for review.

The proponent submitted an application for approval of the tailings impoundment on February 14, 1989 and an application to divert Sky Creek on February 16, 1989. The Department of Fisheries and Oceans reviewed the application extensively because of the fisheries resources in Sky Creek and Craig River, and because the Snip Project had not yet received approval-in-principle. The information required by DFO included detailed local topography, construction techniques for the diversion, and proposed construction plans.

The problem with the predicted levels of cyanide and copper achieved by the water treatment facility continued to delay the overall project schedule. The predicted levels had not been achieved by any other operating plant in Canada, and Environment Canada was reluctant to approve the operation without more substantial proof of water treatment under simulated operating conditions. The research arm of the parent company was unable to achieve the low levels required by Environment Canada in laboratory testwork. Therefore, the proponent initiated discussions with the MDSC

in mid March to determine the impacts to the review schedule as a result of a change in mill processing. It is our understanding that at a meeting the MEMPR representatives indicated that approval-in-principle would be facilitated much more rapidly if the cyanidation option was dropped from the mill process.

On March 9, 1989 the proponent sent correspondence to the MEMPR in Smithers outlining the status of mine development to date and requesting through a Notice of Work an approval to extend the 130 m haulage (providing access to the mine from Bronson Flats and eliminating the need for a road to the 180 m level along Monsoon Lake) and undercutting of the orebody.

The application for clearing of the tailings dams was denied by the MEMPR in late February until other agencies have reviewed the application. On March 10, 1989 the Geotechnical Engineering Branch of the MEMPR responded to the application for approval of the tailings impoundment. Further consideration was required regarding the following points: the hydrology/water balances, the strength and hydraulic conductivity of the general fill, the margin of safety after the construction phase, reliance an the HDPE liner, and monitoring and supervision during construction.

The MDSC indicated by letter to the proponent on March 17, 1989 that the key review agencies had indicated that they likely can finalize their Stage I review by March 17, 1989. The MDSC was concerned at this time that mine development and construction at the site was progressing well beyond what would typically be done prior to approval-in-principle being granted. According to the MDSC, early construction approvals had been obtained for:

1) Monsoon Creek diversion to allow expansion of the Bronson Creek airstrip;

2) Clearing and development of a gravel source to surface the Bronson Creek airstrip;

3) Clearing and construction of the workforce accommodation camp;

4) Bronson Creek Dyke construction and rip rap to protect the camp area; and

5) Clearing and grubbing of the tailings dyke areas.

The MDSC indicated its frustration with the proponent's desire to maintain a development schedule in spite of continued late submissions by the proponent of responses to Stage I information requests required for finalizing Stage I review. The MDSC found it difficult to coordinate the Stage I review because the documentation was received in a piece meal fashion.

Environment Canada completed their review of the proponents response to the concerns regarding acid generation potential, tailings pond seepage, minewater flows, effluent treatment, and Iskut River impact assessment. Environment Canada identified their outstanding approval-in-principle issues by letter dated March 20, 1989. They concluded that the remaining issues were: 1) validation of the contingency plan for tailings pond seepage, incorporating groundwater collection and recycle, and 2) preliminary Iskut River impact assessment based on dissolved metal values. Issues that must be addressed prior to Stage III permitting included: 1) Improved confidence in tailings pond seepage impact estimates through attenuation tests and determination of water chemistry in the two aquifers, 2) additional details on diversion ditches, potential impacts on pond water balance should the diversion ditches fail, and potential for spills to the diversion ditches, 3) calculation of monthly tailings pond supernatant elevations, quality, flow to the treatment plant, 4) details of how long the mill will operate before it will be feasible to recycle to the mill, elevation of tailings pond supernatant required before supernatant can be directed to the effluent treatment plant, and the time interval between effluent first moving to the treatment plant and the pond supernatant reaching the spillway elevation assuming the treatment plant does not function as envisioned, 5) determine what maximum cyanide and copper values in the pond, at various elevations, could achieve effluent criteria prior to reaching the pond spillway, due solely to dilution from precipitation and minewater, 6) response from the company regarding our letter of January 5, 1989 providing comments and recommendations on mill designs to address the increased environmental risks at the new mill location, 7) bioassay tests to determine the effluent chemistry criteria consistent with a non-toxic discharge (LC50 > or = 100%), 8) design information on the effluent discharge pipeline and proposed spray nozzle, 9) site specific fisheries studies to locate the final Iskut River effluent discharge point, 10) upgraded impact assessment for the Iskut River, based on monthly effluent flows and improved dissolved metal baseline data collected over the summer of 1989, and 11) more detailed concepts for abandonment of the site.

The long list of outstanding issues and the delays in project schedule led to a change in mill process by the proponent during mid March, 1989. The cyanidation option was dropped from the mill process and replaced with a gravity separation and flotation circuit. The MDSC was notified of the change by letter on March 23, 1989. This change had a significant effect on the overall engineering of the tailings pond, site water management, and effluent treatment system. In addition, the review schedule and submission requirements were re-evaluated.

The proponent was undertaking laboratory metallurgical testing including gravity separation, flotation, cyanidation, filtration, grind sensitivity, acid generation potential, work index, specific gravity, hydraulic backfill production, and plant metallurgy. The first progress report regarding this metallurgical testwork was completed in March by a mineral processing consultant.

The revised mill process system resulted in new design criteria for the tailings impoundment. The major modifications included:

- supernatant water may be continuously discharged, as opposed to being stored for treatment, and therefore the dykes may be built to lower elevations and staged over the life of the project;

- the tailings effluent does not contain cyanide or other toxic elements and therefore seepage to the groundwater does not need to be strictly contained thus allowing the replacement of the foundation slurry cutoff wall and dam geomembrane with a conventional impervious earthfill section in the dykes; and,

- the tailings gradation will be very fine with about 80% passing the 350 micron sieve size and may have acid generating potential, therefore abandonment of the pond requires a permanent structure to keep the tailings submerged.

Site water management changed because of the new operational hydrology for the tailings pond. The tailings pond storage requirements changed and the requirements for control of water levels and discharges from the pond during operation also changed due to new process flow estimates.

The updated mill process eliminated the concerns associated with the use and handling of cyanide. Benchscale testwork was conducted to refine a flowsheet using gravity concentration and flotation and to produce environmental samples for mill effluent characterization.

3.2.2.3 Stage I Addendum Report Submission

Subsequent to the change in the mill process the proponent and the MDSC agreed that the submission of a Stage I Addendum Report would be appropriate. The Addendum Report would outline all changes in the development plan, the impoundment design, the tailings pond operational hydrology, the mill effluent quality, the environmental impact assessment, environmental monitoring, and the project schedule as a result of the change in mill process. A letter confirming the outstanding information requirements regarding the proposed changes to the mill process was sent to the proponent from the MDSC on April 4, 1989.

In a continuing effort to keep the project on schedule the proponent notified the MDSC on April 10, 1989 of the importance to the project schedule that flexibility be granted in allowing non-controversial work to proceed while the additional information regarding the change in mill process was developed.

The draft Tailings Dam Design Addendum was completed on April 17, 1989. This formed a key part of the Stage I Addendum Report including the basis for the overall site water balance and the environmental impact assessment.

Regarding the application to proceed with main haulage and internal ramp submitted on March 9, 1989, before the change in mill process, approval was granted by the MEMPR to proceed with main haulage. However, undercutting of the orebody was not approved. As a condition of approval, mine discharge water was to be monitored and sampled for suspended solids and dissolved metals at least once per week.

The Stage I Addendum Report was submitted to the MDSC on May 17, 1989. The proponent sent the report directly to the key review agencies to facilitate rapid review. A review deadline of mid-July was established by the Mine Development Steering Committee and identified in correspondence to the proponent from the MDSC on July 4, 1989. However, the Ministry of Environment informed the MDSC that due to staff shortages and chronic work overload, particularly in the Smithers regional office, it will likely be at least late July before its review can be completed and comments forwarded to the MDSC. The MDSC would not be able to complete its review before early August and thus provide the proponent with a formal compendium of review comments. After discussions with the proponent and the Ministry of Environment the workload problem in the Smithers Regional office was resolved and mine reviews continued.

On May 23, 1989 the proponent submitted an application to proceed with drilling, subdrifting and raising to confirm the orebody. The proponent stated that this work was imperative to verify the mineability of the project.

The proponent's Tailings Dam Design Addendum Report was completed on July 11, 1989. The report included information regarding site investigations, dyke design, groundwater seepage estimates and monitoring, stability, and construction aspects of monitoring. Design modifications were as follows: supernatant water may be continuously discharged, as opposed to being stored for treatment, and therefore dykes may be built to lower elevations and staged over the life of the project; seepage to the groundwater does not need to be as strictly contained; abandonment of the pond will require a permanent structure designed to keep the tailings submerged; and the dyke design has been modified to accommodate an increase in seepage.

On June 12, 1989 the proponent indicated its disappointed that one of the review agencies would not be able to consider the submission before late July or August and expressed a desire to contact the Ministry of Environment immediately to resolve the potential delay.

Environment Canada submitted their review comments on the Stage I Addendum Report on August 9, 1989. They concluded that the elimination of cyanide from the

milling circuit reduced the risk of environmental impact. However, the proponent had also reduced containment of effluent in the tailings impoundment, increased effluent seepage losses, and had eliminated recycle of tailings pond supernatant, so that there would be a significant increase in volume of effluent released from the site and a significant decrease in the control that could be placed on effluent release.

The federal review indicated several aspects of the project that would require further clarification and resolution prior to Approval-in-Principal including: 1) mill effluent quality, 2) minewater discharge, 3) tailings dam construction, and 4) tailings pond abandonment.

