

HUCKLEBERRY MINE:
A CASE STUDY IN THE IMPLEMENTATION OF THE BRITISH COLUMBIA
ENVIRONMENTAL ASSESSMENT ACT

by
Ann Tobin



A PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE
in
NATURAL RESOURCE MANAGEMENT

©Ann Tobin, 1996

THE UNIVERSITY OF NORTHERN BRITISH COLUMBIA

June 1996

All rights reserved. This work may not be
reproduced in whole or in part, by photocopy or
other means, without the permission of the author.

Abstract

In 1995, the British Columbia *Environmental Assessment Act* was adopted into law. The proposed Huckleberry open pit copper mine in northwestern British Columbia was the first mining project to be considered under the federal and provincial environmental assessment processes. The focus of this research was to evaluate the Huckleberry Mine environmental impact assessment as it related to the requirements of the *Environmental Assessment Act* and the literature. The *Environmental Assessment Act* was evaluated in comparison with the prescriptive theories in the literature, the *Canadian Environmental Assessment Act* and the *Forest Practices Code of British Columbia Act*. The *Canadian Environmental Assessment Act* and the *Forest Practices Code of British Columbia Act* were chosen because they were the two most recent forms of environmental legislation and they represent innovations in Canadian environmental law. Serious flaws were found in the Huckleberry Mine environmental impact statement. Key areas of concern identified by the Project Committee members were not dealt with effectively before certification was granted. For example, the treatment of wildlife data, cumulative effects and Aboriginal rights was incomplete. Even though most of these data were incomplete, mine certification was awarded and consideration of these issues was postponed until the permitting stage. The *Environmental Assessment Act* lacks adequate regulations, even though the nature of this Act attempts to be all encompassing; however, its implementation with the Huckleberry Mine process was seriously flawed. Although the Huckleberry Mine was a transitional project from the previously existing *Mine Development Assessment Act*, valuable lessons were discovered from this case study. In

the case of Huckleberry Mine, the methods used for public participation were inadequate and public consultation was incomplete. By failing to adequately address outstanding concerns and issues, the Huckleberry Mine Ltd. environmental assessment process was time-consuming and wasteful. Nonetheless, it has proven to be an instructive lesson in the implementation of the *Environmental Assessment Act*.

Table of Contents

<u>Title</u>	<u>Page</u>
Abstract	ii
List of Tables	vii
List of Figures	viii
Acknowledgments	ix
Dedication	x
Chapter One: Introduction: The Land and The People and the British Columbia Environmental Process	1
1.0 Introduction	2
1.1 Objectives of the Research	4
1.2 Huckleberry Mine Development	4
1.3 Methods	10
1.3.1 Case Study	12
1.3.2 Literature Review	13
1.3.3 Evaluation	14
Chapter Two: An Overview of Environmental Impact Assessment	17
2.0 Introduction to the History of Environmental Impact Assessment	18
2.1 History of Environmental Impact Assessment	18
2.2 Highlights of the <i>Canadian Environmental Assessment Act</i>	20
2.2.1 Screening and the Comprehensive Study	20
2.2.2 Mediation and the Public Review Panel	21
2.3 Comparison of the British Columbia <i>Environmental Assessment Act</i> and the <i>Mine Development Assessment Act</i>	23
2.4 The British Columbia <i>Environmental Assessment Act</i>	24
2.5 The Environmental Assessment Process	28
2.6 Environmental Impact Assessment	29
2.7 Characteristics of an Environmental Impact Assessment	32
2.7.1 Scoping	32
2.7.2 Prediction	33
2.7.3 Evaluation	36
2.7.4 Mitigation	36
2.7.5 Monitoring	38
2.8 Design Principles for an Environmental Impact Assessment	39
2.9 Public Participation and the Environmental Impact Assessment Process	41
2.10 Components of an Environmental Impact Assessment	42
2.10.1 Risk Assessment	43
2.10.2 Cumulative Impact Assessment	44
2.10.3 Ecological Impact Assessment	45
2.10.3.i Ecological Succession	46
2.10.3.ii Ecosystem	46
2.10.3.iii Trophic levels and food webs	47

2.11 Socio-economic Impact Assessment	49
2.11.1 Social Impact Assessment	49
2.11.2 Social Impact Prediction	50
2.11.3 Economic Impacts	51
2.11.4 Employment Prediction	51
2.12 Summary	52
 Chapter Three: Mining and the Environment	 54
3.0 Mining and waste production	55
3.1 The Effects of Acid Rock Drainage	58
3.2 The environmental implications of pH changes	58
3.3 Determining the Production of Acid Rock Drainage	59
3.3.1 The static test	60
3.3.2 The kinetic test	60
3.4 Direct Impacts of ARD and Mining	61
3.5 Shadow Effect	62
3.6 Summary	63
 Chapter Four: Evaluative Criteria for Assessing the Huckleberry Mine Environmental Assessment	 64
4.0 Introduction	
4.1 Transition	65
4.2 Project Committee	66
4.3 Public Advisory Committee	68
4.4 Amending an Application	69
4.5 Public and First Nations Information and Consultation	70
4.6 Review of a Project Report	72
4.6.1 Notification of Public Comment Period	72
4.6.2 Project Report Review Comments and Responses	73
4.6.3 The Project Report	73
4.7 Concurrent Permitting	75
4.8 Recommendations of the Project Committee	75
4.9 Ministerial Decision	76
4.10 Conditions on Project Approval Certificates	77
4.11 The Project Registry	78
4.12 Offenses and Penalties	78
4.13 Evaluative Criteria	79
4.14 Guidelines and References for Environmental Assessment	79
4.14.1 Assessing Environmental Effects	81
4.14.2 Assessing Economic Effects	82
4.14.3 Assessing the Social Effects	83
4.14.4 Evaluative Criteria from the <i>Guideline to the Environmental Assessment Process in British Columbia</i>	84

Chapter Five: Results and Discussion: Evaluation of the Huckleberry Mine Environmental Impact Assessment Process	86
5.0 Introduction	87
5.1 Transition Process	87
5.2 Project Report	90
5.3 Project Committee	92
5.4 Public Advisory Committee	96
5.5 Public and First Nations Consultation	97
5.6 Project Registry	103
5.7 Amendments	105
5.8 Project Review Period	107
5.9 Evaluation of Huckleberry Mine According to the <i>Guidelines of the Environmental Assessment Process in British Columbia</i>	108
5.10 Baseline Studies, Methods and Timing	109
5.11 Methods	113
5.12 Cumulative Effects and Mitigation	115
5.13 Socio-Economic Consideration	116
5.14 Regional Economic Development	118
 Chapter Six: Evaluation of the British Columbia Environmental Assessment Act	121
6.0 Introduction	122
6.1 Theories from the Literature Review	124
6.2 Harmonization	129
6.3 Definition of the Environment	131
6.4 Specific Details	132
6.4.1 Timelines	132
6.4.2 Iterative Process	132
6.4.3 Concurrent Permitting	134
6.5 Power of the <i>Environmental Assessment Act</i>	135
6.6 Transitional Projects and Advertising	136
6.7 The Regulations	136
6.8 Offenses and Penalties	140
6.9 Conclusion	142
 Chapter Seven: Recommendations and Conclusions	145
7.0 Introduction	146
7.1 Conclusion of the environmental assessment process	146
7.1.1 Public Participation and the Process	153
7.1.2 Provincial and Federal Harmonization	155
7.1 Recommendations	155
7.2 Summary	163
 Literature Cited	165

List of Tables

<u>Table Number</u>	<u>Title</u>	<u>Page</u>
1	Evaluative criteria for the Huckleberry Mine process based on the requirements from the British Columbia <i>Environmental Assessment Act</i> and Regulations.	80
2	Evaluative criteria based on the guidelines and recommendation as described in the Environmental Assessment process. The three areas evaluated are: environmental, economical and social.	85
3	A summary of the project report submitted on behalf of the Huckleberry Mine as required by section 22 of the Environmental Assessment Act in British Columbia.	91
4	Summary of the members on the Huckleberry Project Committee.	93

List of Figures.

<u>Figure Number</u>	<u>Title</u>	<u>Page</u>
1	Provincial map illustrating where the potential Huckleberry Mine is located in reference to the rest of British Columbia.	3
2	Regional map of the Huckleberry Mine locale.	7
3	Diagram of the Environmental Assessment Process in British Columbia.	26
4	Key inputs and outputs related to the evaluation of impacts.	34
5	A sample of the advertising used by Huckleberry Mine to announce public meetings about the proposed open copper pit mine in the area.	99

Acknowledgments

I would like to thank the following individuals who took the time to speak with me on a number of different occasions: Peter Campbell and Jesse Harper from Huckleberry Mine; Chief Marvin Charlie, Elder George Louis, researchers John Hummel, Dana Wagg, and Mike Robertson from the Cheslatta Carrier Nation; Glenda Ferris and Bernie Gollenbeck on behalf of the Wet'suwet'en Nation; Jo Harris and Sylvia Van Zalingen from the Ministry of Energy, Mines and Petroleum Resources; Brad Parker from the Canadian Environmental Assessment Agency; Norm Ringstad from the Environmental Assessment Office and Craig Stewart and Gord Wolfe from Ministry of Environment, Lands and Parks.

A special thank you to Jim Hofwebber who provided the notion of this research by providing the Huckleberry Mine environmental impact statement without it this research would not have been possible. I would also like to thank Troy Yanulik from the Project Registry for providing me with documents needed to conduct this research. Thanks to Jen Wilson who must have a sore ear after listening to me talk for two years. Thanks to my family (mom, dad, Patrick, Elizabeth & Francois, Bernard & Judy) you have been patient and supportive throughout these past two years. Finally, I would like to thank Dr. Leslie King, Dr. Doug Baker and Mr. Alistair McVey for providing me with inspiration and wisdom. In addition, I would like to thank my External Examiner, Mr. Jim Windsor, for his time and insights into this research. Without all of your advice and contributions this venture would not have been successful.

Dedication

In memory of my grandmother, Susanah Meyer, who always believed in education and to my grandfather Jacob Meyer from whom I inherited my strong will and determination.

To my husband, Larry Ward, and my children Jacob and Brenna for being there when I needed you most and understanding how important it was for me to complete this work. I am grateful to you for being honest, encouraging and making me laugh when I wanted to cry.

Chapter One

Introduction: The Land and The People

1.0 Introduction

In the past ten years the people of British Columbia have been putting pressure on the provincial government to have an environmental assessment process to make industries accountable for their actions. Hence, the province of British Columbia has enacted the *Environmental Assessment Act* which is to monitor and certify large scale developments. The Huckleberry Mine is significant because it was the first mining project to be subjected to the new provincial process.

Huckleberry Mine Ltd. originally submitted a proposal in 1993 for approval under the *Mine Development Assessment Act*. Following a two year program of environmental and socio-economic studies, the company submitted an impact statement report for public and agency review in the spring of 1995 (Environmental Assessment Office, 1995). Subsequently, there has been substantial controversy over the proposed development of the Huckleberry open pit copper mine. This controversy exists for a number of reasons. First, there is high unemployment in the area and two mines in the region have recently closed. Since this region has one of the highest rates of unemployment in British Columbia, the mine development is considered to be an important component in the economic sustainability for this area (Hallam *et al*, 1995, Vol. VI 5-3). Figure 1 illustrates the location of the proposed mine in relation to the rest of the province and other existing provincial mines. Second, the area is claimed to be traditional land for the Cheslatta and Wet'suwet'en. This land is in their treaty negotiations. The fact that these land claims have not yet been settled has caused some fundamental problems. In order to



Figure 1. Provincial map illustrating where the potential Huckleberry Mine is located in reference to the rest of British Columbia (Hallam *et al.*, 1995, Volume I, 1-6)

gain an understanding of the area it is important to understand the issues surrounding the area and the people who use the land. Third, since British Columbia has recently enacted Bill 29, the *Environmental Assessment Act*, no other mine has previously gone through the process. All of these reasons considered, there were some problems with the process which could not have been anticipated beforehand.

1.1 Objectives of the Research

The objectives of this study are: (1) to review the intent of the submitted project report by Huckleberry Mine and to determine whether or not it complies with the *Environmental Assessment Act* and Regulations; (2) to evaluate the process and product of the Huckleberry Mine environmental impact statement; (3) to evaluate the *Environmental Assessment Act* in reference to the growing prescriptive literature about environmental impact assessment and gaps which were identified through analyzing Huckleberry Mine Ltd. as a case study; and (4) to provide recommendations to improve the *Environmental Assessment Act* and its implementation.

1.2 Huckleberry Mine Development

The mine area will cover approximately 515 hectares. To service the mine, Huckleberry Mine Ltd. plans to build an air strip, a gravel pit, a road, two tailings ponds and a containment dam in order to mill 15, 500 tonnes of ore per day (Nelson, 1995). The mine will have two open pits, the "Main Zone" and the "East Zone". In total, the mine

would be expected to produce a total of 60 million pounds¹ of copper per year over a 17 year span (Environmental Assessment Office, 1995, 2).

One of the major recurring concerns throughout the project committee deliberations was the uncertainty over how to address Aboriginal land rights. The mine development is in territory claimed by the Cheslatta and the Wet'suwet'en Nations. In order to gain a perspective of the First Nations' concerns, it is necessary to understand the factors which have affected and influenced their way of life. For the Cheslatta, the greatest disruption to their livelihood came through a major development in 1950 when the British Columbia government gave the rights of the Nechako river to the Aluminum Company of Canada (Christensen, 1995, 73).

In order to generate hydroelectric power for the smelting of aluminum, Alcan dammed the Nechako river and, in turn, flooded the Ootsa, Tetachuk and Tahtsa rivers, creating a 250 mile long reservoir (Christensen, 1995, 73). Since the flow of the Nechako river was cut off, and would be until the reservoir was filled, there were concerns raised by the Department of Fisheries and Oceans that the Nechako river should retain water for salmon runs. In March, 1952, Alcan built a dam on Murray Lake which created a small reservoir in order to provide enough water to sustain salmon runs until the Nechako reservoir was filled. The Cheslatta had used this area for centuries to hunt and fish. In April of the same year, the Cheslatta people were forced from their homes and traditional lands (Christensen, 1995). The waters in the Cheslatta/Murray Lake system began to rise behind the dam which was built. The Cheslatta were relocated to Grassy Plains in

¹imperial measurement is the standard weight of measurement for non-precious metals on the stock market

Northern British Columbia. Today there are fewer than 80 people who live on 11 parcels of land which were purchased in the Grassy Plains area after the people were relocated. Huckleberry Mine (now owned by New Canamin Resources Limited) plans to develop a copper-molybdenum mine 86 km. south of Houston in the area claimed by the Cheslatta prior to the Alcan relocation (Figure 2). The mine is to be developed on the edge of Tahtsa Reach which will be used for the release of mine tailings and other wastes into the environment.

The Aboriginal people are not completely opposed to the mine development, but they feel there must be some sort of financial compensation or job opportunities for their people (Nelson, 1995). The company estimates that the construction phase would create 200 jobs for a period of 18 months, followed by 180-200 full-time positions over the life of the mine. The company has expressed an interest in hiring Aboriginal people, but to what extent is still unknown (Environmental Assessment Office, 1995, 158). According to Morin (1995), a mine of this scale will drastically change the landscape and will have significant impacts on the surrounding ecosystem. In July 1994, through the purchase of New Canamin, the property was acquired by Princeton Mining, a consortium of Mitsubishi Materials, Dawa Mining, Furukawa Co. and Marubeni (Nelson, 1995). Mitsubishi's financing for the project is contingent on permit approval for the mine and a government infrastructure loan from the British Columbia Investment Office (Nelson, 1995).

In British Columbia, the *Environmental Assessment Act* was enacted on June 30, 1995. Historically, in British Columbia large-scale mega-project development in the late 1960s and 1970s had limited environmental assessments. For most of the projects, public

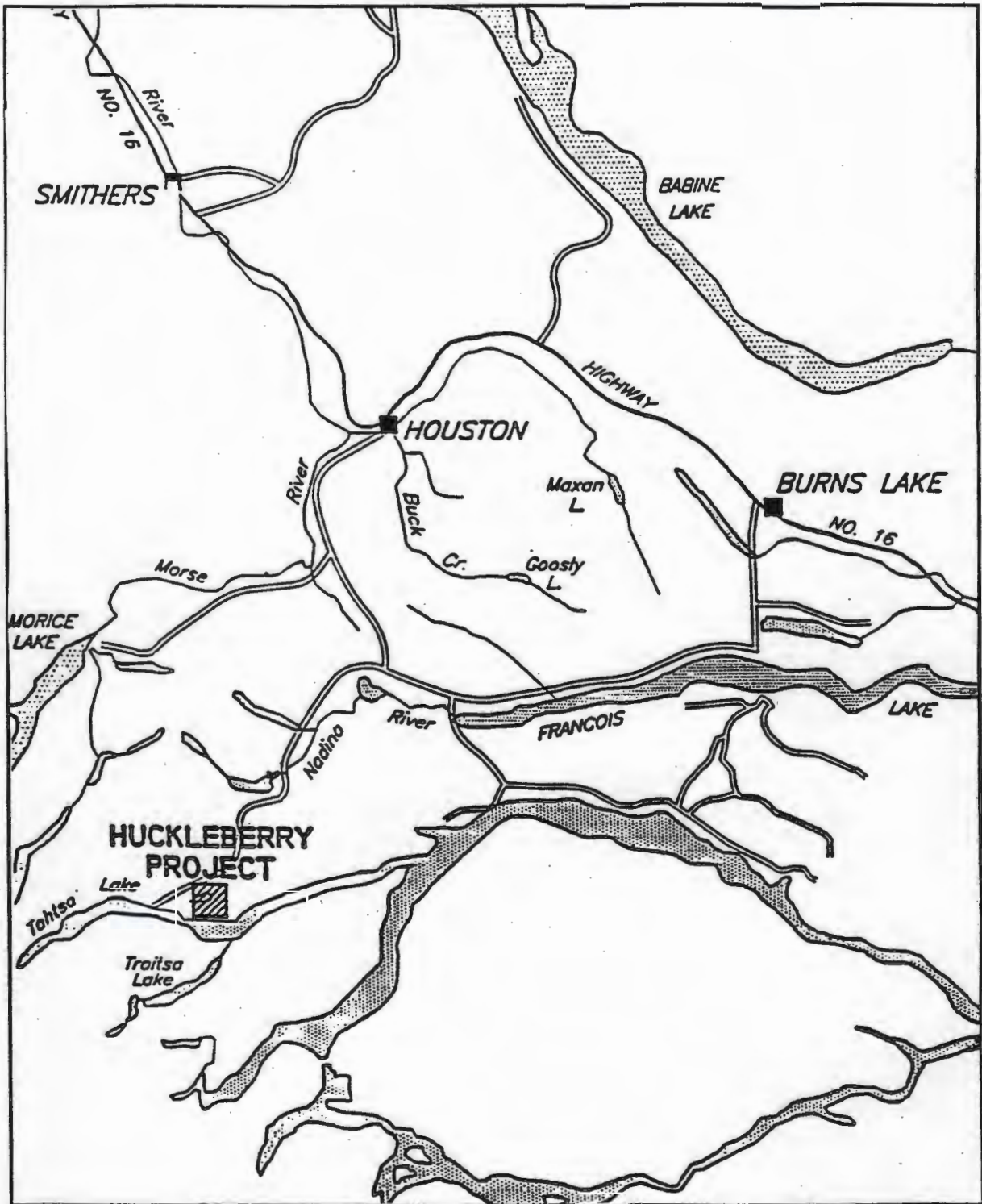


Figure 2. Regional map of the Huckleberry Mine locale (Huckleberry Mine, 1995).

input was limited and very few projects were rejected on environmental bases. Pressure for developing the *Environmental Assessment Act* was based on the lack of accountability by governing agencies. Previously, the process was extremely lengthy and there were no time restrictions so the proponent would often lose money while waiting for project approval. The new process has regulatory time lines which specify a certain amount of time each stage in the environmental assessment process should take to be completed. The project committee members and the proponent are responsible to ensure the time lines are enforced.

Beginning in 1992, the *Environmental Assessment Act* was initiated after lengthy consultation with various interest groups including the British Columbia Environmental Network, Union of British Columbia Municipalities, British Columbia Federation of Labour, Business Council of British Columbia, Canadian Association of Petroleum Producers, Council of Forest Industries, Mining Association of British Columbia, Vancouver Board of Trade and the West Coast Environmental Law Association and the public (Environmental Assessment Office, 1995). The focus was to get as much input as possible from various stakeholders in order to create a comprehensive and thorough Act (Environmental Assessment Office, 1995).

Reviewable projects already approved under the *Energy Project Review Process*, the *Mine Development Assessment Act* and the *Major Project Review Process* now have their reviews completed under the *Environmental Assessment Act* as of June, 30 1995 (Environmental Assessment Office, 1995, 1-13).

Huckleberry Mine was the first mining project to be subjected to the new legislation. Section 9 of the *Environmental Assessment Act* requires a Project Committee to be established for every reviewable project. The purpose of the Project Committee is to provide the Minister with policy and technical advice, perform analysis and make recommendations (Environmental Assessment Office, 1995, 2-2). The issues raised from the Huckleberry Mine Project Committee were Aboriginal interests, Acid Rock Drainage (ARD), fisheries habitat and cumulative effects (Environmental Assessment Office, 1995). Working groups were created to work on each of these areas of concern. According to Huckleberry Mines spokesperson, Jesse Harper, an important aspect of the review was to ensure that Aboriginal interests were not infringed upon by the proposed development (Harper, pers. comm., 1996). The objective for the Aboriginal Project Committee was to identify any outstanding Aboriginal issues which required resolution. Solutions ranged from economically-feasible modifications of the proposal to recommendations for compensation where impacts proved unavoidable (Environmental Assessment Office, 1995, 5).

In the case of Huckleberry Mine, Acid Rock Drainage was an issue of great concern for the committee members. There was a fear among members that development in the area would enhance the production of Acid Rock Drainage and potentially pose a threat to fish stocks. Although Acid Rock Drainage can be naturally occurring, it is worsened by highway development, logging road construction and, particularly, mining. Acid Rock Drainage occurs when sulphide minerals are exposed to the weathering effect of oxygen and water which results in sulphur being converted to sulphuric acid. The

development process breaks sulphide-bearing rocks apart, greatly increasing surface exposure and, therefore, the potential for producing acid. Due to the high sulphur content (>.3%) of the rocks in the site area, Acid Rock Drainage is a significant issue which could be exacerbated by the mining process.

The mine would directly affect fish habitat, therefore, the fisheries habitat working group reviewed the compensation plan prepared by the company to determine required measures to achieve the “no net loss of fish habitat” policy of the *Federal Fisheries Act* s. 25 (Environmental Assessment Office, 1995, 3). Finally, the project committee reviewed the cumulative environmental effects assessment of the proposed project in reference to the issues of existing works/projects which have impacted, or could impact, the environment such as the past flooding of Tahtsa Reach and the proposed salvage of timber from the same area. These issues may not be so problematic as to stop the development from proceeding, but they are basic issues which need to be considered in the environmental assessment process.

1.3 Methods

The first step was to undertake a thorough and extensive literature review. The major topics researched were: (1) environmental legislation, specifically the *National Environmental Policy Act* of the United States and the *Canadian Environmental Assessment Act*, (2) the British Columbia environmental assessment process and requirements of the *Environmental Assessment Act*, (3) the theoretical and prescribed

contents of an environmental impact assessment, and (4) the effects of mining on the environment.

The second step was to develop evaluative criteria to assess the *Environmental Assessment Act*. The criteria were developed from the literature and the contents of the *Environmental Assessment Act*. The evaluative criteria were used to evaluate the application of the British Columbia *Environmental Assessment Act* to the proposed Huckleberry Mine case study.

Third, for the Huckleberry Mine case study, documents from the Environmental Assessment Office, Project Registry and local newspaper articles were reviewed and analyzed. They were reviewed for content and completeness. Since most of the correspondence between Project Committee members occurred via the project registry and the local newspaper, these documents were used to determine whether or not issues were resolved.

Fourth, unstructured interviews were used to interview members of the Huckleberry Mine Project Committee. According to Li (1981, 45) the use of unstructured interviewing in field research which employs the method of participant observation is both appropriate and effective. The interaction between a researcher and the respondents in interviewing sessions also means that the researcher can gain insights about the subjects and continue to refine the research question and analysis as field work progresses (Li, 1981, 45). Babbie (1995, 289) and Jackson (1988, 31) conclude that unstructured interviews are appropriate for field research and a good rapport is often built up so that, if repeated interviews are required, a high response rate can be maintained.