Stage III issues identified by the environmental agencies and the MDSC to be addressed at the permitting stage included: 1) Identification of permit criteria and effluent control mechanisms to ensure that the combined discharges of minewater, controlled supernatant and uncontrolled seepage did not adversely affect the downstream environment, and clarification of tailings pond storage capacity and control mechanisms. 2) Proposed effluent and receiving water quality monitoring programs. 3) Data from Monsoon Lake sediment surveys, as requested in the prospectus comments, should be submitted. 4) Proposed installation of acceptable groundwater monitoring wells should be submitted. 5) Spill prevention and contingency plans, including potential for spills to diversion ditches. 6) Response from the company regarding the letter of January 5, 1989 providing comments and recommendations on mill design to address the increased environmental risks at the new mill location on the Bronson Creek floodplain.

On September 14, 1989 a meeting was held to review the comments from Environment Canada. The meeting was attended by the proponent, the environmental consultants, and representatives from Environment Canada. Environment Canada outlined their requirements for Stage I including: 1) Rough seepage calculations using conservative numbers. 2) Impact assessment using the conservative numbers. 3) Demonstrate that the tailings impoundment remains flooded after closure. 4) Demonstrate that contaminants in the minewater discharge do not aggravate impact to the downstream environment. At Stage III the proponent was requested to confirm effluent quality through analysis of further metallurgical testwork and outline potential effluent permit conditions.

The Ministry of Environment completed their review of the Stage I Addendum Report on September 25, 1989. The delay in providing their comments was caused by an excessive workload in the Skeena Region. The ministry comments recognized that a number of changes had been made to the mill and tailings pond in an effort to address the concerns resulting from the Stage I conceptual design. With the exception of the cyanide issue, the ministry's concerns remained very similar to those outlined in December, 1988. The issues that remained to be resolved included: 1) quality of tailings supernatant, 2) potential flow and quality of mine water and backfill seepage,

3) acid generation potential in tailings and waste rock, 4) permeability of the tailings dykes, 5) groundwater monitoring program and pumpback contingency, 6) water balance and impact assessment if the company wishes to expand to 500 tonnes/day capacity, and 7) the development a plan for the prevention and control of acid mine drainage after abandonment.

The response to the Stage I Addendum Report comments from Environment Canada and the Ministry of Environment were prepared by the proponent and the consultants and submitted to the MDSC on October 12, 1989. This submission addressed the specific outstanding environmental issues on the Snip Project. The covering letter also indicated the problems of the continuing delayed response to the application for approval-in-principle and suggested that the requirement for metallurgical testwork to demonstrate the characteristics of effluent with a higher degree of confidence is excessive. The proposed schedule had been impacted substantially. When the Stage I Addendum Report was submitted in May, it was anticipated that site preparation and foundation construction would proceed in September or October, 1989. The contract for construction of the mill foundations had been awarded, subject to permitting and establishment of project viability by further drilling in the period July to September. Construction was now not likely possible before spring 1990. An indication of the timing of approval-in-principle was needed by the proponent to expedite purchasing activity and equipment installation prior to the onset of the next construction window.

Environment Canada indicated by letter on December 15, 1989 that the proponent had provided additional details and rationale related to the four issues raised in their letter dated August 9, 1989. EC was satisfied that the calculations adequately represent site conditions and that the mining project would not result in adverse impacts on downstream water quality and salmon resources. Therefore, Environment Canada and the Department of Fisheries and Oceans had no objection to this project proceeding to Stage III - permitting. Information required to review the project's Waste Management permit identified in the August 9, 1989 letter was reiterated.

The Ministry of Environment indicated they were prepared to grant approval-in-principle to the Snip project by memo to the MDSC on December 20, 1989. The Ministry decided to deal with some of the uncertainties of the effluent discharge to Monsoon Lake as a permitting issue. They indicated that the permit levels for metal concentrations will be limited to levels near receiving water criteria and that a detailed monitoring program, including a biomonitoring component, would be required, for early detection of impacts. To establish the initial permit conditions the proponent would be required to: determine the metal complexing capacity of Monsoon Lake water; conduct laboratory bioassays using Monsoon Lake water under estimated worst case conditions, and; develop an appropriate water, sediment, and biological monitoring program that will detect early signs of stress to the aquatic resources at risk in the receiving environment. The proponent was urged to contact the Regional

Waste Manager at their earliest opportunity to initiate the preliminary laboratory work outlined.

All of the outstanding Stage I issues were apparently resolved in December 1989 and the proponent applied to the MEMPR for permission to proceed with the clearing and grubbing of the tailings pond area. The MEMPR responded quickly but denied approval until the 30 day review period had expired and no other resource conflicts were expressed.

The company was formally advised by the MDSC of the approval-in -principle on February 5, 1990. The approval covered thirteen years of mining operations at a nominal mill throughput rate of 300 tons per day, utilizing gravity separation followed by flotation of a gold rich sulphide concentrate. Stage II was waived because there were no outstanding policy or technical concerns and the project was consigned to Stage III (the licensing stage). The Ministry advised the proponent that timely consideration of outstanding Stage III issues identified by the Ministry of Environment and federal environmental review agencies was appropriate.

By copy of the letter, the Mine Development Steering Committee advised the permitting agencies that the project had entered Stage III, and requested that they cooperate fully in the achievement of expeditious review and approval of permit applications.

3.2.2.4 Stage III Permitting

Although the approval-in-principle had been granted and the permitting process was underway, the tailings impoundment design had yet to be finalized. The proponent was considering changing the design of the outflow from a siphon over the dyke to a culvert through the dyke. This caused some apprehension at the Waste Management Branch because of the experience with Premier Silbak Mine regarding seepage of water through the dyke that did not meet permit criteria.

To assist with the development of criteria for the effluent permit the proponent requested a work program to conduct a detailed environmental study on Monsoon Lake covering whatever aspects were necessary to evaluate the value of the lake. It was evident at this time that the agencies and the proponent had differing views regarding the value of the fisheries resources in Monsoon Lake.

Negotiations between the provincial government and industry representatives regarding road access to the region were continuing. There had been some discussion of the government supporting the concept of a road from Highway 37 along the Iskut River valley to the Snip site. The proponent purchased a hovercraft for use on the project as an interim measure while negotiations continued with the government on the road.

An environmental assessment regarding hovercraft operations was commissioned by the proponent.

The proponent submitted a revised Notice of Work on February 28, 1990 regarding the clearing and grubbing of the tailings area. This work was subsequently authorized by the MEMPR on March 1, 1990. The proponent was requested to submit a reclamation plan prior to the commencement of any further construction activity or within 90 days, whichever was shorter.

A Statement of Exploration and Development was submitted by the proponent and subsequently amended on March 29, 1990 to cover the clearing of the proposed mill site area. The permits for most of the mine development and construction activities at the site were approved or in the process of being approved. The two outstanding issues regarding the mine and the environment were an interim reclamation plan and the environmental monitoring program during construction and operation.

An application for an interim letter of approval to proceed with construction based on the reclamation proposals submitted in the Stage I application was submitted to the Chief Inspector of Mines on April 5, 1990.

On April 14, 1990 a meeting was held at the Ministry of Environment offices in Smithers. The attendees included representatives from the Ministry of Environment, the Fisheries Branch, the Waste Management Branch, the proponent, and their environmental consultants. The agenda for the meeting included: a review of Monsoon Lake including bathometry, water quality statistical information, depth profiles; and a brief review of fisheries data was presented. The objective of the meeting was to determine, if possible, effluent permit criteria for the tailings supernatant discharge based on recent information from the metallurgical consultants, to review management objectives and plans for Monsoon Lake, and to agree on an environmental monitoring program for the site.

The environmental monitoring program for the preoperational and operational period was discussed with agreement on some aspects of the plans. The meeting concluded without resolution of the permit levels or the environmental monitoring plan. The minutes of the April 17 meeting were sent to the Ministry of Environment office in Smithers for review on April 27, 1990.

The proponent and their consultants prepared an environmental monitoring plan based on the issues raised at the April 17 meeting and the response to the Stage I Addendum Report. The environmental monitoring program for the project covered the pre-operational, operational and post-operational phases. The program included: hydrology, sedimentology and geochemistry, physical and chemical characteristics of Monsoon Creek and lake water, biological monitoring in Monsoon Lake and in the tailings pond, mill effluent monitoring, groundwater characterization, and mine water

characterization. The program was submitted by the proponent for review by the Ministry of Environment on May 24, 1990. The scheduled items in the proposed program were initiated at the site on June 10, 1990 (i.e. identification of sample sites, instruction to on site staff, water quality sampling, sediment geochemistry, lake sediment deposition monitoring). Many parts of the proposed program were to be undertaken later in the field season. The determination of effluent permit criteria was dependent on some of the data to be collected and the results of the 1990 monitoring program.

Correspondence received by the proponent from the Ministry of Environment on September 9, 1990 indicated that the ministry had not yet received the environmental monitoring program for the Snip project. The ministry indicated that copper and zinc complexing will be part of the required monitoring program as well as programs that detect early signs of stress in organisms in Monsoon Lake. Upon further investigation in the ministry office the proposed monitoring program was located and the review completed on September 17, 1990.

The Ministry of Environment was of the opinion that the monitoring program that had been underway since June did not adequately address the issue of detection of early signs of stress in aquatic organisms present in the lake. They suggested a more comprehensive program including both fish bioassays and sediment characterization. An agreement on the scope of the additional biomonitoring requirements was reached in early November and the fieldwork conducted at that time.

On November 21, 1990 the Ministry of Environment provided some recommendations for the effluent permit to try and avoid further conflict regarding potential impacts to aquatic resources in Monsoon Lake. The permit would stipulate that the discharge from the tailings impoundment be directed to a point downstream of Monsoon Lake and Monsoon Creek. Recognizing that engineering and installation of the necessary works to achieve discharge at a site further downstream will not be possible prior to the scheduled mill start-up date, and that the risk to Monsoon Lake is primarily of a long term nature, the ministry recommended that a letter of Approval from the Regional Waste Manager authorize a temporary discharge to Monsoon Lake.