Indeed, there are problems with using this type of method. Unstructured interviews are more complex and difficult to analyze (Li, 1981, 46). In addition, each interview is unique, depending on how the interview develops. Conversations are hard to quantify, and statistical comparisons are frequently restricted. All too often, the way questions are asked can subtly create bias in the answers obtained (Babbie, 1995, 289). Sometimes questions can be put in a particular context that altogether omits the most relevant answers.

Since the nature of this research was specific to one project and the individuals involved in the process were easily identifiable, unstructured open-ended interviews were conducted with representatives from different stakeholders groups who sat on the Huckleberry Mine Project Committee. The reason for having unstructured interviews was to accommodate the different expertise and interests of the Project Committee. Since there was not a standard level of expertise among the Project Committee members, questions were directed towards the interests and/or expertise the various committee members could provide.

1.3.1 Case Study

This research was designed to incorporate a case study. An advantage of using a case study included the ability to identify flaws in the implementation of the British Columbia environmental assessment process. The disadvantage was that many of the contentious issues identified by the Project Committee were specific to the Huckleberry

Mine. These same issues may or may not be relevant to another mining project in British Columbia.

1.3.2 The Literature Review

The major areas of the literature review were literature relevant to the Huckleberry Mine project and literature concerned with environmental impact assessment. The first area was useful in determining the extent to which the environmental impact assessment of the Huckleberry Mine was complete and accurate. Background information was also provided on the impact assessment process, open pit copper mining and the effects of mining on the ecosystem.

Most of the information researched focused on Canadian environmental impact assessments and specifically the development of environmental assessments in British Columbia. Information was utilized from the *Environmental Assessment Act* to determine the level of progression of current practices in the application of environmental impact assessment.

The second major area of the literature review examined the intent of the *Environmental Assessment Act* and generated evaluative criteria for assessing the *Environmental Assessment Act*. Literature relevant to environmental impact assessments was used to assess and evaluate the *Environmental Assessment Act*. In addition, the *Environmental Assessment Act* was evaluated in light of other recent Canadian Acts such as the *Forest Practices Code of British Columbia Act* and the *Canadian Environmental Assessment Act*. Both of these laws are recent attempts at environmental legislation in

Canada. Although the *Forest Practices Code of British Columbia Act* is not directly concerned with the specific details of environmental legislation, it is an important piece of legislation which relates to the management of forestry resources which are indirectly related to environmental issues. The provincial and federal Acts for environmental assessment are intended to harmonize. If a federal ministry is involved with a provincial project, the *Canadian Environmental Assessment Act* and the *Environmental Assessment Act* are designed to have one environmental assessment process to meet the requirements of both levels of government. Therefore, these two Acts provide relevant and important information to be compared and contrasted with the intent and purpose of the *Environmental Assessment Act*.

1.3.3 The Evaluation

The evaluation of the Huckleberry Mine environmental assessment was based on a set of evaluative criteria determined from the requirements of the *Environmental Assessment Act* and from a review of the literature. There were two sets of evaluative criteria created to evaluate the Huckleberry Mine environmental impact statement and the *Environmental Assessment Act*. The first set of evaluative criteria was used to assess the Huckleberry Mine environmental impact assessment to determine whether or not it provided all of the necessary information required by the *Environmental Assessment Act*. The evaluative criteria were based upon the requirements written in the *Environmental Assessment Act*. The Huckleberry Mine environmental assessment process will be assessed on whether or not it fulfilled the intent of the *Environmental Assessment Act*,

how complete the process was and how accurately the process was completed according to the requirements of the *Environmental Assessment Act*. The Huckleberry Mine environmental impact statement and the recommendations of the project committee were evaluated based on documents (letters, reports, minutes, memos) submitted to the project registry and/or personal interviews with members of the committee.

The second set of evaluative criteria was used to evaluate the *Environmental Assessment Act* and the process it mandates in the light of the literature and experience of environmental impact assessment in Canada and elsewhere. The evaluative criteria were identified from the *Environmental Assessment Act* and the literature.

The final step involved the analysis of the *Environmental Assessment Act* and the identification of areas of potential improvement. The evaluative criteria were identified from the requirements of the *Environmental Assessment Act* and what is suggested by the literature. Recommendations for improvement to the *Environmental Assessment Act* and the process in British Columbia will be provided in the final chapter of this report.

It is important to recognize the constraints of this research. Huckleberry Mine was accepted under the *Mine Development Assessment Act* (1990) which was to be abolished with the enactment of the *Environmental Assessment Act*. Thus, Huckleberry Mine was transferred over to the new environmental assessment process under the *Environmental Assessment Act*. Huckleberry Mine came in at a Stage Two of the environmental process and, therefore, it does not reflect the process from the beginning (Stage One). This does not make it any less significant and the Huckleberry Mine experience has revealed meaningful lessons. The second constraint is that there are no

other examples to compare with this process. Therefore, it is difficult to determine how effective the Huckleberry Mine environmental impact assessment process was in comparison with another mining project. This is not, however, a limiting factor in determining solutions and outcomes which will prove to be effective for future projects.

Before the Huckleberry Mine Ltd. environmental impact assessment process and the *Environmental Assessment Act* are evaluated, background information on environmental impact assessments and the effect of mining on the environment will be presented in the following chapter. Chapter two discusses the fundamental components of an environmental impact assessment and what the essential constituents are for a successful impact assessment according to the literature.

Chapter Two
An Overview of Environmental
Impact Assessment

2.0 Introduction

The purpose of this chapter is to outline the historical importance of environmental impact assessment in Canada and British Columbia. This cannot be complete without considering the "forefather" of environmental impact legislation: the *National Environmental Policy Act* (NEPA) of the United States. NEPA will be considered in reference to the establishment and influence of Canadian environmental law. In addition, the components which constitute a successful and comprehensive environmental impact assessment will be outlined. The literature described in this chapter will be used in chapter seven to evaluate the *Environmental Assessment Act*.

2.1 History of Environmental Impact Assessment

Although the term environmental impact assessment was not used until the 1970s, environmental assessments have been undertaken in Canada for at least 50 years (Couch *et al*, 1981, 1). There were a number of different factors which contributed to the development of a federal Environmental Assessment Act. Some of these factors were: (1) pressures from environmental literature (i.e. Rachel Carson's *Silent Spring*), (2) a sudden drop in numbers from the public which reflected a lack of confidence in technology and in the opinions of science, and (3) an increase in the amount of mega-projects which produced economic benefits but were also potentially environmentally disruptive (Couch *et al*, 1981, 3).

The *National Environmental Policy Act* was passed into law in 1969 and it was the first American attempt at environmental impact legislation. Its implementation,

history, subsequent amendments and treatment in the courts set a number of precedents and introduced a number of concepts such as scoping, which will be discussed later in this chapter. The objectives of the *National Environmental Policy Act* were (1) to create an environmental policy for the United States which would take responsibility of environmental planning and control over other government agencies, (2) to provide a wide range of alternatives to be examined in the case of project development and (3) have a detailed environmental impact statement of a proposal prepared by the federal agency supporting, funding or developing the project (Jain *et al*, 1993, 44). The *National Environmental Policy Act* integrated the public into the decision-making process and set the precedent of making an environmental impact statement mandatory. Also, the *National Environmental Policy Act* created terms and concepts specifically used in reference to environmental legislation. Terms never used before such as environmental impact statement, mitigation and cumulative effects provided new concepts when dealing with environmental issues. These terms will be discussed to a greater extent later in this chapter.

In 1974, the Canadian *Environmental Assessment Review Process* came into effect. Adjustments were made in 1977, and the *Environmental Assessment and Review Process Guidelines* were issued in 1984 by Order in Council under the *Government Organization Act*, 1979 (Canadian Environmental Assessment Research Council, 1987, 7).

In 1988, the *Environmental Assessment Review Process* became law; however, before this time proponents did not have to submit an environmental impact statement

and, more importantly, the entire *Environmental Assessment Review Process* was optional for most private projects. However, the enactment of the *Environmental Assessment Review Process* gave rise to the *Canadian Environmental Assessment Act* which replaced the *Environmental Assessment Review Process* when it was enacted in January 1995.

2.2 Highlights of the *Canadian Environmental Assessment Act*

The *Canadian Environmental Assessment Act* is divided into four environmental assessment processes: Screening, Comprehensive Study, Mediation and Public Panel Review. Screening and the Comprehensive Study are considered to be self-directed because they are conducted by the responsible authority for the project.

2.2.1 Screening and the Comprehensive Study

A screening systematically documents the environmental effects of a proposed project and determines the need to eliminate or mitigate these harmful effects, to modify the project plan, or to recommend further assessment through mediation or panel reviews (Canadian Environmental Assessment Agency, 1995, 2). Public involvement is at the discretion of the responsible authority.

The Comprehensive Study does not require public consultation until the Comprehensive Study Report is written. Generally, the public consultation takes place between 30 and 90 days. In the Comprehensive Study the responsible authority considers a wider range of factors than those considered in a screening. The Comprehensive Study

Report, which summarizes the findings of the Canadian Environmental Assessment Agency, is submitted to the Minister of the Environment. At this time there is opportunity for the public to provide comments and these are considered in the final decisions by the Minister of the Environment (Canadian Environmental Assessment Agency, 1995, 8).

2.2.2 Mediation and the Public Review Panel

Mediation and the Public Review Panel are considered to be independent assessments. Mediation is a voluntary process in which an impartial mediator appointed by the Minister of Environment helps interested parties resolve issues surrounding a project (Canadian Environmental Assessment Agency, 1995, 2). According to the Canadian Environmental Assessment Agency, public participation is confined to interested parties and they try to resolve their concerns and conflicts through the guidance of an independent mediator. The objective is to reach consensus on such issues as the potential environmental effects of a project and the most effective mitigation measures.

Where mediation is not appropriate or is not successful, the environmental assessment is conducted by an independent public review panel appointed by the Minister of the Environment. A review panel has the unique capacity to involve a large number of different stakeholders. For example, the public has the opportunity to become involved in determining the scope of the environmental assessment and to participate in public hearings about the project (Canadian Environmental Assessment Agency, 1995, 8). Although the federal Act incorporates public participation into the environmental

assessment process, according to the Canadian Environmental Assessment Agency (1995, 5), 99% of the projects will go through either Screening or the Comprehensive Study while the public Review Panel will occur only 1% of the time. At this stage, the public is able to establish guidelines for the proponent and there are public meetings to try to scope and identify the issues.

The federal environmental assessment process is applied whenever a federal authority exercises one or more of the following duties, powers or functions in relation to a project:

1. proposes a project;
2. sells, leases, or otherwise transfers control or administration of land to enable a project to be carried out;
3. contributes money or any other form of financial assistance to a project; or
4. exercises, in relation to the project, a regulatory duty (such as issuing a license, permit and approvals) that is included in the Law List regulation (Canadian Environmental Assessment Agency, 1994, 9).

Aside from the four “triggers” which initiate the *Canadian Environmental Assessment Act*, the regulations indicate which projects are also reviewable. There are four different regulatory lists: the *Comprehensive Study List*, the *Inclusion List*, the *Exclusions List* and the *Law List*. The federal regulations are strict in defining which project must undergo the *Canadian Environmental Assessment Act* process. If a provincial project falls under one of the above categories the management of the environment is shared federally and provincially. Federal agencies have a legislatively guaranteed opportunity to participate in the provincial process, either as a member of the project committee or by reviewing and commenting on specific documents. Each government makes its decision, but the two decisions are made on the basis of

information gathered and analyzed through a single process (The *Environmental Assessment Act*, 1994, s. 2 [8]).

2.3 Comparison of the British Columbia *Environmental Assessment Act* and the *Mine Development Assessment Act*

In order to gain an understanding of the changes in the *Environmental Assessment Act*, it is necessary to understand which processes it is replacing. The *Environmental Assessment Act* replaces the *Energy Project Review Process*, the *Mine Development Assessment Act* and the *Major Project Review Process*. Since the purpose of this project is focused on mining, the *Environmental Assessment Act* will be compared only to the *Mine Development Assessment Act*.

The *Mine Development Assessment Act* differs from the *Environmental Assessment Act* significantly. First, public participation in section 3(1)(a) in the *Mine Development Assessment Act* states:

After reviewing an application under section 2, the minister, with the concurrence of the Minister of the Environment, may where they consider it necessary in the public interest, refer the application to an assessment panel for the conduct of an inquiry into it...

This is not an open policy for public input into the certification approval process. In contrast, the *Environmental Assessment Act* attempts to involve the public to a greater extent. Under this Act, the Executive Director, from the Environmental Assessment Office, must give notice to the public inviting comments relevant to the assessment of the effects of the reviewable project (The *Environmental Assessment Act*, 1994, s.42 [1]). If an application is accepted, it is placed on the Project Registry within seven days and the

public has between 30 and 60 days to comment on the application. The Project Registry is designed to facilitate public access to documents pertaining to projects. All applications, comments, recommendations and decisions must be filed on this Registry (Environmental Assessment Office, 1994).

Second, in the *Mine Development Assessment Act*, there is no mention of Aboriginal issues or other cultural concerns. The *Environmental Assessment Act*, on the other hand, attempts to address issues raised by Aboriginal people. The application must specifically identify any information sessions or consultations that have taken place with Aboriginal people and it must identify any potential impacts on the exercise of Aboriginal rights (Environmental Assessment Office, 1994). The *Environmental Assessment Act* is an integrated attempt to involve both the public and various stakeholders in a thorough decision-making process. While these are the main differences between the *Mine Development Assessment Act* and the *Environmental Assessment Act* as they pertain to this research, additional differences will be highlighted in the description of the *Environmental Assessment Act*.

2.4 The British Columbia *Environmental Assessment Act*

The *Environmental Assessment Act* is the most recent attempt in environmental legislation to combine a number of different policies into one act. The purposes of this Act are:

- (a) to promote sustainability by protecting the environment and fostering a sound economy and social well being,
- (b) to provide thorough, timely and integrated assessment of the environmental, economic, social, cultural, heritage and health effects of reviewable projects,
- (c) to prevent or mitigate adverse effects of reviewable projects,

- (d) to provide an open, accountable and neutrally administered process for the assessment
 - (i) of reviewable projects, and
 - (ii) of activities that pertain to the environment or to land use and that are referred to the board in accordance with the terms of reference mentioned in section 51 (1)(c), and
- (e) to provide for participation, in an assessment under this Act, by the public, proponents, first nations, municipalities and regional districts, the government and its agencies and British Columbia's neighboring jurisdiction (The *Environmental Assessment Act*, 1994, s. 2).

The provincial environmental assessment process has three distinct stages, the application review (Stage One), the project review (Stage Two) and the Environmental Assessment Board (Stage Three). All of these stages are designed to flow into one another or if sufficient information is available the Minister can approve a project when it reaches the end of the specified stage (Figure 3). Public participation is required in all stages at specified times and there are strict timelines for each stage.

The application review (Stage One) is the initial stage in which the proponent submits an application for project development. The Minister appoints a Project Committee to review an application, and in turn, the Project Committee submits their recommendations to the Minister. The Minister has the option to accept the project or require the proponent to proceed to the project review period (Stage Two) and complete a project report (environmental impact statement). The Project Committee reviews the project report and informs the Minister of their decision. Once again the Minister must decide to accept the project or pass it on to the final stage viz.: an Environmental Assessment Board (Stage Three). The Environmental Assessment Board is a three member panel appointed by the Lieutenant Governor in Council to come to a conclusion at the end of lengthy meetings and extensive public consultation (The *Environmental*

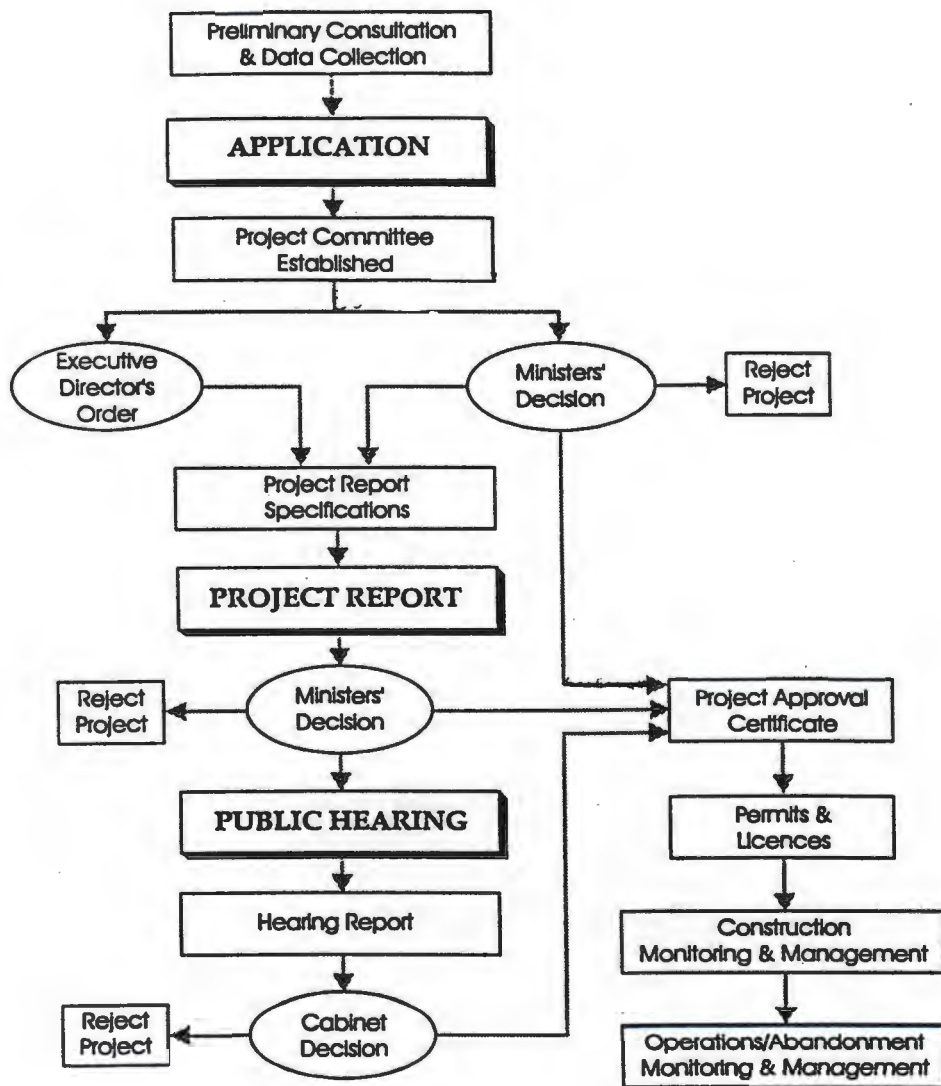


Figure 3. Outline of the Environmental Assessment Process in British Columbia (Environmental Assessment Office, 1995, 1-14).

Assessment Act, 1994, s.48). Expert witness may be subpoenaed to appear in court. The Minister does not have a say in the decision-making process in this stage. The final outcome is dependent on the Board's decision. Except for transitional projects, it is customary for all projects to begin at Stage One and progress to the following stages sequentially approved by the Minister.

The British Columbia *Environmental Assessment Act* is "triggered" under the Reviewable Projects section. The *Environmental Assessment Act* Section 3(1) states that the Lieutenant Governor in Council may make regulations prescribing what constitutes a reviewable project for the purposes of this Act. Under the Reviewable Projects Regulation, the review process typically applies to the construction, operation, dismantling and abandonment of new facilities and the modification, dismantling or abandonment of existing facilities. All projects subject to review must adhere to the regulations of the *Environmental Assessment Act*.

One of the unique features in the *Environmental Assessment Act* is the ability to incorporate the federal process when it is applicable. This is determined by the federal regulations outlined previously in this chapter. The concept of integrating the federal and provincial process has never been done previously in Canada. The history of federal-provincial relations suggests that harmonization is difficult to achieve; nonetheless, the federal and provincial governments are continuing to work on a harmonization agreement aimed at delegating to British Columbia all administrative responsibilities for projects which are primarily under provincial jurisdiction but which are subject to both the *Canadian Environmental Assessment Act* and the provincial act (Canadian Environmental

Assessment Agency, 1995, Appendix VII). The common goal of these two pieces of legislation is to have one environmental assessment process. The next section outlines the environmental assessment process and explains what an environmental assessment is and what are the necessary components for an assessment to be comprehensive.

2.5 The Environmental Assessment Process

Environmental assessment is the study of probable change in various socio-economic and biophysical characteristics of the environment which may result from a proposed action (Jain *et al*, 1993, 5). Over time environmental assessment has shifted from a single-purpose focus on ecological prediction to a more multifaceted approach to development planning and control that routinely includes social and risk analysis, impact management and analysis of cumulative effects (Sadler and Jacobs, 1991).

Many authors, practitioners and theorists have attempted to describe an ideal impact assessment process. Prescriptive analysis of environmental impact assessments has led to such conclusions as designing an environmental process to facilitate efficient implementation (Gibson, 1993, 21). Gibson (1993, 21) identified problems such as inefficiency in an environmental assessment which can potentially breed hostility as well as waste. In addition, Gibson (1993, 13) states that the environmental assessment process can foster the development of undertakings that are compliant with principles of sustainability and the broad public interest. Environmental assessment decision-making requires the critical examination of purposes and comparative evaluation of alternatives (Gibson, 1993, 17). The environmental impact statement is the summary of the findings

made through the environmental assessment process. Erickson (1994, 60) concludes that the goal of the impact assessment should be designed to improve the decision-making process under which projects are planned, designed and implemented. The scientific and technical difficulties inherent in impact assessment often obscure the fact that the object of the impact assessment is not the furthering of scientific knowledge, but the improvement of decision-making by considering the consequences of human actions (Erickson, 1994, 60).

The components of the decision-making process include an experimental base, a prediction system, a value system and a selection system. The experimental base defines the possible action that may be undertaken, as well as the goals and objectives that are to be considered appropriate (Erickson, 1994, 61). A fundamental component which facilitates the environmental assessment process is the environmental impact assessment.

2.6 Environmental Impact Assessment

An environmental impact assessment is a component of the environmental decision-making process. Environmental impact assessments are defined differently among various scholars and practitioners. Beanlands and Duinker (1983) refer to environmental impact assessment as a process or set of activities designed to contribute pertinent environmental information to a project or program decision. The Canadian Environmental Assessment Research Council (1987) similarly defines environmental impact assessment as a process which attempts to identify and predict the impacts of legislative proposals, policies, programs, projects and operational procedures on the

biogeophysical environment and on human health and well being. Hollick (1984) defines the environmental impact assessment as a complex body of methods for predicting and evaluating the probable environmental effects of a proposal in order to reach a balanced decision between environmental, technical and economic factors and to determine acceptable measure for mitigating the more serious environmental effects. Hollick (1984) concludes that there are three main factors which are important in formulating an environmental impact assessment: (1) ensure the process is unbiased, (2) require that the “polluter pays” for the assessment and (3) integrate the need to integrate environmental factors into project design. No common definition of environmental impact assessment has existed beyond the procedural direction provided by government guidelines, policies or legislation (Beanlands and Duinker, 1983, 23).

According to Beattie (1995, 109), environmental impact assessments are not science, they always contain unexamined and unexplained value assumptions and they will always be political. Science is a field involving observation, experimentation and hypothesizing. While this may not be the view shared by other professionals and academics, Beattie argues that environmental impact assessments are not designed to test and reform explanations, they are created to predict potential impacts (Beattie, 1995, 110). An environmental impact assessment lacks a significant experimental component, which means that environmental impact assessments cannot be repeated in the same time frame or under the same circumstances. One of the key features in the scientific process is repeatability.

Beattie (1995, 109) also claims that, although the field of science is an intricate part of the environmental impact assessment process, environmental impact assessments do not rely on the scientific process alone. Rather, they are much more encompassing and more focused on a single project. Beattie, (1995, 110) concludes “scientific knowledge is often respected above other kinds of knowledge in the public discourse because the scientific method has been a powerful tool in creating modern society and improving lives”. If environmental impact assessment practitioners behave as though the knowledge they produce is science, they are claiming the respect that scientific knowledge has gained over the years. This is potentially detrimental. There are lots of data and assumptions used in the environmental impact assessment which will not stand up to such scrutiny under scientific knowledge (Beattie, 1995, 111). By assuming that the environmental impact assessment is scientific in nature, it can be more critically analyzed. Even scientists are often unsure if they should interpret the results of their studies or merely present their findings (Beanlands and Duinker, 1983, 39). These conflicts can lead to public scrutiny while abandoning the scientific process. Environmental impact assessments are unique because they use the tools and techniques of science to derive statements. While environmental impact assessments incorporate both science and social science, these disciplines are equally vital contributors to the success of an environmental assessment process.