This proposal was not acceptable to the proponent and negotiations continued through December in efforts to achieve permit criteria that would protect aquatic life and allow the mine to operate without being out of compliance a majority of the time.

Production at the Snip Mine began on January 23, 1991. The final permit levels were determined by the Waste Management Branch and a permit to discharge tailings supernatant to Monsoon Lake was issued to the mine on January 25, 1991. The permit stipulated that there would be terms and conditions applied to the permit and defined at a later date. The effluent biomonitoring program was outlined by letter to the proponent on January 28, 1991.

3.3 Identification of Environmental Issues and Permit Requirements

There were numerous environmental issues identified throughout the review process. The key environmental issues identified early in the process were the ability to reduce cyanide levels in the process effluent to levels acceptable by the Department of Fisheries and Oceans and Environment Canada, the ability of the tailings impoundment to prevent seepage of groundwater containing significant concentrations of cyanide, the overall quality of the tailings pond supernatant, the impacts of effluent discharge, the development of contingency plans for the mine operation and the acid generation potential of the ore and waste rock from the mine.

The key environmental issues subsequent to the change in the mill location included protection of downstream fisheries resources due to the increased proximity of the mill, more permeable foundation soils, and lack of downgradient collection and treatment facilities previously provided by the tailings pond. There were also concerns regarding the management of minewater flows from the new adit.

The change in the mill process eliminated the concern for cyanide concentrations in the effluent but the environmental agencies still required contingency plans for tailings pond seepage that incorporated groundwater collection and recycle, an impact assessment regarding dissolved metal concentrations in Iskut River, information regarding the extent of the fisheries resource in Monsoon Lake, and information regarding the water quality characteristics of Monsoon Lake.

The permits required for mine development were identified during the mine review process but the technical information required to obtain each permit was sometimes negotiated during the permit application period. A list of permits required for the development and operation of the Snip mine is included in Appendix 3.3-1.

The key permits in the critical path of the development of the mine were the water licence for the use and storage in the tailings impoundment, the effluent permit for discharge from the impoundment, the Section 6 application for mine operation, and the submission of the reclamation plan. Delays in granting these permits could have caused the overall schedule for project startup to slip further.

3.4 Corporate Performance

The assessment of the corporate performance is based on their approach to the review and permitting process founded on observations and correspondence during the period of review, and the information acquired from the interviews with the proponent and government agencies.

Overall, the MDSC was pleased with the approach and degree of cooperation exhibited by the proponent throughout the review and permitting process. The review

agencies were also favourable in their description of the proponents approach to information requirements, the review process, and permitting requirements. One of the general comments regarding the project overall was that the proponent could have brought more information to the review and permitting process such as estimated of effluent quality, and more comprehensive baseline data.

The proponents performance in the tasks critical to an efficient review process is outlined in the following sections.

3.4.1 Communication

Communication during the exploration phase was very efficient. The permit applications for work at the site were submitted as required by MEMPR and the MOF. The exploration staff of the parent company were well acquainted with mineral exploration permitting requirements and ensured all applications were submitted in a timely manner from 1981 to 1988. In 1988 the mine development arm of the parent company began to manage the development of the property with the assistance of the research group and the exploration arm. It is the opinion of both the MEMPR and the MOE that the transition period from the exploration arm to the mine development group created a discontinuity in the overall project management because communications from the proponent were not as focused and informed as before and attendance at project review meetings early in the development schedule was limited to the proponent and the research arm of the company. No consultants or corporate representatives dealing directly with environmental issues attended the early meetings to establish baseline programs. The MOE thought this approach was unusual. Examples of incidents that created the impression of discontinuity with the MEMPR in Smithers were the Notices of Work applications coming from numerous sources and the reduced role of the research branch in overall project development since the key engineering and environmental issues were now becoming established and this appeared to be the focus of the research group.

The continuity of project management was re-established during the submission and review of the Stage I report. Roles and responsibilities of consultants and contractors were established through meeting and correspondence with the MDSC and review agencies.

The second period of discontinuity occurred at another significant milestone in the project development. After the approval-in-principle was granted to the project and construction of the mine, mill, tailings impoundment and ancillary facilities began at the site the responsibility for the work at the site during the construction period of approximately 8 months was not clear to the MEMPR.

Overall the communication between the proponent and the review agencies was satisfactory with the exception of the two transition periods during the development

of the mine. In the opinion of the MEMPPR in Smithers the proponent did a good job during the exploration phase but did not have a good understanding of the review and permitting process.

3.4.2 Awareness of Government Requirements

The proponent was aware of the government requirements during the exploration phase. Government involvement regarding environmental issues was initiated in 1987 during a general review of mining properties in the northwest conducted by the resident engineer and inspector of mines and the Area Section Head from the Waste Management Branch. Subsequent to the visit, the exploration group hired environmental consultants prior to submitting the prospectus to ensure that there were no environmental constraints that would preclude mine development and to understand the extent of the existing resources in the area. The immediate concerns for the exploration program was the disturbance of wildlife resources related to refuse disposal at the site.

The Ministry of Environment was of the opinion that the research arm of the parent company had an understanding of typical requirements and areas of concern when they were involved during the early stages of development. Several meetings were held with the ministry and the proponent to exchange views and to update the project from the Prospectus stage.

The entire permitting process is perhaps not as user friendly as it could be. The agencies may be conditioned to dealing with consultants or other experts when discussing permitting applications, issues or conditions on behalf of a proponent. Therefore, when the proponent assumes control of the permitting process they may be at a disadvantage not knowing the Acts and Regulations intimately and the permitting process may be a learning experience that is both time consuming and expensive rather than an efficient, well defined process. This was emphasized during the interview with the proponent in stating the "environment agencies lack clear cut, well defined guidelines. Environmental guidelines/regulations are in a stage of evolution."

The proponent is of the opinion that some government requirements are well communicated while other are less accessible. For example, MEMPR coordinated a Labour/Industry/Government Agency review of mine safety rules to produce the most comprehensive and workable standards before introducing revised legislation. The proponent is not aware of any similar "regulation-negotiation" policy used by MOE and the overall direction of changes to environmental legislation is unknown to developers.

The proponent believed that the extent of the studies required for the assessment of Monsoon Lake were an example of an overreaction on the part of the agencies to determine the impact of mining activity on the lake.

3.4.3 Schedule

The proponent had established a development schedule very early in the review process. Throughout the review process the proponent made efforts to maintain its commitment to the original schedule despite the requirements of the MDRP review schedule.

The MDSC had expressed concern regarding the original schedule during the submission of the Prospectus and was also concerned about the proponents desire to proceed with construction activities at the site despite late submissions in response to the governments Stage I comments.

The overall development schedule was delayed by the proponent during the last half of 1989 when the mineability of the project was being reviewed by the proponent and its joint venture partners.

The difference between the schedule proposed in the Prospectus and the actual schedule achieved for production start-up was approximately 18 months.

3.5 Agency Performance

The assessment of the agency performance is also based on their approach to the review and permitting process and is founded on observations and correspondence during the period of review, and the information acquired from the interviews and discussions with the proponent and government agencies.

The proponent's impression of the agencies performance was mixed. They were pleased with the approach and degree of cooperation exhibited by most of the agencies but were disappointed with the approach and the attention to detail exhibited by the environmental agencies that was perceived by the proponent to be without rationale or scientific basis.

The agencies performance in the tasks critical to an efficient review process is outlined in the following sections.

3.5.1 Communication

The MEMPR and Ministry of Environment believe that for the most part the agency requests were well coordinated throughout the review process. Much of the communication was written and when correspondence on key issues required urgent attention, the contact of letters and memos were outlined to the proponent or consultant team by phone.

The Department of Fisheries and Oceans initiated a review of the project under the EARP Guidelines Order after the MDRP had completed its objectives. This was most likely a result of a change in federal policy regarding protection of fisheries resources. This was conducted without input from the MDSC and little input from the proponent.

The proponent believes the agency communication methods were adequate but there is not enough information dissemination regarding environmental issues in general.

3.5.2 Government Acts and Regulations

In the opinion of the proponent, the environmental regulations related to the mining industry are arbitrary. They believe a more effective approach to the development of environmental regulations specific to mining would be a joint undertaking between industry representatives and government agencies. To justify the permit requirements, research and preparation of case studies should be undertaken by a third party to establish credibility.

The scope for the baseline environmental studies at the Snip Project was an iterative process and was a result of the Prospectus comments received from the Waste Management Branch and Environment Canada and during discussions meetings with agency personnel. Although there is no legal requirement to conduct baseline studies, the responsibility for designing and undertaking the program lies with the proponent and the proponent is requested to submit the program for review and approval by the agencies requesting the environmental studies. A comprehensive baseline studies program combined with detailed project design leads to a high quality environmental assessment.

The Ministry of Environment believes that the interpretation of objectives and criteria related to resources in Monsoon Lake made this project unique. The question faced by the agency was one of habitat loss versus compensation. There was no set policy or precedent in the provincial system for compensation. The mandate to protect habitat is set out in the Pollution Control Objectives for the Mining and Smelting Industry in British Columbia. The methods for habitat protection vary from site to site and project to project.

The Department of Fisheries and Oceans has a no net loss policy regarding habitat loss as a result of encroachment. This policy excludes pollution as the reason for habitat compensation. From a provincial perspective, this issue requires further discussion in Victoria because there is a lack of a clear policy regarding compensation for habitat loss.

This lack of a clear policy led to a lapse of direction in the Ministry of Environment during and after the Stage I Addendum Review. The interim environmental monitoring program was the solution to the lapse in policy. There is essentially a policy void regarding compensation for habitat loss.

Regarding the federal and provincial agencies and the interprovincial agencies, there were no conflicts in jurisdiction at the Snip Project. According to the Ministry of Environment, the process was more of a joint effort among agencies to resolve issues. At the time there was a clear division of jurisdiction. For example the federal responsibilities ended at Iskut River and the provincial responsibilities were restricted to the resident fish species in the Monsoon Creek system.