Beattie (1995,110) contends that most environmental impact assessments are undertaken under time pressure, therefore, data gaps and simplifying assumptions are not unusual. In order to create a comprehensible and efficient environmental impact

assessment, input from many different professionals is sought. The simple fact that environmental impact assessments are conducted to evaluate the impacts of a specific proposed action means that their focus is narrow from the beginning. Environmental impact assessments are biased in part because they cannot address courses of action outside this scope (Beattie, 1995, 111). It is imperative that professionals make biases known to the public in order to maintain an open process. Although environmental impact assessments often have hidden value biases and are inherently political, they are valuable and necessary because they represent a public attempt to document and evaluate the environmental effects of project and policies (Beattie, 1995, 112). Environmental impact assessments are essential to assess problems, the effects of a particular development of a project on the public and potential constraints a project poses.

2.7 Characteristics of an Environmental Impact Assessment

2.7.1 Scoping

Scoping is the initial step in the assessment process. It focuses on a range of issues which are significant and toward which the assessment should be directed (Jain *et al*, 1993, 77). The goal of scoping is to identify possible impacts and to minimize the influences of the assessment process by focusing attention on probable scenarios rather than improbable issues and concerns (Erickson, 1994, 64). The scoping process creates an overall managerial function by defining and setting assessment objectives, making personal assignments, and determining schedules and budgets (Erickson, 1994, 64). Scoping sets the monitoring boundaries in terms of what is to be monitored and to what

extent (Krawetz *et al*, 1987, 9). The main steps in the scoping process are to describe basic goals and objectives of the assessment. Thus, through this process, issues and problem are identified by different stakeholders and they establish a context for research is established (Krawetz *et al*, 1987, 9).

Figure 4 illustrates the chronological scheme of events used in the scoping process to identify impacts. Valuation of these impacts must be done by the assessment team by considering projects and site specific conditions of the physical and the social environment (Erickson, 1994, 66).

2.7.2 Prediction

Prediction, evaluation and mitigation are important parts of the environmental impact assessment process. Prediction is needed at the earliest stages when the project, including alternatives, is being planned and designed. It continues through to mitigation, monitoring and auditing (Glasson *et al*, 1994, 113). Prediction is not treated as an explicit stage in the process. There are a number of different models and methods which can determine how to predict different impacts. Checklists, matrices, overlay mapping, networks and modeling are five primary methods used for identifying and predicting impacts.

Checklists are a list of features which may be affected by a project. They aim to promote thinking about impacts, providing a concise summary of effects of proposals, identifying factors and the trade-off between alternatives (Smith, 1993, 18). Matrices were developed from a desire by professionals to link environmental factors with project

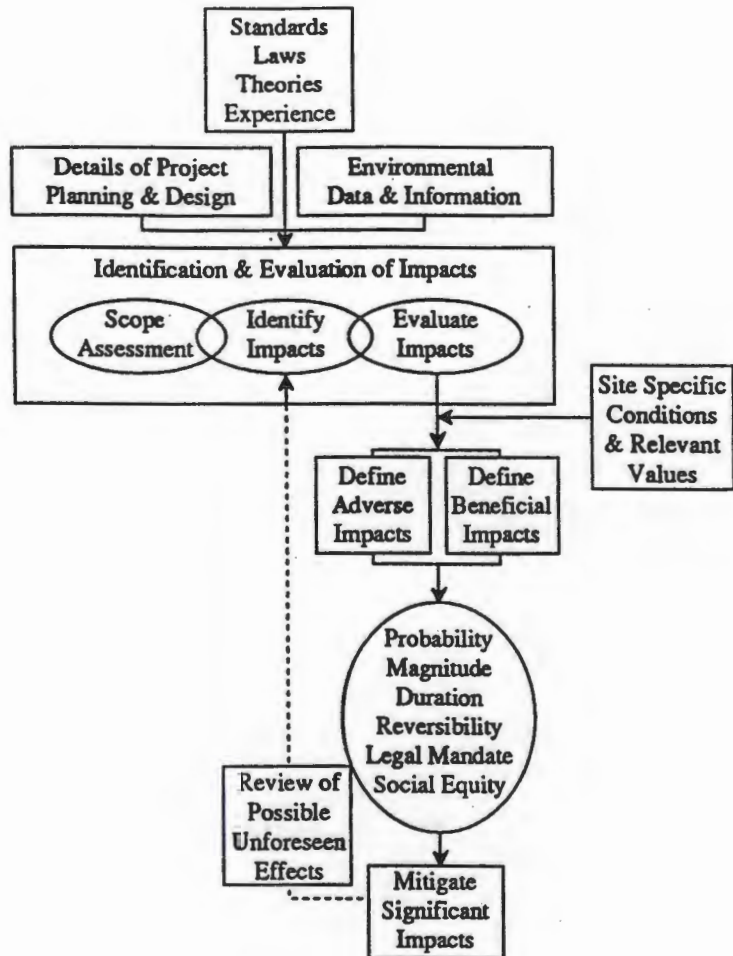


Figure 4. Key inputs and outputs related to the evaluation of impacts. Note that the broken arrow is a feedback mechanism requiring the review of proposed mitigation measures with respect to possible unforeseen consequences (Erickson, 1994, 67).

activities. Matrices are grid diagrams with one set of factors on the horizontal axis and another set on the vertical. The interaction between the factors on the two different axes is recorded in a presentational manner using symbols or numerical scores or in a mathematical manner using algebraic functions (Smith, 20, 1993).

Overlay mapping consists of a base map with a series of overlays. The overlays are transparent and summarize a set of environmental features of the existing environment according to value classes. Value classes denote physical constraints on the environment. Those with dark shading have high impact, medium shading have medium impact and no shading have no impact. The value classes are defined in both social and physiographic processes (McHarg, 1969).

Networks develop links between secondary, tertiary and primary impacts. Networks are directional diagrams designed to trace in two dimension the higher order of linkages between project actions and environmental factors. A network consists of a number of linked impacts known to have occurred in the past which are then used to trace the progression of causes and effects of various project actions (Smith, 23, 1993).

Simulation Modelling is a logical extension of networks to model interactions and varied orders of impacts. A wide array of mathematical, economic and natural systems modeling techniques are applied to estimate impacts. This particular method is extremely expensive and rarely used.

Each method has its own role in an environmental impact assessment, however, they are often stronger when used in conjunction with at least one other method. All of the methods described have a common tendency to describe impacts rather than evaluate

them (Smith, 1993, 26). Some do not explicitly consider impact significance distinct from impact magnitude, few make provisions for public input to balance the judgment of 'experts' and all are project-specific. Thus, as with all research strategies, the principles of reliability and validity make it prudent for analysts to utilize more than one method in an investigation (Smith, 1993, 26).

2.7.3 Evaluation

Having identified possible impacts of a project development, evaluating those impacts with respect to their significance is necessary. Although the word "impact" has acquired a quasi-legal and negative connotation, impacts are merely consequences of proposed action (Erickson, 1994, 66). The primary categories used to help frame a rationale for determining evaluative criteria are probability, magnitude, duration, reversibility, legalities, mandates and social equity.

Evaluation can be done in a number of ways. Methods range from quantitative to qualitative and from intuitive to analytical. The choice of evaluation method should be related to the task in hand and to the resources available (Glasson *et al*, 1994, 124). The most common evaluation method is the comparison of likely impacts against legal requirements and standards.

2.7.4 Mitigation

The *National Environmental Policy Act* defines mitigation as:

not taking certain actions, limiting the proposed action and its implementation; repairing rehabilitating or restoring the affected environment; presentation and

maintenance actions during the life of the action; and replacing or providing substitute resources or environments (Hildebrand and Conrad, 1993, 86).

Mitigation covers such areas as avoidance, preservation, rehabilitation, restoration, improvement, development and diversification (Erickson, 1994, 241-243). Mitigation measures are normally discussed and documented in each topic section of the environmental impact assessment (e.g. air quality, visual quality, transport and employment) (Glasson *et al*, 1994, 137).

Essentially there are two types of mitigation methods: structural and non structural.

Structural methods of mitigation are those that require major investments of money to design, construct and maintain features of the proposed project. They include such features as underpasses and overpasses designed for the migration of animals under and over highways, fish ladders and elevators and specially designed impoundment and wetlands. Structural methods also include fencing designed to control wildlife access to rights-of-way, as well, extensive terrestrial aquatic and wetland habitats specifically designed constructed and landscaped to provide food supply, shelter, and isolation (Erickson, 1994, 245-246).

Structural means of mitigation should only be considered once assessors determine that the intended mitigation cannot be achieved using non-structural methods.

Non-structural methods of mitigation generally include managerial protocols and often use inexpensive materials essential to mitigate certain types of impacts for example, dredging to avoid environmentally significant events, such as the migration of anadromous fish, and the storage of excavated soils so they can be replaced without mixing soil horizons (Erickson, 1994, 246). Non-structural mitigation methods are generally inexpensive and they do not require the placement of significant structures in the environment. Mitigation measures must be planned in an integrated and coherent

fashion to ensure that they are effective, that they do not conflict with each other and that they do not merely shift a problem from one medium to another (Glasson *et al*, 1994, 136).

2.7.5 Monitoring

Monitoring involves the measuring and recording of physical, social and economic variables associated with developmental impacts (Glasson *et al*, 1994, 166). Karr (1987), claims that biological monitoring is an essential component of all assessment analysis and the biological foundations used in such monitoring must include ecological insight from studies of the structure and dynamics of populations, communities and ecosystems. Monitoring provides the magnitude and information of impacts in time and space. It can be used to improve project management in addition to providing information on harmful trends before it is too late to take remedial action (Glasson *et al*, 1994, 167). Monitoring also provides on going essential data collection. Environmental impact monitoring involves comparing the impacts predicted in the environmental impact assessment and those that actually occur after implementation (Glasson *et al*, 1994, 167). For a monitoring program to be successful, three basic needs must be in place: (1) a statement of objectives or goals for the area monitored, (2) a program of monitoring data, and (3) an assessment of that data (Shoemaker, 1994, 15). Terms and conditions of approvals must be enforceable. Approvals must be followed by monitoring the effects, enforcement of compliance and its implementation (Gibson, 1993, 21).

Monitoring can contribute to long term improvements in project planning or in knowledge for future impact assessment (Krawetz *et al*, 1987, 12). However, since most projects have a unique location, work force and host community, the knowledge gained is contingent and of inferential value rather than of direct value (Krawetz *et al*, 1987, 12).

2.8 Design Principles for an Environmental Impact Assessment

Smith (1993, 40) argues that an effective environmental assessment process should encourage an integrated approach to the broad range of environmental considerations and be dedicated to achieving and maintaining local, national and global sustainability. Sustainable development was a term developed in the 1980s. Essentially it means that the needs of the present are met without compromising the ability of future generations to meet their own needs and extends to all the opportunity to fulfill their aspirations for a better life (Notke, 1994, 4; World Commission on Environmental Development, 1987, 8). Sustainable development is concerned with maintaining a healthy environment that can sustain a healthy economy and therefore permit a healthy society (Keating, 1994).

The dominant paradigm for impact assessment has emphasized the production of an impact statement as the means to provide information to the decision-makers regarding the appraisal of project implementation (Smith, 1993, 95). This narrow focus has inhibited the ability of impact assessment to address such issues as risk, uncertainty and cumulative effects (Smith, 1993, 96). Ideally, any environmental concerns should be addressed and prevented before they occur.

An environmental impact assessment should be designed to integrate local planning and indigenous knowledge where it is applicable. It is important to consider planning in a wider context of resource management as the initiation and operation of activities to direct and control the acquisition of resources, to transform and distribute the disposal of resources in a manner capable of sustaining human activities with a minimum disruption of physical, ecological and social process (Smith, 1993, 76).

Integrating the local planning process with the provincial environmental assessment process will aid in identifying potential conflicts with the goals of the community. In the British Columbia *Environmental Assessment Act* there is no requirement for local planning to be considered in the project report. Planning is only considered through the involvement of individuals on the project committee. Since all different levels of government are responsible on the project committee, there is the opportunity to ensure the proposed project does not infringe on the plans of another ministry. The *Environmental Assessment Act* contains information on the inclusion of the public in the decision-making process and the acknowledgment of Aboriginal concerns through a First Nations Consultation Plan (The *Environmental Assessment Act*, 1994, s. 22/23). Environmental decisions, whether incremental or holistic, contain benefits, costs and risks (Petak, 1980, 291). Therefore, planning must allow the decision maker to establish which risks and costs the public is prepared to incur (Petak, 1980, 299). Petak (1980, 299) states that public involvement is the only way decision makers can incorporate public concerns into the decision-making process.