The Ministry of Environment believes that the permitting process is efficient and other than the issue regarding the cyanide destruction the permitting process has not required any project design changes.

3.5.3 Qualifications of Agency Personnel

In terms of project assessment and review, the key agency personnel involved (those that have the mandate to approve various aspects of the development), all had experience with previous exploration projects and operating mines in northwestern British Columbia.

The MEMPR permitting process was conducted in Smithers by the resident engineer and inspector of mines. The review of the Prospectus and subsequent submissions were undertaken by the resident engineer and the district geologist in Smithers and the various MEMPR branches in Victoria.

The environmental review was undertaken by biologists, hydrologists and engineers in the Ministry of Environment, Environment Canada, and the Department of Fisheries and Oceans. The Ministry of Environment review was coordinated by the Senior Project Review Coordinator in Victoria. The Area Section Head and the Habitat Biologist in the Waste Management Branch of the Ministry of Environment in Smithers led the provincial review from an engineering and environmental perspective. Other ministry staff from Smithers were involved such as the resident fisheries biologist, the Regional Manager of the Fish and Wildlife Branch to provide technical or policy advice during review. The Water Management Branch in Victoria is always involved in mine reviews. The Regional Waste Manager in Smithers had overall

responsibility for review in the region and was involved to a greater extent midway through the review of the Stage I report. The responsibility for environmental monitoring programs, and plant process and discharge rested with the Habitat Biologist and the Area Section Head, respectively. It is also the responsibility of the regional ministry personnel to have on the ground knowledge of the property to effectively conduct review of mine proposals.

The federal agency review was coordinated by the Environment Canada offices in North Vancouver. The various comments from federal agencies and from U.S. agencies in Alaska were compiled by the Project Engineer in the Pollution Control Group, Environmental Protection Service, Pacific Region, Environment Canada.

There was close contact between Environment Canada and the Ministry of Environment during the review period. Viewpoints were exchanged and draft comments were discussed. According to the MOE there was typically an informal exchange of information during each of the review stages. However, all response comments were documented independently from each ministry or agency.

The overall impact assessment was a joint effort in the Ministry of Environment between the engineering group an the environmental group in the Waste Management Branch. The Snip Project was considered by the Branch to be a relatively difficult assignment. One of the key reasons for this was a lack of site specific water quality objectives. These had to be developed from insufficient background data. The baseline data collected from the site was considered by the Branch to be questionable because of the continuous work at the site during the collection of baseline data, and some parameters exceeded provincial and CCREM criteria. Although the baseline data was in doubt it was clear to the Ministry of Environment what resources were at risk.

The proponent was of the opinion that there were no conflicts with the agency requirements but that there was a certain amount of transfer of responsibility between the agencies leading to delays in review response.

The proponent also perceived an underqualification of regulatory staff in environmental agencies. This perceived underqualification is perhaps more related to a lack of familiarity with mining than underqualification in terms of technical environmental expertise. It is also perceived by the proponent that other ministries (those with no environmental mandate) employ personnel more knowledgable about industry.

The environmental agencies, who recognize that they are unable to provide technical expertise in every type of industrial development, describe themselves as generalists by necessity. In the opinion of the agencies the proponents should augment the review process by hiring qualified professionals.

3.5.4 Schedule

The MDSC establishes time frames for review of all project submissions. Each review period is established, all agencies and the proponent are informed and requested to respond to the MDSC if the review period is unacceptable.

The overall schedule for the Snip Project had three incidents in 1988, 1989 and 1990 where the Ministry of Environment in the Smithers Regional office was understaffed and could not efficiently conduct project reviews. According to file information and available correspondence, the problem with lack of review staff was identified to the MDSC immediately prior to the review of the Stage I Addendum Report. The review of the Prospectus, the Stage I Report and the environmental monitoring program were delayed or incomplete without early notice given to the MDSC or the proponent. In 1989, the Ministry of Environment regional staff had only enough resources to continue with the permitting functions of the office.

In the opinion of the proponent, the development schedule was inhibited by agency requirements. The Approval-in-Principle has become a financial document and the joint venture partner's funding for the project was dependant on AIP. The Stage I report presented issues that required resolution through additional study and negotiation. However, the proponent believes the response time from agencies was unduly long, which made for a very protracted timetable and that time commitments, on the part of the environmental agencies, were avoided in general.

When dealing with agency requests and the consideration for the development schedule the proponent received a very proactive response from MEMPR as indicated in Section 3.3. However the proponent believes that the other agencies seemed to consider only their own bureaucratic timetables and not those of the developer.

One of the weak points in the process, which ultimately relates to the overall review schedule, is the determination of when baseline studies are initiated. The suggestion of baseline studies is made during the initial contact with the proponent although there is no legal requirement to undertake any baseline studies. Frequently, studies are not initiated early enough. In the opinion of the MOE, the Snip project would have benefited from an earlier start to baseline studies.

3.6 Costs

The proponent was not able to comment on the total cost of permitting and environmental studies related to the Snip Project.

The Ministry of Environment tracks manhours for mine reviews within the entire region but not for each specific mining project. The Snip Project review was undertaken during the busiest time for mine reviews over the past few years. The

Area Section Head of the Waste Management Branch required approximately 25% of the time available for mine reviews.

The MEMPR does not document or allocate time to review submissions. The approach of the MDRP is to incorporate priority for review into an agreed time frame. The ultimate cost of mine reviews are not available.

ADVANTAGES AND DISADVANTAGES

The advantages and disadvantages of the permitting process must be assessed within the context of the entire project. There are many factors that will influence both the proponents approach to a project and the agencies approach to review and permitting of the project.

The proponent's approach may be influenced by the economic climate (i.e. base metal prices, precious metal prices, exchange rates), previous corporate experience, experience from adjacent developments or those in close proximity, and perceived environmental or socio-economic issues. Proponents may also be required to operate within certain business thresholds such as budgets, schedules, and technology that determine the feasibility of projects and the relative profits or losses of a corporation.

The approach taken by various regulators may be influenced by public pressure, the policies established regarding development or environmental protection in various regions, the criteria established for review and permitting of projects, competition for resources, and regional development plans.

4.1 Advantages

The advantages of the Mine Development Review Process for the proponent are its flexibility, early identification of critical issues, early identification of permitting requirements, and no direct charge by the government.

The flexibility of the process is an advantage to the proponent because it recognizes the economic uncertainty of mining and can suspend review until the proponent is prepared or it can facilitate rapid review if all information requirements are met. The process is also flexible in terms of approvals for items critical to development schedules prior to approval-in-principle.

The process also provides early identification of critical issues to the proponent. The Staged review process has been effectively used to provide scope for engineering and environmental requirements. As the amount of information regarding the development plan and the corresponding environmental issues increases, the ability to focus and resolve the critical aspects is greater. However, many mining projects including Snip are dynamic and must respond to technological and economic changes during the development period that may either increase or decrease overall project costs.

Permits are a key aspect of the development of a project and timely approvals will influence the overall schedule. The review process provides an opportunity for all

agencies to identify their permit requirements and associated information requirements as early as possible in the life of the project.

Finally, there are no direct capital costs of a review. The costs to the proponent of review and permitting the Snip Project were determined by the amount of information required, the design changes, and the schedule.

The advantages of the review process for the agencies include: early identification of project plans, an opportunity to coordinate information requirements and information exchange, and an opportunity to outline long term scheduling requirements.

The "one window" approach allows the agencies to track projects that are developing at different rates. Thus, as mine development concepts change so do potential environmental impacts. If the Mine Development Assessment Branch (MDAB) is kept informed of the changes, then the agencies can continue the process of identification of critical issues and keep the proponent informed of critical information requirements.

4.2 Disadvantages

The disadvantages of the process related to the proponent is that the proposed development schedule must be altered to accommodate unknown requirements from government agencies, the cost of the requirements influence the overall internal budget for the project, the proponent must accommodate government requests by perhaps locating and hiring experts to respond to specific technical issues like slope stability relative to avalanche potential, acid rock drainage, or fisheries resource conflicts.

The disadvantage of the process for the agencies is an increased workload. If economic conditions and government policy are favourable toward mine exploration and development, as they were in 1987 and 1988, the additional workload caused by the increased number of submissions for review can create staff shortages. This was evident in the Ministry of Environment office in Smithers during the development of the Snip mine.

The Ministry of Environment also notes that the Mine Development Assessment Process is designed to focus the assessment on aspects of a project that have potential environmental impacts. The Ministry attempts to identify all relevant issues and clarify information requirements at the outset of a project but, on occasion, aspects of a project with potential environmental impacts may not be apparent until later in the review when additional information is provided by the proponent. The MDSC will advise a proponent of required schedule changes to accommodate further review of potential environmental impacts where necessary.

The most common observation by many proponents and agency participants is that the review process, although described as Staged is inherently iterative.

MAJOR INCENTIVES AND DISINCENTIVE TO METAL MINE DEVELOPMENT

The incentives and disincentives of the mine development review process are directly related to the advantages and disadvantages.

The incentives for the proponent are that the process and subsequent permitting allows the mine to operate legally and if concerns regarding the operation arise over the life of the mine, the proponent has a complete agency review to use in defence of operating techniques. Furthermore, the approval-in-principle for the Snip Mine (and all others prior to the new legislation) was in effect for five years which allows proponents to gain approval but perhaps wait for a more appropriate economic climate before beginning mine operations.

The incentives for the agencies are more experience with various mine operations and therefore more effective review on future projects. The agencies will also develop a considerable body of information that may provide a basis for future policy development and land use planning. The review process also allows other agencies to plan for future requirements regarding indirect and cumulative impacts of mining operations.

SYNOPSIS

The Snip Mine was being developed during a relatively volatile period of exploration and mining activity in British Columbia. Incentives for exploration and development were introduced by the federal government in 1987 which allowed significant tax relief for major companies and junior companies involved in mining activities. As a result of these government programs (flow through shares and the Canadian Exploration Incentive Program) investment in exploration increased significantly. Exploration activity was recovering very slowly from the 1982 recession. The annual exploration expenditures had decreased from a high in 1981 of close to $140,000,000 to approximately $70,000,000 in 1983. In 1986 spending had increased to $90,000,000, still well below 1981 levels. The introduction of flow through shares doubled the exploration activity to $190,000,000 in 1987 and to $220,000,000 in 1988. It was the tax incentive programs and the resultant increase in spending combined with the price of gold that provided the biggest incentive to mine development in 1987 and 1988.

Northwestern British Columbia was the most actively explored area in Canada in 1987 and 1988 with many significant targets established such as on Iskut River as well as Unuk River and Stikine River. This increased level of activity combined with a relatively low level of regional environmental information placed additional pressure on the environmental agencies to develop consistent guidelines and facilitate rapid review of exploration and baseline environmental study programs.

Some of the examples of mining operations that the agencies were able to use for reference were not very favourable towards mine development. The Equity Silver Mine was frequently mentioned as an example of a lack of understanding of environmental issues which resulted in an inability to identify potential environmental impacts and develop waste management techniques. The Equity Mine had been developed without thorough knowledge of the geochemistry of the ore and waste rock at the site and has subsequently encountered significant environmental problems and clean-up costs. The Skyline Gold operation, immediately adjacent to the Snip Mine was also used as an example of the potential difficulties in constructing and operating a mine in one of the more remote areas in the province. The agencies were concerned that the Snip development would encounter similar design and operating flaws present at the Skyline operation. These flaws were likely a result of an excessively rapid development schedule, the economic incentives at the time of development and production start-up (1988), and the desire of both the mining industry and the province to demonstrate that a remote mine in the Iskut area was feasible.

The two operating mines, combined with two controversial mines in the review process, Cinola and Windy Craggy, led the environmental agencies to be more cautious than expected by the proponent. This caution was fuelled by perceived uncertainty in the Stage I report regarding the size of the proposed operation and the capabilities of the proposed water treatment system at the site. The proponent, on the other hand, considered their approach to be satisfactory given their experience at the site and with numerous other mine developments. Ultimately, it was the caution of the agencies regarding environmental issues, combined with the proponents belief that the level of information they had acquired during the review process was satisfactory, that led to schedule delays.

Furthermore, during 1989 the Mines Act in British Columbia was being modified to include requirements to address environmental concerns associated with typical mine developments. These changes influenced the timing and level of detail in the reclamation plan at Snip and the scope of information included in the Stage I Addendum Report and the Section 6 applications for construction of the tailings dykes.

Most recently, the Mine Development Review Process has been legislated as the Mine Development Assessment Act. The Mine Development Assessment Branch has been formed and the review of mine applications will change from the process used during the development of the Snip Mine. New mines in British Columbia will obtain approvals and certificates of operation using the same basic format but with some modifications to procedure.

In conclusion, the case study for the Snip Mine indicates that mine approvals can be facilitated by developing and presenting thorough and complete conceptual designs, construction methods, operating procedures, and environmental impacts and monitoring programs. The critical factors in the review process for the Snip mine were the unrealistic expectations of the proponent regarding the review schedule, the inability of the agencies to provide review comments according to required deadlines, the budget constraints or reluctance of the proponent to complete the environmental studies identified in the review comments, and the agencies inability to explain the rationale or use of environmental studies in terms of overall policy or specific permitting requirements.

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GLOSSARY

B.C.	British Columbia
CWS	Canadian Wildlife Service
DFO	Department of Fisheries and Oceans
EARP	Environmental Assessment and Review Process
EC	Environment Canada
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
FEARO	Federal Environmental Assessment Review Office
ha	hectare
m	metre
MDAB	Mine Development Assessment Branch
MDRP	Mine Development Review Process
MDSC	Mine Development Steering Committee
MEMPR	Ministry of Energy, Mines and Petroleum Resources
MOE	Ministry of Environment
t	tonnes
USBM	United States Bureau of Mines

KEY TERMINOLOGY

Pollution Control Objectives (B.C. Environmental Protection Branch):

- Prescribed as policy advice to the Pollution Control Board
- The aim is to protect the quality of the environment while providing for: 1) the use of the environment's assimilative capacity within the limits which do not lead to unacceptable conditions and 2) for adopting realistic cost-benefit pollution control strategies
- Provide for a wide range of possible discharge concentrations which take into account the needs of particular receiving environments
- Studies may be required to include a comprehensive examination of site suitability, baseline documentation of physical and chemical parameters, a biological resource inventory and detailed impact predictions

Initial Dilution Zone (B.C. Environmental Protection Branch):

- That zone around a waste discharge in a receiving water that is not subject to receiving water guidelines

Receiving Water (B.C. Environmental Protection Branch):

- Any body of surface water into which a discharge of a leachate or effluent may flow. Receiving water wholly contained within a permittee's property is not included in this definition, provided that pollutants in such waters cannot be transported outside the property

Water Quality Criteria (B.C. Water Management Division, Water Quality Branch):

- Used to assess water quality data and to prepare site specific water quality objectives
- Intended to be used as a water quality data screening tool

- B.C. Environment Ministry policy is that the Canadian Council of Environment Ministers (CCEM) Water Quality Guidelines are to be used in developing water quality criteria

Metal Mining Liquid Effluent Regulations (Federal Fisheries Act):

- The intent of these requirements is to limit the discharge of deleterious substances from new, expanded, or reopened base metal, uranium and iron ore mines (but are frequently used in the evaluation of gold mines).

- These controls apply uniformly as national baseline standards and are expected to provide the necessary protection to fish and other aquatic life. However, in specific locations where they fail to protect the fishery resources, more stringent requirements may be imposed by the federal government through a specific regional regulation. Where provincial requirements are more stringent than the federal requirements the more stringent requirements will prevail.

Metal Mining Liquid Effluent Guidelines (Federal Fisheries Act):

- As in MMLE Regulations applied to existing mines

Canadian Water Quality Guidelines (Task Force on Water Quality Guidelines for the Canadian Council of Resource and Environment Ministers):

- Developed to provide basic scientific information about the effects of water quality parameters on uses in order to assess water quality issues and concerns and to establish water quality objectives for specific sites

- Within the Canadian Water Quality Guideline document, criteria, guideline, objective and standard are defined as follows:

  - **Criteria:** scientific data evaluated to derive the recommended limits for water uses

  - **Water Quality Guideline:** numerical concentration or narrative statement recommended to support and maintain a designated water use

  - **Water Quality Objective:** a numerical concentration or narrative which has been established to support and protect uses of water at a specified site

  - **Water Quality Standard:** an objective that is recognized in enforceable environmental control laws of a level of government

Appendix 2.2.1-1

List of Federal Statutes and Regulations That Will Trigger the Environmental Review Process

The following provisions are prescribed for the purposes of subsection 5(d) of the Canadian Environmental Assessment Act:

(1) Subsection 10(1) of the Arctic Waters Pollution Prevention Act[3,8,19]

(2) Subsection 13(1) of the Arctic Waters Pollution Prevention Act[17,19]

(3) Subsection 9(1) of the Atomic Energy Control Regulations under the Atomic Energy Control Act[1]

(4) Paragraph 10(1)(a) of the Atomic Energy Control Regulations under the Atomic Energy Control Act[1]

(5) Subsection 25(2) of the Atomic Energy Control Regulations under the Atomic Energy Control Act[1]

(6) Paragraph 7(1)(c) of the Uranium and Thorium Mining Regulations under the Atomic Energy Control Act[1]

(7) Paragraph 7(1)(d) of the Uranium and Thorium Mining Regulations under the Atomic Energy Control Act[1]

(8) Subsection 8(1) of the Uranium and Thorium Mining Regulations under the Atomic Energy Control Act[1]

(9) Section 9 of the Uranium and Thorium Mining Regulations under the Atomic Energy Control Act[1]

(10) Section 34 of the Uranium and Thorium Mining Regulations under the Atomic Energy Control Act[1]

(11) Section 2 of the British Columbia Indian Reserves Mineral Resources Act[3]

(12) Subsection 10(3) of the Dairy Product Regulations under the Canada Agricultural Products Act[2]

(13) Subsection 7(3) of the Egg Regulations under the Canada Agricultural Products Act[2]

(14) Subsection 11(1) of the Processed Products Regulations under the Canada Agricultural Products Act[2]

(15) Subsection 14(4) of the Processed Poultry Regulations under the Canada Agricultural Products Act[2]

(16) Section 4 of the Wildlife Area Regulations under the Canada Wildlife Act[6]

(17) Subsection 86(1) of the Canada-Newfoundland Atlantic Accord Implementation Act[9]

(18) Paragraph 138(1)(b) of the Canada-Newfoundland Atlantic Accord Implementation Act[9]

(19) Subsection 153(1) of the Canada-Newfoundland Atlantic Accord Implementation Act[9]

(20) Subsection 155(1) of the Canada-Newfoundland Atlantic Accord Implementation Act[9]

(21) Subsection 159(1) of the Canada-Newfoundland Atlantic Accord Implementation Act[9]

(22) Subsection 89(1) of the Canada-Nova Scotia Offshore Petroleum Resource - Accord Implementation Act[10]

(23) Paragraph 142(1)(b) of the Canada-Nova Scotia Offshore Petroleum Resource - Accord Implementation Act[10]

(24) Section 158 of the Canada-Nova Scotia Offshore Petroleum Resource - Accord Implementation Act[10]

(25) Subsection 160(1) of the Canada-Nova Scotia Offshore Petroleum Resource - Accord Implementation Act[10]

(26) Subsection 164(1) of the Canada-Nova Scotia Offshore Petroleum Resource - Accord Implementation Act[10]