2.9 Public Participation and the Environmental Impact Assessment Process

Public contributions are extremely important because communities need to be involved in the process and they provide developers the opportunity to explain their perspective. The meanings, perceptions and social significance of change tends to contribute the most information to an environmental impact assessment. In British Columbia (and throughout North America) there is substantial pressure from the public to be involved in the decision-making process. Under the *Environmental Assessment Act* (1994), public participation is a fundamental component in the process. Section 16 (1) of the *Environmental Assessment Act* states:

Within the prescribed period after any of the following steps in the review of a project, the executive director must give notice to the public, inviting comments relevant to that step, about the potential effects of the project. The public is invited to comment within a specified time frame (30 to 75 days).

According to Burdge *et al* (1995), public meetings by themselves are inadequate for collecting information from the public. Burdge *et al* (1995) conclude that questionnaires and survey methods are effective ways to obtain additional public information. However, all social research techniques rely on three basic methodological approaches: listening, observing and asking questions (Hostovsky, 1984, 9).

Despite considerable literature since the 1970s, a lack of understanding still exists among many decision-makers as to how public involvement fits in the planning process (Burdge *et al*, 1995, 33). Public involvement can aid the interpretation of the impacts for each group. It should be interactive with substantial communication between the agency and affected groups.

There are three main reasons to include public input in impact assessments: (1) the competence of the final decision is higher when local knowledge is included and when expert knowledge is publicly examined; (2) the legitimacy of the final outcome is higher when potentially affected parties can state their own case before their peers and have an equal chance to influence the outcome; and (3) public participation is identified with proper conduct and democratic government in public decision-making activities (Webler *et al*, 1995, 444).

Public participation provides crucial information to the environmental assessment process. Participation is important to identify local citizens and groups with special expertise that might be used by the assessment team to provide historical perspective to current environmental conditions, to contribute knowledge about the area and to aid in providing recommendations and contribute alternatives to the assessment team (Erickson, 1994, 166).

2.10 Components of an Environmental Impact Assessment

The characteristics of an environmental impact assessment typically define how an environmental impact assessment is completed. Generally, the main components of the environmental impact assessments are: risk assessment, cumulative impact assessment (CIA), ecological impact assessment and socio-economic impact assessment. Each of these four categories contain essential information for determining the impact of a project.

2.10.1 Risk Assessment

Risk assessment is concerned with how different societies, and elements within those societies, evaluate risk (Smith, 1993, 28). It involves three different components: risk identification, risk estimation, and risk evaluation. Risk assessment has developed as an approach to the analysis of risks associated with various types of development (Glasson *et al*, 1994, 7). It refers not to the intrinsic potential for harm or injury, but to the probability that an organism will experience that harm or injury (Erickson, 1994, 217). Both cumulative impact assessment and risk assessment are seldom done in an environmental impact assessment and, therefore, they reflect the failure of impact assessments to achieve their full potential (Smith, 1993, 28).

Often risk assessment is used in reference to exposure to toxic chemicals from development. However, distinguishing between toxic risks and the risk of other types of harm or injury is important. Essentially a statistical concept, the risk of experiencing toxicity reflects the fact that individuals in a biological population demonstrate a range of tolerance with respect to a toxic chemical (Erickson, 1994, 217). This type of risk assessment involves (1) compiling specific data and information regarding the types of chemical hazard that might be associated with project activity and the various factors influencing the exposure of humans and other species and (2) evaluating data and information for likely risks (Erickson, 1994, 222).

2.10.2 Cumulative Impact Assessment

Cumulative Impact Assessment (CIA) is the process of systematically analyzing and evaluating cumulative environmental change (Smit and Spaling, 1995, 83). It is an explicit attempt to analyze and monitor cumulative changes within a regional or landscape system that lends itself to the establishment of ecological thresholds or carrying capacities (Sadler and Jacobs, 1991). CIA results from the incremental impact of an action when added to other past, present and reasonable foreseeable future actions (Canter and Kamath, 1995, 312). Cumulative impacts can be classified as either homotypic or heterotypic (Canter and Kamath, 1995, 313). Homotypic impacts are developments of the same type in the same locality while heterotypic impacts are different developments in the same area.

These effects are of concern because they lead to a “piecemeal degradation” or loss of key environmental components and attributes that, not addressed, can lead to highly significant long term (if not irreversible) change in the human environment (Erickson, 1994, 231).

There are two different approaches to CIA. The first approach views the CIA as an information-generating activity using principles of research and design and scientific analysis (Smit and Spaling, 1995, 83). The second approach is to utilize planning principles and procedures to determine an order of preference among a set of resource allocation processes (Smit and Spaling, 1995, 88).

There are a number of different methods for CIA such as matrix models, causal analysis, meta-modelling, acceptable change scenarios and integrated resource

management. Matrix models use matrix multiplication techniques to determine the interactive effect of multiple projects on various environmental components (Smit and Spaling, 1995, 83). Causal Analysis uses flow diagrams to identify cause and effect relationships involving human and environmental components and interactions (Shoemaker, 1994, 19). Meta-modelling involves mathematical equations and computer simulation of an environmental system or system components (Shoemaker, 1994, 19). This method integrates various sub-models to analyze a range of spatial, temporal and system dimensions. Acceptable change scenarios are concerned with the use of ecological criteria to specify location and intensity of land uses (Shoemaker 1994, 19).

There is no universally adopted method for cumulative impacts. Commonly used methods are matrices or indices. It is desirable to use a method which integrates qualitative and quantitative information (Canter and Kamath, 1995, 320).

2.10.3 Ecological Impact Assessment

In order to comprehend the ecological impact assessment the term ecology will be defined in the context of an environmental impact assessment. Ecology includes the study of a species population (biota) communities and ecosystems, all of which should be considered in an ecological assessment (Morris, 1995, 197). Two key features to ecological dynamics are ecological succession and nutrient/chemical cycling.

2.10.3.i Ecological Succession

Succession refers to predictable ecological changes (Erickson, 1994, 106). The sequence of biological communities which replace one another is the sere. The sere is divided into three different stages: primary, development and climax. Seral stages or species will replace one another until a climax community is reached (Barbour *et al*, 1987, 230). Technically, succession is the entire progression of seral stages from the first community to occupy bare ground (pioneer community) to the climax community (Barbour *et al*, 1987, 231). Succession is further divided into primary and secondary classifications. Primary and secondary succession are characterized by predictable changes in species and in community processes which: (1) result from modification of the physical environment caused by the biota that use that environment and (2) accumulate in an ecosystem that is stable with respect to its overall climate (Erickson, 1994, 108). Communities are constantly changing to achieve a climax state. The evaluation of ecological impacts of most projects typically include consideration of impacts on seral succession (Erickson, 1994, 106).

2.10.3.ii The Ecosystem

The ecosystem consists of all organisms in a community as well as the abiotic factors with which they interact. Essentially there are two processes involved with ecosystems: energy flow and chemical cycling. These two processes are related because they both involve the transfer of substances through feeding relationships in the ecosystem. Energy enters most ecosystems in the form of sunlight and is converted to

chemical energy by autotrophic organisms and is consumed by heterotrophs in the organic compounds of food and dissipated in the form of heat (Campbell, 1993, 1133). Photosynthetic organisms acquire Carbon (C) and Nitrogen (N) from air, water and soil and they are converted to organic molecules which are consumed by animals. The development of Huckleberry Mine will have a significant impact on the terrestrial and aquatic biota. The intimate relationship between the trophic levels and food webs forms the fundamental basis to understanding the impact the mine will have on the environmental and how these relationships could be altered.

2.10.3.iii Trophic levels and food webs.

Aside from chemical cycling and recycling, another way to conceptualize the environment for the purpose of environmental impact assessment involves a detailed look at the trophic structure (Beanlands and Duinker, 1983, 5). Each ecosystem has a trophic structure of different feeding relationships which determines the route of energy flow and the pattern of chemical cycling (Campbell, 1993, 1132). Trophic levels are divided on the basis of nutrition. There are five different levels: primary producers, primary consumers, secondary consumers, tertiary consumers and detritivores. Primary producers are photosynthetic organisms which support all of the other levels. They use light energy to synthesize sugars and other organic compounds which they use as fuel for cellular respiration and as building material for growth. Primary consumers are herbivores, while secondary and tertiary consumers are carnivores and detritivores derive energy from

organic waste. All of these levels interact to make up the food web. The food web is an intricate and delicate system which are characterized by food chains.

Projects altering the physical and chemical environment may affect the biota at any level of the food web (Beanlands and Duinker, 1983, 5). Indicator species are generally not affected until advanced stages of the project. Relying on indicator species is a simplistic approach to effective monitoring. Karr (1987) claims that the use of indicator species is often flawed and he argues that the Guild concept provides an integrative ecological perspective for environmental assessment since it combines both population biology and the niche concepts. Practising ecologists are often forced to study species at lower levels in the trophic hierarchy and extrapolate upwards, or to rely more on professional judgment and intuition than on quantitative analysis (Beanlands and Duinker, 1983, 39).

The basic understanding of the intricate details composing the ecosystem are extremely important since any human development can potentially effect the natural processes. There are some fundamental rules presented by Morris (1995) which deal with ecological information: (1) no single ecologist can be expected to deal with all aspects of an ecological assessment (2) particular taxonomic groups or ecosystems can not be considered in isolation and (3) the ecological assessment should be coordinated with other components of an environmental impact assessment.

2.11 Socio-economic Impact Assessment

There are a number of different definitions for socio-economic impact assessment. Burdge *et al* (1995) describe social impacts as the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. The term must also encompass cultural impacts involving changes to the norms, values and beliefs that guide and rationalize people's cognition of themselves and their society (Canadian Environmental Assessment Research Council, 1987,11).

Socio-economic impacts can be significant for particular projects, nevertheless, they have often had a low profile in the environmental impact assessment (Glasson *et al*, 1995, 9). Some see the social and economic impact as two separate entities, while others combine them into one assessment. In order to thoroughly explain a socio-economic impact assessment, it will be separated into two different categories although they are both interrelated and significant when combined.

2.11.1 Social Impact Assessment

The development of projects can raise legitimate concerns from the public. There are two important reasons not to omit such concerns from social impact assessments: (1) positions taken by all sides in a given controversy are likely to be shaped by differing perceptions of the project and the decision to accept a set of perceptions while excluding another may not be scientifically defensible; (2) if the agency asserts that its critics are "misinformed" or "emotional", it is guaranteed to raise the level of hostility between

itself and community members which potentially may stand in the way of a successful resolution (Burdge *et al*, 1995, 16).

Social impact assessments tend to rely on public participation. All social impact assessments should have an effective public involvement plan to address the concerns of groups affected by a project. Groups affected by proposed actions include those who live nearby, who smell, hear, or see the development and individuals who are forced to relocate (Burdge *et al*, 1995, 25).

2.11.2 Social Impact Prediction

Social impacts result from the movement of people into the project area. The social impact is generally dependent on population influx and/or efflux. Several separate estimates are required to determine the population change directly due to the project: (1) the total number of employees moving into the impact zone; (2) the proportion of immigrant employees bringing their family; (3) the characteristics of these families (i.e. their size and age structure) (Chadwick, 1995, 35). The nature of the project will determine some of these factors. For example, during the construction stages there will be a larger number of short term residents. Once the construction phase is completed the population numbers are likely to decrease. With the influx of families into an area there is increased pressure on local resources. There will be more people using the health care, schools and community programs (Chadwick, 1993, 38).

2.11.3 Economic Impacts

Impact assessments typically reduce the complexity of economic impacts to a relatively simple model of project costs and project benefits (Erickson, 1994, 184). Although there are a number of other models, the cost-benefit model is frequently used. The cost-benefit approach is often over-simplified. This model categorizes the components into a black and white division when much of the world operates in the gray (Erickson, 1994, 184). The challenge is to be able to analyze the model by knowing what types of questions to ask i.e. Who will be employed? What are the environmental and social costs for this development? Costs which are almost impossible to predict such as environmental degradation and cultural change, are not addressed in these types of models. Cost-benefit analyses determine benefits of proposed projects but ignore distribution effects and attempt to assign dollar values to the intangibles of daily life and fail to consider hidden costs (Erickson, 1994, 185).