(27) Subsection 61(1) dealing with project-specific regulations under the Canadian Environmental Protection Act[6,19]

(28) Subsection 71(1) of the Canadian Environmental Protection Act[6]

(29) Section 11 of the Federal Mobile PCB Treatment and Destruction Regulations under the Canadian Environmental Protection Act[6]

(30) Subsection 12(1) of the Federal Mobile PCB Treatment and Destruction Regulations under the Canadian Environmental Protection Act[6]

(31) Subsection 13(2) of the Ozone-Depleting Substances Regulations No. 1 chlorofluorocarbons under the Canadian Environmental Protection Act[6]

(32) Subsection 7(3) of the Ozone-Depleting Substances Regulations No. 2 certain bromofluorocarbons under the Canadian Environmental Protection Act[6]

(33) Subsection 43(1) of the Canadian Petroleum Resources Act[4]

(34) Subsection 14(1) of the Heritage Canal Regulations under the Department of Transport Act[17]

(35) Subsection 7(1) of the Dominion Water Power Act[3]

(36) Section 9 of the Dominion Water Power Act[3,19]

(37) Subsection 8(1) of the Dominion Water Power Regulations under the Dominion Water Power Act[3]

(38) Subsection 69(3) of the Dominion Water Power Regulations under the Dominion Water Power Act[3]

(39) Subsection 7(a) of the Explosives Act[8]

(40) Section 33 of the Explosives Regulations under the Explosives Act[8]

(41) Subsection 35(2) relating to ministerial authorizations under the Fisheries Act[11]

(42) Subsection 37(2) of the Fisheries Act[11]

(43) Paragraph 3(1)(e) of the Forestry Development and Research Act[12]

(44) Subsection 4(b) of the Forestry Development and Research Act[12,19]

(45) Subsection 3(1) of the Forestry Timber Regulations under the Forestry Development and Research Act[12]

(46) Subsection 9(1) of the Forestry Timber Regulations under the Forestry Development and Research Act[12]

(47) Section 121 of the Animal Disease and Protection

Regulations under the Health of Animals Act[2]

(48) Section 123 of the Animal Disease and Protection Regulations under the Health of Animals Act[2]

(49) Section 124 of the Animal Disease and Protection Regulations under the Health of Animals Act[2]

(50) Section 160 of the Animal Disease and Protection Regulations under the Health of Animals Act[2]

(51) Paragraph 9(1)(b)(iii)(A) of the Immigration Regulations under the Immigration Act[7]

(52) Subsection 18(2) of the Indian Act[3]

(53) Subsection 19(c) of the Indian Act[3]

(54) Subsection 28(2) of the Indian Act[3]

(55) Section 93 of the Indian Act[3]

(56) Subsection 5(2) of the Indian Mining Regulations under the Indian Act[3]

(57) Subsection 6(1) of the Indian Mining Regulations under the Indian Act[3]

(58) Section 5 of the Indian Reserve Waste Disposal Regulations under the Indian Act[3]

(59) Subsection 5(1) of the Indian Timber Regulations under the Indian Act[3]

(60) Subsection 5(2) of the Indian Oil and Gas Regulations under the Indian Oil and Gas Act[3]

(61) Subsection 7(1) of the Indian Oil and Gas Regulations under the Indian Oil and Gas Act[3]

(62) Subsection 10(1) of the International River Improvements Regulations under the International River Improvements Act[4]

(63) Subsection 27(3) of the Meat Inspection Regulations, 1990, under the Meat Inspection Act[2]

(64) Subsection 4(1) of the Migratory Birds Regulations under the Migratory Birds Convention Act[6]

(65) Section 33 of the Migratory Birds Regulations under the Migratory Birds Convention Act[6]

(66) Section 36 of the Migratory Birds Regulations under the Migratory Birds Convention Act[6]

(67) Subsection 9(1) of the Migratory Bird Sanctuary Regulations under the Migratory Birds Convention Act[6]

(68) Subsection 5(1) of the National Archives of Canada Act[13]

(69) Paragraph 5(1)(c)(vii) of the National Research Council Act[15]

(70) Paragraph 5(1)(k) of the National Research Council Act[15]

(71) Subsection 46(1) of the National Energy Board Act[14]

(72) Section 52 of the National Energy Board Act[14,19]

(73) Subsection 58(1) of the National Energy Board Act[14]

(74) Subsection 58.11(1) of the National Energy Board Act[14]

(75) Subsection 58.16(1) of the National Energy Board Act[14,19]

(76) Subsection 58.32(1) of the National Energy Board Act[14]

(77) Subsection 58.34(1) of the National Energy Board Act[14]

(78) Paragraph 74(1)(d) of the National Energy Board Act[14]

(79) Subsection 117(1) of the National Energy Board Act[14]

(80) Subsection 119.03(1) of the National Energy Board Act[14]

(81) Subsection 119.08(1) of the National Energy Board Act[14,19]

(82) Subsection 125(1) of the National Energy Board Act[14]

(83) Subsection 5(7) of the National Parks Act[6]

(84) Paragraph 6(2)(c) of the National Parks Act[6,19]

(85) Subsection 8.3(3) of the National Parks Act[6,19]

(86) Subsection 5(10) of the National Parks Act[6]

(87) Subsection 3(2) of the National Historic Parks General Regulations under the National Parks Act[6]

(88) Subsection 28(2) of the National Historic Parks General Regulations under the National Parks Act[6]

(89) Subsection 5(1) of the National Parks Regulations (Building) under the National Parks Act[6]

(90) Subsection 13(1) of the National Parks Regulations (Building) under the National Parks Act[6]

(91) Subsection 4(1) of the National Parks Regulations (Business) under the National Parks Act[6]

(92) Paragraph 19(1)(a) of the National Parks Regulations (Cemetery) under the National Parks Act[6]

(93) Subsection 7(1) of the National Parks Regulations (Cottages) under the National Parks Act[6]

(94) Subsection 4(3) of the National Parks Regulations (Fire Protection) under the National Parks Act[6]

(95) Subsection 5(2) of the National Parks Regulations (Fire Protection) under the National Parks Act[6]

(96) Subsection 5(2) of the National Parks Regulations (Garbage) the National Parks Act[6]

(97) Subsection 4(1) of the National Parks Regulations (Timber) under the National Parks Act[6]

(98) Subsection 15(1) of the National Parks Regulations (Wildlife) under the National Parks Act[6]

(99) Subsection 47(2) of the Wood Buffalo National Park Game Regulations under the National Parks Act[6]

(100) Paragraph 56(1)(a) of the Wood Buffalo National Park Game Regulations under the National Parks Act[6]

(101) Paragraph 56(1)(b) of the Wood Buffalo National Park Game Regulations under the National Parks Act[6]

(102) Subsection 44(1) of the National Transportation Act[16]

(103) Section 145 of the National Transportation Act[16]

(104) Paragraph 147(4)(a) of the National Transportation Act[16]

(105) Paragraph 147(4)(b) of the National Transportation Act[16]

(106) Subsection 149(3) of the National Transportation Act[16,19]

(107) Subsection 150(1) of the National Transportation Act[16]

(108) Subsection 151(2) of the National Transportation Act[16]

(109) Subsection 232(1) of the National Transportation Act[16]

(110) Subsection 243(1) of the National Transportation Act[16]

(111) Paragraph 5(1)(a) of the Navigable Waters Protection Act[17]

(112) Subsection 10(2) of the Navigable Waters Protection Act[17]

(113) Section 25 of the Navigable Waters Protection Act[17]

(114) Subsection 11(1) of the Northern Inland Waters Act[3]

(115) Subsection 14(a) of the Northern Inland Waters Act[3]

(116) Subsection 14(b) of the Northern Inland Waters Act[3]

(117) Section 5 of the Northwest Territories Archaeological Sites Regulations under the Northwest Territories Act[3]

(118) Paragraph 5(1)(b) of the Oil and Gas Production and Conservation Act[4]

(119) Section 17 of the Oil and Gas Production and Conservation Act[4]

(120) Section 19 of the Oil and Gas Production and Conservation Act[4]

(121) Subsection 23(1) of the Oil and Gas Production and Conservation Act[4]

(122) Section 11 of the Canada Oil and Gas Drilling Regulations under the Oil and Gas Production and Conservation Act[4]

(123) Subsection 137(b) of the Canada Oil and Gas Drilling Regulations under the Oil and Gas Production and Conservation Act[4]

(124) Subsection 139(a) of the Canada Oil and Gas Drilling Regulations under the Oil and Gas Production and Conservation Act[4]

(125) Subsection 139(c) of the Canada Oil and Gas Drilling Regulations under the Oil and Gas Production and Conservation Act[4]

(126) Subsection 13(1) of the Pest Control Product Regulations under the Pest Control Products Act[2]

(127) Subsection 4(1) of the Plant Quarantine Regulations under the Plant Protection Act[2]

(128) Section 4 of the Public Lands Grants Act[18,19]

(129) Section 3 of the Public Lands Leasing and Licensing Regulations under the Public Lands Grants Act[18]

(130) Paragraph 5(1)(f) of the Radiocommunication Act[5]

(131) Section 7 of the Railway Relocation and Crossing Act[16]

(132) Subsection 8(1) of the Railway Relocation and Crossing Act[16]

(133) Subsection 112(3) of the Railway Act[16]

(134) Subsection 123(1) of the Railway Act[16]

(135) Subsection 127(1) of the Railway Act[16]

(136) Section 131 of the Railway Act[16]

(137) Subsection 145(1) of the Railway Act[16]

(138) Subsection 147(1) of the Railway Act[16]

(139) Subsection 196(6) of the Railway Act[16]

(140) Paragraph 197(3)(a) of the Railway Act[16]

(141) Subsection 201(1) of the Railway Act[16]

(142) Subsection 202(1) of the Railway Act[16]

(143) Subsection 212(1) of the Railway Act[16]

(144) Subsection 214(3) of the Railway Act[16]

(145) Section 216 of the Railway Act[16]

(146) Subsection 230(1) of the Railway Act[16]

(147) Subsection 326(3) of the Railway Act[16]

(148) Subsection 329(3) of the Railway Act[16]

(149) Paragraph 330(1)(a) of the Railway Act[16]

(150) Paragraph 330(1)(b) of the Railway Act[16]

(151) Subsection 330(2) of the Railway Act[16]

(152) Subsection 383(1) of the Railway Act[16]

(153) Subsection 8(1) of the Railway Safety Act[17]

(154) Subsection 10(1) of the Railway Safety Act[17]

(155) Section 71.6 of the Regulations for the Transportation of Dangerous Commodities by Rail under the Railway Safety Act[17]

(156) Section 6 of the Liquified Petroleum Gases Bulk Storage Regulations under the Railway Safety Act[17]

(157) Subsection 22(b) of the Telegraphs Act[5,19]

(158) Subsection 22(c) of the Telegraphs Act[5,19]

(159) Section 41 of the Telegraphs Act[5]

(160) Section 8 of the Territorial Lands Act[3,19]

(161) Subsection 24(3) of the Canada Mining Regulations under the Territorial Lands Act[3]

(162) Subsection 29(10) of the Canada Mining Regulations under the Territorial Lands Act[3]

(163) Section 14 of the Territorial Coal Regulations under

the Territorial Lands Act

(164) Section 24 of the Territorial Coal Regulations under the Territorial Lands Act

(165) Section 35 of the Territorial Coal Regulations under the Territorial Lands Act

(166) Section 3 of the Territorial Dredging Regulations under the Territorial Lands Act

(167) Subsection 15(1) of the Territorial Dredging Regulations under the Territorial Lands Act

(168) Paragraph 25(1)(a) of the Territorial Land Use Regulations under the Territorial Lands Act

(169) Subsection 27(a) of the Territorial Land Use Regulations under the Territorial Lands Act

(170) Section 5 of the Territorial Quarrying Regulations under the Territorial Lands Act

(171) Subsection 12(2) of the Territorial Quarrying Regulations under the Territorial Lands Act

(172) Subsection 10(1) of the Yukon Forest Protection Regulations under the Territorial Lands Act

(173) Section 4 of the Yukon Timber Regulations under the Territorial Lands Act

(174) Section 7 of the Yukon Timber Regulations under the Territorial Lands Act

(175) Section 5 of the Yukon Archaeological Sites Regulations under the Yukon Act

(176) Subsection 40(1) of the Yukon Placer Mining Act[3]

(177) Section 70 of the Yukon Placer Mining Act[3]

(178) Subsection 18(1) of the Yukon Quartz Mining Act[3]

(179) Subsection 77(1) of the Yukon Quartz Mining Act[3]

(180) Subsection 78(2) of the Yukon Quartz Mining Act[3]

(181) Section 122 of the Yukon Quartz Mining Act[3,19]

(182) Section 125 of the Yukon Quartz Mining Act[3]

NOTE: Department or Agency administering specific provisions:

1 Atomic Energy Control Board

2 Agriculture

3 Department of Indian Affairs and Northern Development

4 Canada Oil and Gas Lands Administration

5 Department of Communications

6 Environment Canada

7 Employment and Immigration Canada

8 Energy, Mines, and Resources

9 Canada-Newfoundland Board

10 Canada-Nova Scotia Board

11 Fisheries and Oceans

12 Forestry Canada

13 National Archives

14 National Energy Board

15 National Research Council

16 National Transportation Agency

17 Transport Canada

18 Various - More than one department administers

19 Governor in Council

Appendix 3.2.2-1

Prospectus Fact Sheet

1.0 FACT SHEET

Metal Reserves

Metals	Gold, minor silver
Reserves (diluted)	1.1 million metric tonnes (1.2 million short tons)
Average Grade of Ore	24.0 g/tonne (0.7 oz/ton)
Potential for Additional Reserves	Excellent

Mining

Mine Operation	Underground by adit entry
Production Rate	500 tons per day milled
Process Plant	Conventional cyanidation mill or combination gravity/cyanidation
Mine Life	7 years (plus)
Work Period	Mining - 7 days/week Milling - 7 days/week

Transportation

Aircraft	Fixed-wing from Smithers/Terrace and Wrangell, Alaska
Road	Possible consideration of constructing a 70 km access road from mine site to Bob Quinn Lake on Cassiar-Stewart Highway. Road access is being considered only as an option for extending the life of mine. Current plans envisage Stage I application and

	approval to be based on air only access. Once the mine is in production, discussions will be carried out with the appropriate regulatory agencies to determine whether road access is viable.
Power	Diesel fuel generation with consideration of hydroelectric development from two possible sources: on site or from an overland transmission line originating from the head of Bradfield Canal in Alaska.

Work Force

Operational	125
Construction	145
Housing	Northwest Communities of Smithers, Terrace, Stewart and Dease Lake
On-site Accommodation	
Pre-Production	80
Production	65

Schedule

Construction and Pre-Production	November 1988
Operation	July 1989

Appendix 3.2.2-2

Agencies Participating in the Snip Project Prospectus Review

Appendix 3.2.2-2

Agencies Participating in the Snip Project Prospectus Review

Ministry of Energy Mines and Petroleum Resources

- Engineering and Inspection Branch
- Geological Survey Branch

Ministry of Environment and Parks

- Environment
- Parks

Environment Canada/Fisheries and Oceans Canada

Ministry of Agriculture and Fisheries

- Farmland Resources Branch

Ministry of Forests and Lands

- Forest Service
- Lands Division

Ministry of Transportation and Highways

- Traffic and Design Branch

Ministry of Tourism, Recreation and Culture

- Heritage Conservation Branch

Ministry of Municipal Affairs

- Development Services Branch

Ministry of Advanced Education and Job Training

- Labour Market Policy Branch

Ministry of Economic Development

- Economic Analysis and Strategy Branch

Ministry of Health

Skeena Health Unit

Ministry of Social Services and Housing

Corporate Services Division

Ministry of Transportation and Highways

Native Affairs Secretariat

Indian and Northern Affairs Canada

Resource, Economic and Employment Development Branch

Appendix 3.2.2-3

Ministry of Environment - Stage I Information Requirements

APPENDIX
STAGE I INFORMATION REQUIREMENTS FOR THE SNIP PROJECT

1. WATER MANAGEMENT

1.1 Hydrology

A hydrological analysis and stream flow monitoring program in support of Water and Waste Management planning and engineering design activities is required for the Stage I report. An outline of surface water quantity data requirements is presented below for consideration. It is important that the details of the monitoring program be discussed with the Regional Water Management staff in Smithers to ensure reasonable standards of data collection.

Based on existing data, the submission should include a description of the regional surface water regime in terms of:

- mean annual runoff
- maximum and minimum annual runoff
- mean monthly distribution
- mean and return period annual maximum daily discharge (peak flow)
- mean and return period annual minimum daily, 7 day, monthly discharge

These data should be summarized in the forms of maps, graphs, and histograms.

To carry out regionalization or extrapolation of stream flows, some basic physiographic watershed characteristics should be compiled for gauged and project related streams. The following are normally presented.

- drainage areas
- elevation range
- median elevation
- channel profiles

If the existing stream flow/runoff data can be transposed to project related watersheds, preliminary estimates should be provided. Available climate data will form an integral part of this analysis.

On the basis of this analysis, data gaps should be identified and the required monitoring program should be outlined indicating location, instrumentation (water level recorder, staff gauge, current meter or weir, etc.) observation frequency and period of observation.

A hydrometric network was established in the fall of 1987 with staff gauges on Bronson Creek, Monsoon Creek and upper Sky Creek. If inflow to Monsoon Lake is to be considered in project plans, lake levels should be measured in addition to Monsoon Creek at the lake outlet. Data collection is scheduled from January to June, 1988. However, most heavy rainstorms occur in the late fall period in this region and it is recommended that the hydrometric stations be continued to the end of 1988 to monitor significant storms.

All hydrometric stations have water level observations scheduled one or two times per week. However, during storms, when stages are changing rapidly, observations should be made twice daily, or more often during the storm peak, since the drainages are steep and small to intermediate sized and will produce sharp-peaked or flashy hydrographs. It is recommended that Water Survey of Canada be consulted to ensure an acceptable standard of hydrometric data collection. Also, any peak flow records used in design should be carefully evaluated by a peak flow regionalization method.

1.2 Water Management Plan

Based on the hydrological information collected, a plan for the management, use and protection of surface and groundwater is required for this project. The Water Management office in Smithers should be consulted if questions arise in the preparation of the plan.

Project information relative to site facilities and management of surface water and groundwater should be presented on a topographic map. For the mine site, the scale should be 1:5,000 or better, with contour intervals of 5 metres or less. This mapping should indicate:

- locations of tailings ponds, waste dumps, ore stockpiles, pits and adits, mill, camp, fuel and explosives storage, equipment service facilities, access roads, and other facilities.

- drainage areas, with natural interception areas and contaminated drainage areas shown separately.

- water disposal system.

- water supply requirements, source, points of diversion and distribution system.

- drainage for slope and spoil dump stability.

- drainage ditches.

- delineation of the 200-year floodplain on all natural streams.

- channel stabilization of existing water courses where required.

- locations at which acquifers will be intercepted.

- location of hydrometerological stations.

- a water balance diagram for the project.

- preliminary design of the tailings dam.

- draft applications for water licences conforming to the Water Balance.

- design flows, velocities and cross-sectional details should be provided for all proposed changes to natural stream channels, drainage ditches, stream crossings by roads, etc.

- a description of surface runoff and drainage control systems proposed at the mine sites and plant site to minimize the impact of suspended solids on the environment.

- a description of any measures necessary to prevent damage to any facilities from flooding.