2.11.4 Employment Prediction

Ideally, the prediction of the direct employment impact on an area would be based on information relating to the recruitment policies of the companies involved in the development, and on individual decisions in response to new employment opportunities (Glasson *et al*, 1995, 20). In the absence of firm data on these and related factors, predictions need to be based on a series of assumptions related to the characteristics of the development and the locality. There are two types of predictive approaches: extrapolative and normative. Extrapolative methods draw on past and present data to

compare situations of employment with similar projects (Glasson *et al*, 1994, 21). Normative methods work backwards from described outcomes to assess whether the project in its environmental context is adequate to achieve them.

Regardless of the models used to predict economic benefit and social cost, a good rule to keep in mind is that the more specialist the staff, the longer is the training needed to achieve that expertise and, therefore, the more likely it is that the employees will not come from the immediate locality (Glasson *et al*, 1994, 22). Specialists, professional staff and managerial staff are likely to be brought in from outside or recruited either nationally or internationally. In other words, many jobs created may be in the lower income bracket, thus most of the economic benefits will not go directly to the people of the area. However, there may be opportunity for different companies to implement trades programs to further the careers of their employees. Individuals may be required to give a number of years of service to the company as pay back for their training. The length of employment will vary according to the life of the project and the various stages of development will require different numbers of workers.

2.12 Summary

All of the topics discussed in this chapter are extremely important features of an environmental impact assessment because they identify essential criteria for evaluating any environmental impact assessment or evaluating mandating legislation or guiding an environmental assessment process. If they are overlooked there may be drastic

repercussions for the environment, the environmental assessment process and the acceptance of a project.

Mining, like many large scale developments in British Columbia, requires, by law, extensive and detailed environmental impact assessments. Because mining can cause unfavourable environmental effects, it is important to comprehend the basic concepts behind mining practices and the wastes they produce in order to design an environmental impact assessment which will satisfy these potential areas of concern. The following chapter examines mining and the effects it has on the environment.

Chapter Three
Mining and the Environment

3.0. Mining and Waste Production

Copper is considered a scarce metal because it makes up less than 0.1% of the earth's lithosphere mass. Primarily, copper occurs in deposit as a sulphide. It is mined from low grade hydrothermal deposits of chalcocite (Cu_2S) and chalcopyrite (CuFeS_2) (Castillon, 1992, 320). These deposits are typically associated with igneous pyrite rocks. The focus of this section will be to assess the environmental impact of copper mines and to provide general background information on open pit copper mining.

Through the mining process, rock is extracted from the ground, whether from the surface through the use of a pit or strip methods, or underground through the use of a tunnel. The rock is processed, separating ore from overburden or other waste and is milled to produce a concentrate (Ellis, 1989, 70). Specifically, open-pit mining is used to extract massive or veined minerals or coal in rough terrain from near surface deposits. The pit is cut downward in "benches" or strips and slopes inward until at a certain depth it becomes non economical to go any deeper (Marshall, 1982). In order to ensure stability of the slopes, the excavation must be considerably larger than the ore.

One of the benefits of open-pit mining is that it offers a high degree of mechanization and a high ore recovery. However, according to Marshall (1982) and Ellis (1989, 69) there are a number of disadvantages: (1) there are large volumes of waste, (2) there are variations in the physical and chemical characteristics of the land from waste production, (3) there are changes in the ecosystem composition occupied by the mine, (4) there is a potential habitat loss for fish and wildlife, (5) there are negative visual impacts

(6) there are potential reclamation problems and finally (7) there can be Shadow Effects which will be discussed to a greater extent later in this chapter.

Mining produces two specific types of waste: waste rock and tailings. Waste rock is comprised of granular, broken rock and soil with particles ranging in size from fine sand or clay to boulders several feet in diameter (Hutchinson and Ellison, 1992, 20). The waste rock is carried by a dump truck along the heads or sides of valleys to minimize interference with natural surface water drainage. Rock waste heaps have the chemical potential to produce acid seeps underground, leaching toxic contaminants (Ellis, 1989). In a worst case scenario seeping water will combine into surface springs, polluting downstream fish habitats and affecting terrestrial wildlife. There are procedures to reduce the production of acid-generating potential due to the presence of sulphides. These practices include lining the facility and selectively depositing the more acid generating fraction of the material within cells constructed of non acid generating material, alternately co-mingling the acid with the non acid-generating material (Hutchinson and Ellison, 1992, 20-21). In order to minimize the inflow of water and oxygen the layer should be covered with a low permeability soil layer and a vegetative layer.

Waste rock includes both non-mineralized and low grade mineralized rock removed either from above or adjacent to the mineral ore (Hutchinson and Ellison, 1992, 19). The extent of mineralization, climate conditions and buffering capacity of the foundation soil beneath the waste rock pile determines the potential of the material to impact water quality (Hutchinson and Ellison, 1992, 19). Waste rock can have a high sulphide concentration and can give rise to Acid Rock Drainage (ARD) through exposure

to air, snow, rain and other climatic conditions (Sengupta, 1993, 185; Kipley *et al*, 1996, 74).

Tailings are uniform, finely ground rock particles from which most of the commercial ore has been extracted (Hutchinson and Ellison, 1992, 21). These tailings can be discharged as a slurry (“wet tailings”) or with the consistency of sand pores (“dry tailings”) (Hutchinson and Ellison, 1992, 21). The common disposal method is to deposit wet tailings in surface impoundment ranging in size from 12.36 to 1236 hectares. These can be any of the following: artificial ponds created by damming, natural water bodies or a combination of the two (Marshall, 1982). Eventually, the tailings can be released back into the environment through a number of different creeks which will reach a larger body of water.

The most obvious impacts of the disposal of mining wastes on the hydrosphere are sedimentation and the introduction of toxic metals (Ripley *et al*, 1996, 77). Tailings usually require containment and treatment over a period of time before being released to the environment (Ripley *et al*, 1996, 77). Soil covers (such as clay or silt) over tailings ponds show promise as oxygen inhibitors, but they are generally more effective in controlling infiltration of precipitation (Sengupta, 1993, 200). The effectiveness of soil covers as inhibitors of infiltration depend on such factors as climate, cover design and construction.

3.1. The Effects of Acid Rock Drainage

Serious problems can arise from reactions with either waste rock or tailings. Acid Rock (or Mine) Drainage (ARD) arises from the rapid oxidation of sulphide minerals and often occurs when such minerals are exposed to the atmosphere by excavation from the earth's crust (Ferguson and Erickson, 1989, 26). The formation of ARD involves the breakdown of pyrite (FeS_2) in the presence of water and oxygen to produce sulphuric acid (Kelly, 1988, 33). Acid drainage is a potential problem for mining wherever the rock matrix contains more acid-producing materials (such as pyrite and pyrrhotite) than acid consuming materials (carbonate or calcite) (Ripley *et al*, 1996, 159). Most acid streams occur as a result of mining activities (Kelly, 1988, 26).

The complexity of ARD is increased by the presence of specific bacteria which are capable of accelerating the process. The acidophilic chemoautotrophs *Thiobacillus ferrooxidans* (iron oxidizing) and *T. thiooxidans* (sulphur oxidizing) have been found in virtually all cases of ARD (Kelly, 1988, 35). These bacteria are able to utilize pyrites as an energy source and act as catalysts increasing the formation of ARD. They can also increase the rate of oxidation up to one million times (Kelly, 1988, 27). The implication for ARD is that it is impossible to control these bacteria since they are everywhere. The solution is to prevent ARD from occurring in the first place.

3.2. The Environmental Implications of pH Changes

pH is an intensity factor, measuring the concentration (or activity) of hydrogen ions. With respect to ARD, it is not the concentration of hydrogen ions, but their

availability to neutralize bases or their excess over other ions which makes ARD significant (Kelly 1988, 33). This is a feedback mechanism which controls the magnitude of shifts in pH. Below a pH of about 4.2, all carbonate and bicarbonate is converted to carbonic acid. This readily dissociates to water and free carbon dioxide (CO₂) which may be lost to the atmosphere. There are two major impacts from this: (1) the water loses its capacity to buffer changes in pH and (2) the destruction of the bicarbonate buffer system (Kelly, 1988, 36). Many photosynthetic organisms use bicarbonate as their inorganic carbon source. All aquatic organisms which live below pH 4.2 will have to adapt to a lack of bicarbonate buffering and aquatic plants will need to utilize free CO₂ as their inorganic carbon source. This assumes that the species will be able to adapt to these conditions; however, some species are not able to adjust and the end result is death.

Aside from the change in carbon source, the acid produced from ARD can have potential acidic effects on the water. There are significant concerns for aquatic life because they are not capable of choosing the environment in which they live. These organisms act as discrete indicators for human actions on land.

3.3. Determining the Production of Acid Rock Drainage

The production process for determining potential ARD generation should be done by comparing the ARD generation of similar and neighboring mines, undertaking a systematic sampling program to collect representative samples, and utilizing static and kinetic tests on the samples. Comparisons of ore and waste rock should be made with neighboring mines and similar geological and paleoenvironmental areas to obtain initial

indications of acid generation (Sengupta, 1993, 176). This comparison provides only generalized data due to the unique difference of each mine site. However, it can offer valuable indications of the relative ARD generation in an area.

3.3.1. The static test

The static test is usually the first step in the analysis of acid generation potential. This test estimates the balance between the acid generating and acid neutralizing capacities of a sample (Hutchinson and Ellison, 1992, 175). Essentially, the static test involves chemical analysis of rock sulfur availability, the neutralizing and acid generating potential of the sample rock. Despite the theoretical simplicity, static tests cannot be used to predict the quality of drainage emanating from waste materials at any future time (Sengupta 1993, 180). The quality of drainage is time dependent and relies on other factors such as mineralogy, rock structure and climate. The static test should be treated as a qualitative predictive method, i.e. it can only indicate whether a potential exists for the generation of net activity at some unknown time (Sengupta, 1993, 181). The static test is not designed to determine the effect of ARD over time or space or if the rock is exposed to biotic or abiotic factors. The kinetic test is much more thorough in this regard.

3.3.2. The kinetic test

Kinetic tests explicitly define reaction rates through time and under specific conditions. These tests involve three components: (1) the weathering (under laboratory-

controlled or site conditions) of samples in order to confirm the potential to generate net acidity; (2) the determination of the rates for acid generation, sulphide oxidation, neutralization and metal depletion, and (3) test control/treatment techniques (Sengupta, 1993, 181). The problem arises from the fact that these types of tests require long-term monitoring while, in many instances, mine development has occurred to the point where it can not be rectified if there is a problem. The ideal goal is to prevent ARD from occurring before it begins. Some control methods are presented in the recommendations section.

3.4. Direct Impacts of ARD and Mining

Ecological disturbance which can cause reactions in aquatic organisms include changes in acidity of water systems, increased magnitudes of suspended solids and increased quantities of dissolved heavy metal and other toxic substances (Ripley *et al*, 1978, 16). Changes in the pH of water systems can cause reduction in the numbers and diversity of fish and plant life. An excessive concentration of fine suspended solids can be harmful to fish by killing them or reducing their growth rate or decreasing their resistance to disease (Ripley *et al*, 1978, 17). Indirect effects may include modifying their natural movements and migration or reducing the amount of available food.

Aside from the potential production of ARD, mining has other significant impacts on the environment. Through the mining process, the removal of vegetation generally lowers the productivity of the area until reclamation activities have been successful (Ripley *et al*, 1996, 90).

The most obvious impact on terrestrial ecosystem structure is destruction of land forms and vegetation during construction of open pit operations (Ripley *et al*, 1996, 93). Vegetation may also be destroyed indirectly when microclimates are changed. Toxic wastes added to the atmosphere, soil, groundwater and surface waters may kill aquatic plants and animals and destroy terrestrial vegetation (Amiro and Courtin, 1981).

Human activity through the production of the mine site, and the construction of roads and access lines can intimidate wildlife, inhibit migration and increase mortality rates.

3.5. Shadow Effect

Many projects are large-scale developments which have wide ranging environmental effects. Some of these effects are secondary and they are not easy to predict or evaluate (Shoemaker, 1994, 25). Marshall (1982) refers to these secondary effects as "Shadow Effects". They are subtle effects which are neither visible nor immediate and which extend far beyond the site of the large-scale development (Marshall, 1982, 188). It is extremely difficult to predict what these effects will be and therefore, it is harder to anticipate their impact. For example, in the past, the production of ARD was often overlooked in the initial impact of the mine. Once a shadow effect has been discovered the mitigation of these effects is nearly impossible. Metal contamination is also a concern and it is often not apparent until many years later. Time is a critical factor in identifying shadow effects. They may not be apparent until many years after a mine is no longer operating. It is extremely important to identify the potential of the

shadow effects in the planning process, otherwise they can lead to environmental disaster and cause problems in the future.