Approvals for short term use of water (not exceeding 6 months) may be required for temporary camps, pilot plants and alike. Furthermore, approvals for changes in and about a stream may be required for stream crossings and other changes to watercourses.

Inquiries regarding licences and approvals should be directed to Regional Water Management staff in Smithers, telephone 847-7278.

1.3 Surface Water Quality

1.3.1 Water Quality Monitoring

The surface water quality monitoring program is well described and appears adequate with the following exception:

- the quarterly monitoring frequency should be increased to monthly, subject to access and staff availability considerations. It is noted that staff will be available on-site to read the staff gauges 1 to 2 times/week during the exploration program (p. 5-10). Given the relatively short time to construction/pre-production (Nov/88) and operations (July/89), more frequent monitoring is needed to establish a baseline, and possibly for the development of water quality objectives.

1.3.2 Water Quality Criteria

The company should be advised of the Ministry's approved criteria for particulate matter, nutrients and algae, cyanide, molybdenum, nitrate, nitrite, ammonia, copper, and lead, and of the working criteria being used for the substances for which we do not yet have approved criteria. These criteria provide a guide to the levels needed to protect various water uses at appropriate locations for assessment of water quality data, impact prediction, and project design. Copies of approved and working criteria can be provided as needed.

1.3.3 Cyanide

The discharge of effluent containing cyanide is a major potential concern for this project. The high precipitation in this area (mean of 2000-2400 mm/year) will make it necessary to discharge tailing pond effluent to the ground adjacent to Monsoon Lake/Creek or the lower Bronson Creek, or directly to these fish-bearing waters. Cyanide is very toxic to fish, as indicated by the Ministry's approved criteria of 5 µg/L average, 10 µg/L for weak-acid dissociable cyanide. Figure 5 shows that cyanide destruction is proposed for the barren bleed and tailings solids, but such treatment typically yields effluent with 1 to 5 mg/L (1000 to 5000 µg/L) of cyanide, necessitating dilution of 200 to 500:1 in the initial dilution zone to achieve levels that will protect fish. Secondary cyanide treatment may be needed to achieve ambient levels safe for fish. It must also be remembered that the Johnny Mountain Gold project may also discharge cyanide to Bronson Creek via Johnny Creek, possibly further limiting the amount of cyanide that can safely be discharged from the Snip Gold project.

The Stage I studies must fully explore the treatment and disposal of cyanide to provide assurance that it can be managed to protect the fish resources in the area.

1.4 Groundwater

On page 5-10 of the report, it is mentioned that no groundwater information exists for the project. Information on quantity and quality of groundwater will be assessed during the Stage I environmental program. Aquifer and aquitards will be identified and water samples will be collected from flowing boreholes, springs or seeps. Shallow drilling and piezometer installations will be used where necessary to characterize the groundwater.

Although it is mentioned that water samples will be collected for chemical analyses, the list of analyses in Table 1 does not include some of the major [redacted] cations (calcium, potassium, sodium). The company should consider adding these parameters to their list.

Appendix 3.2.2-4

Environment Canada - Stage I Information Requirements

APPENDIX

STAGE I INFORMATION REQUIREMENTS: SNIP GOLD PROJECT

1. Geology/Mining/Mineral Processing/Infrastructure

A. Mineral Reserves
   a) geological exploration and mineral quality studies
      - work history
      - geological description
      - estimated reserves
      - potential for expansion
      - mineral quality
        - acid generation potential testing
        - heavy metal content

B. Minesite
   a) general description of project
   b) location and access
   c) pre-production and construction
      - activities
      - schedule
   d) mining
      - mining concept
      - adit locations
      - mining methods and activity schedule
      - dewatering requirements
      - estimates of minewater flow and quality
      - explosives use and predicted nutrient loading (eg. PO_4, NO_3, NO_2, NH_3)
      - contaminants control (eg. settling ponds design and operation, flocculant testing)
      - location of roads
      - mine waste handling and disposal locations
      - extent and character of surface disturbance
      - proposal for segregation and treatment of waste rock runoff
      - conceptual abandonment plans

C. Future Development Potential
   a) potential expansion of mineral production
   b) longterm capacity of facilities
      - processing plant
      - tranportation systems
      - airstrip

D. Mineral Processing
   a) raw ore handling and storage
      - runoff control, monitoring and potential treatment
   b) plant site selection and location

- potential terrain hazards (eg. flood plain location, avalanche paths)
- surficial geology
- groundwater flow regime

c) plant process flowsheet and preliminary design
d) water requirement and sources
e) required reagents, quantities and storage
f) results of metallurgy tests
- characteristics of tailings for acid generation potential, cyanide, metals and nutrients

g) results of cyanide destruction testwork
h) estimates of mill effluent quality and quantity
i) tailings and reclaim pipelines
- location
- stability
- spill control and contingency plans

j) tailings disposal
- site selection, terrain hazards
- detailed topography and surface geology
- preliminary design
- foundation characteristics
- groundwater flow regime
- seepage control and estimated flows
- volume/capacity curves
- detailed water balance
- operation parameters
- estimates of effluent discharge flows and characteristics
- conceptual abandonment plan

k) service and support facilities
l) potential sources/types of spilled materials and prevention/contingency plans
m) sewage and garbage disposal

E. Power
a) diesel power option
- transport/transfer/ and storage of diesel
- spill contingency plans

b) overland transmission line option
- route details

c) onsite hydro power option
- location, size, design, and operation parameters
- potential impacts to downstream watercourses

2. Environmental Information

A. Biophysical Description
a) Atmospheric

- regional and local climate eg. precipitation events

b) Topography
   - detailed topographic maps of the minesite and plantsite
   - surficial geology, terrain hazards

c) Surface Water Hydrology
   - seasonal characteristics of standing, flowing, and intermittent waters
   - stream characteristics: maximum, minimum, and mean water levels, temperatures, flow and velocities
   - surface water quality: seasonal variation of parameter concentrations including replicated samples for pH, temperature, conductivity, dissolved oxygen, filterable and non-filterable residues, alkalinity, hardness, sulfate, nitrite, nitrate, turbidity, total and dissolved Ag, Cu, Zn, Mo, Hg, Cd, Pb, As

d) Groundwater
   - general extent of aquifers
   - groundwater flow systems, including delineation of recharge and discharge areas
   - groundwater/surface water relationships, including estimated amount of groundwater flowing into surface water prior to development
   - groundwater quality

e) Freshwater Biology
   - fishery resources (separate resident and anadromous species)
   - habitat description (eg. substrate composition, migration, obstruction,)
   - habitat utilization
   - habitat capabilities (eg. proposed/potential enhancement)
   - species life histories (migration timing, spawning/ rearing behaviour)
   - fish tissue analyses for heavy metals
   - basic trophic level of Monsoon Lake (oligo-, meso-, eutrophic)

f) Sediment
   - replicated sampling for heavy metals, particle size distruibution, and organic content

B. Impact Assessment

a) Erosion
   - land stability and errosion hazards due to minesite, plantsite, access roads

b) Hydrology and Water Quality
   - effects of development on drainage patterns
   - groundwater flow modifications
   - groundwater and surface water quality impacts

- mitigation measures

c) Fisheries
- direct effects eg. potential habitat loss
- changes in receiving water quality
- mitigation measures

Appendix 3.3-1

Snip Mine Permit Requirements

SNIP PROJECT - STAGE III PERMIT SCHEDULE		
ACTIVITY	**PERMIT REQUIREMENTS**	**MINISTRY**
Camp Operation (Accommodation Complex)	Effluent Permit (revised for construction period)	MOE - Waste Management Branch
	Refuse Permit (revised for construction period)	MOE - Waste Management Branch
	Fire Commissioner's Approval	MMARC - Fire Commissioner
	Health Inspectors Approval	MOH - Public Health
Plant Site	Application for Permission to Construct - Mill (Site Survey Required)	MEMPR - Inspector of Mines
	Application for Permission to Construct - Shops/Warehouse/Office/Dry	MEMPR - Inspector of Mines
	Application for Permission to Construct - Assay Lab	MEMPR - Inspector of Mines
	Application for Permission to Construct - Power Generation Facility	MEMPR - Inspector of Mines
	Application for Permission to Construct - Explosives Magazine	MEMPR - Inspector of Mines
	Interim Reclamation Plan	MEMPR - Inspector of
Mine and Mill Operations	Air Emissions - Mill - Power Plant (?) - Incinerator	MOE - Regional Waste Manager
	Effluent - Tailings Pond - Mill - Mine - Settling Ponds - Accommodation	MOE - Regional Waste Manager
	Refuse (revised)	MOE - Regional Waste Manager
	Fuel and Reagent Storage	MMARC - Fire Commissioners Approval
General	Land Improvement Purposes License	MOE - Senior Hydraulic Engineer, Victoria
	Environmental Monitoring Program Approval	MOE - Regional Waste Manager
	Hours of Work	MEMPR - Inspector of Mines
	Emergency Preparedness Plans and Procedures for Injuries and Dangerous Spills	MEMPR - Inspector of Mines
	Mine Plan	MEMPR - Inspector of Mines
	Process Plan	MEMPR - Inspector of Mines
	Explosives Storage	MEMPR - Inspector of Mines
	Underground Diesel	MEMPR - Inspector of Mines
	Burning Permits	MOF - Resource Officer
	Waste Disposal	MOE - Regional Waste Manager
	Potable Water System	MOH - Public Health Officer
Tailings Impoundment	Section 6 Application Tailings Disposal Plan	MEMPR - Inspector of Mines
	Land Improvement Licence Water Storage	MOE - Senior Hydraulic Engineer, Victoria
	Application for Permission to Construct - Tailings Impoundment	MEMPR - Inspector of Mines
Site Access	Transportation of Dangerous or Hazardous Goods (?)	Transport Canada
Reclamation	Reclamation Plan	MEMPR - Inspector of Mines

BC ENVIRONMENT - FLOWCHART FOR PERMIT APPLICATION