3.6. Summary

Mining is an important part of the British Columbia economy. According to the British Columbia Ministry of Finance, in 1994 mining contributed 18% to the Primary Sector Gross Domestic Product second only to forestry. In addition, mining companies have the highest industrial wages for employees in British Columbia (Hallam *et al*, 1995, Volume VI, 1-1). Even though mining can potentially give rise to environmental catastrophes, if monitored and designed properly these problems should be avoidable. British Columbia has made an attempt to make proponents of large projects accountable for their actions. The following chapter will outline the evaluative criteria used to assess the Huckleberry Mine environmental assessment process and the *Environmental Assessment Act*.

Chapter Four

Evaluative Criteria for Assessing the Huckleberry Mine
Environmental Assessment.

4.0 Introduction

The *Environmental Assessment Act* contains 110 sections. To evaluate all of these sections in reference to Huckleberry Mine would be outside the scope of this research. Hence, the purposes of this chapter are (1) to develop relevant evaluative criteria which directly apply to the Huckleberry Mine environmental assessment process, and (2) to establish evaluative criteria for the *Environmental Assessment Act* directly using the requirements of the Act. Huckleberry Mine is unique because it is a transitional project having been transferred from the previously existing *Mine Development Review Act*; therefore, all the requirements in the *Environmental Assessment Act* do not pertain to it. Regardless, the following criteria play a central role in determining the adequacy of the environmental assessment process. The criteria from this chapter follow the chronological order in which issues were dealt with in the Huckleberry Mine process. In addition to following the sequence of events from the Huckleberry Mine process, the criteria tend to follow the order of appearance in the *Environmental Assessment Act*. For example, although transition projects are under section 93 of the *Environmental Assessment Act*, it was the first step in the Huckleberry Mine process and therefore it will be the first criterion.

A number of questions will be raised to evaluate the process, however, since these questions form the fundamental basis for the evaluation of the Huckleberry Mine process, they will remain unanswered until the following chapters where they will be discussed. Background information on the topics will be provided according to their contents in the *Environmental Assessment Act*. Questions will be raised at the end of each section.

These questions will be designed to relate to the Huckleberry Mine environmental assessment process and determine whether or not these objectives were a part of the process.

4.1 Transition

Projects already submitted under either the *Energy Project Review Process*, the *Mine Development Assessment Act* or the *Major Project Review Process* were transferred over to the new environmental assessment process when the *Environmental Assessment Act* was proclaimed on June 30, 1995. Transition provisions in section 93 of the *Environmental Assessment Act* were used to place these projects in the new environmental assessment project review process at the step that most closely approximates their review progress to date (Environmental Assessment Office, 1995, 1-13). The three previous processes became obsolete and projects under the old processes had to be completed under the *Environmental Assessment Act*. In reference to the Huckleberry Mine it is appropriate to ask how smoothly the transition was effected and, was the designated stage of the environmental assessment process appropriate for the progress made in the proposed development of the mine?

4.2 Project Committee

After an application for a project approval certificate has been screened, a project committee is formed. Every reviewable project which is subjected to the *Environmental*

Assessment Act must have a Project Committee. The purpose of the Project Committee is to:

- (a) provide to the Executive Director, the Minister and the responsible minister expertise, advice, analysis and recommendations, and
- (b) to analyze and advise the Executive Director, the minister and the responsible minister as to,
 - (i) the comments received in response to an invitation for comments under this Act
 - (ii) the advice and recommendations of the Public Advisory Committee, if any, established for that reviewable project,
 - (iii) the potential effects, and
 - (iv) the prevention or mitigation of adverse effects (The *Environmental Assessment Act*, 1995, s. 10).

The Project Committee is established by the Executive Director. The members present on the committee are provincial agencies, federal agencies, any municipality or regional district in the vicinity of the project or in which the project is located, any First Nations in British Columbia whose traditional territory is included in the site of the project or is in the vicinity of the project (Environmental Assessment Office, 1995, 2-3). Members will typically have regulatory responsibilities in relation to the project or will possess expert knowledge about issues raised by the project or potential effects of the project on the programs or interests of the agency, local government or First Nation which they represent (Environmental Assessment Office, 1995, 2-3).

After the Project Committee is established government agencies or First Nations which were not represented on the committee may be invited by the Executive Director to attend committee meetings or to join the committee where the party has specific issues which affect that party (Environmental Assessment Office, 1995, 2-3).

Some questions about the Huckleberry Mine environmental assessment process are: (1) Was there a Project Committee established? (2) What was its composition? (3) Who was on the Project Committee? (4) How many people were present on the Project Committee? (5) Were the appropriate stakeholders initially present on the Project Committee? (6) Did they provide competent expertise in their respective fields? (7) Did they complete their objectives of providing the Minister with expertise, advice, analysis and sufficient recommendations after considering all of the issues?

4.3 Public Advisory Committee

The Public Advisory Committee is a committee whose existence is optional under the *Environmental Assessment Act*. It is designed to provide a forum for identification and discussion of public concerns about the proposed project and to advise and make recommendation to the Project Committee on matters of public concern.

Since the decision to establish a Public Advisory Committee is discretionary, its creation will depend on a number of different factors: public interest and concern, evidence of the need for a structured forum for public discussion, and the need to coordinate and integrate public input on a project (Environmental Assessment Office, 1995, 4-3). Once again, the Executive Director will appoint members to the Public Advisory Committee and the members should reflect the broad range of public views and interests in the project.

There are a number of different activities a Public Advisory Committee can do in order to complete the tasks identified in the Terms of Reference:

1. identify specific public concerns which need to be considered in the review of proposed projects;
2. reviewing features of the project from the public's perspective, such as project design, proposed mechanisms for mitigation, proposed monitoring of potential adverse impacts, and other related issues for which the Project Committee requests advice;
3. providing a forum for clarification of issues of concern through discussion with members of the Project Committee, other government officials and/or the proponent;
4. assisting the public in understanding the environmental assessment process, the proposed project, and the potential effects of the project;
5. providing local knowledge and advice to the proponent in preparation for impact assessment studies;
6. presenting oral or written reports and recommendations to the Project Committee which identify areas of consensus among committee members, and any areas of disagreement with the basis for disagreement explained;
7. assisting with project monitoring and liaison during the implementation phase (Environmental Assessment Office, 1995, 4-3).

In regard to the Huckleberry Mine environmental assessment process, was a Public Advisory Committee formed? Did they meet the goals and objectives stated in the *Environmental Assessment Act*? Did the Public Advisory Committee aid in the dissemination of information to the public?

4.4 Amending an Application

If the proponent wishes to make a material change to a project, or to the manner of project implementation, a written request must be submitted to the Executive Director with particulars of the proposed changes and a request to amend the application (Environmental Assessment Office, 1995, 3-7). The Executive Director, on the recommendation of the Project Committee, will prepare an order either accepting or

rejecting the application for amendments (Environmental Assessment Office, 1995, 3-7). The public has the opportunity to comment on any amendments before they are adopted.

Notice of amendments are placed on the public registry within seven days for public access and comments. The Executive Director has 60 days to either accept or refuse any amendments (The *Environmental Assessment Act*, 1994, s. 13).

Material amendments to an application which significantly alter a proposed project or its location should be distinguished from routine changes which occur in response to feedback provided to the proponent during the project review process (Environmental Assessment Office, 1995, 3-7). Generally, amendments are made to improve project design and reduce unnecessary impacts. In the case of Huckleberry Mine, were there any amendments to the project report? If so, were they dealt with appropriately? What influence of change determine whether or not an amendment to an application must be considered? Are these standards for considering an amendment to a project report?

4.5 Public and First Nations Information and Consultation

Once a project has been accepted for review, the Executive Director in consultation with the Project Committee must make a written assessment of the adequacy of any measures that the proponent has taken or proposed relating to the distribution of information about the reviewable project that is the subject of the application (The *Environmental Assessment Act*, 1994, s. 14 [b]).

The written assessment may include one or all of the following measures:

1. the advertisement of the application for a project approval certificate

2. public consultation
3. consultation with one or more First Nations
4. the distribution to persons or organizations, specified by the Executive Director, of copies of the application or notices of their availability for inspection at one or more locations specified by the Executive Director (The *Environmental Assessment Act*, 1994, Section 14 [3]).

The proponent must advertise the availability of the application or project report (The *Environmental Assessment Act*, 1994, s. 14 [2]). The Executive Director will specify a time period for these time measurements to be met. Either the Environmental Assessment Office or the proponent will be responsible for carrying out these measures.

The proponent is largely responsible for covering the costs of advertisement and distribution of material for public consultation (The *Environmental Assessment Act*, 1994, s. 15). However, if consultation activities are jointly sponsored by the proponent and the Environmental Assessment Office, the Executive Director may direct that the costs of these activities be shared between the two parties (Environmental Assessment Office, 1995, 4-2).

Both the public and First Nations are invited to provide written commentary on an application for a period between 30 and 75 days (*Prescribed Time Limit Regulations*, 1995, 6 [2b]). The Executive Director determines the amount of time for required for written commentary. All comments received are filed on the Project Registry. In reference to Huckleberry Mine the following questions will be used to evaluate the extent of public/First Nation participation and involvement in the process: (1) Were the public and First Nations involved? (2) What measures were taken to ensure there was ample opportunity for public and First Nation comments to be received and reviewed by the

Project Committee? (3) Were all of the issues raised from these interest groups addressed? (4) Aside from the proponent, was the government involved with the public and First Nation consultations? (5) Were the public/First Nations included to participate on the Project Committee? (6) Did the process represent an open and fair opportunity to have public/First Nations involvement? (7) Was an application for a project certificate approval advertised? If so, were the public invited to comment?

4.6 Review of a Project Report

4.6.1 Notification of Public Comment Period

Once a project report is received, the Executive Director must give notification of its placement on the Project Registry. The Executive Director invites the public to comment within a specified time frame (45 to 60 days) which will commence not less than seven days after the notice is given (*Prescribed Time Limits Regulation*, 1995, s. 6 [2b.]). Was notification given on behalf of the Huckleberry Mine?

The proponent is required to conduct consultation programs with the public and First Nations and to report on the results of the programs in the project report, together with plans for further information distribution and consultation (Environmental Assessment Office, 1995, 6-2). Consultation at the project report review stage is focused on two-way dialogue and on collaborative opportunities intended to resolve outstanding issues raised during the application review phase (Environmental Assessment Office, 1995, 6-2). In the case of Huckleberry Mine, did Huckleberry Mine provide notification

of the project report? How adequate was it? Were consultation programs initiated by the proponent?

4.6.2 Project Report Review Comments and Responses

Within seven days after the conclusion of the project report review period, the Executive Director must assemble and forward all comments received on the project report to the proponent, inviting a response to the comments (Environmental Assessment Office, 1995, 6-3). The proponent is given an opportunity to respond to the comments received on its project report. In reaching conclusions at the end of the project report review stage, the Project Committee is required to consider, in its deliberations, the comments received from the government agencies, local government, First Nations, the public and the Public Advisory Committee (if there is one) (Environmental Assessment Office, 1995, 6-3). In reference to Huckleberry Mine, how well did the Executive Director amalgamate the public concerns and comments and respond to them? Did any of the comments raised by the public lead to changes to the project? Were there any outstanding concerns which were not addressed by the Project Committee?

4.6.3 The Project Report

The purpose of the project report is to provide a customized set of requirements for the preparation of the project (or detailed impact assessment) (Environmental Assessment Office, 1995, 5-2). The project report specifications determined by the

Executive Director may identify, and require the project report to contain or be accompanied by, information and analysis that reveal, explain or give particulars of :

- a. the rationale for the project,
- b. the site selection procedures for the project, the reason why the site was chosen and a description of alternative sites considered,
- c. the existing environmental, economic, social, cultural, heritage and health characteristics and conditions that may be affected by the project,
- d. the potential for direct and indirect effects of the project,
- e. alternatives to the methods of construction, operation, modification,
- f. dismantling or abandonment proposed in the application,
- g. the potential effects of the alternatives referred to in paragraph (e),
- h. the potential impacts on the exercise of Aboriginal rights,
- i. health issues,
- j. the potential for accidents with adverse effects,
- k. data necessary or useful to enable the assessment of the probable cumulative
- l. effects of the project,
- m. the potential cross-boundary effects of the project, and
- n. means of incorporating energy efficiency and energy conservation measures into the design and operation of the project (The *Environmental Assessment Act*, 1994, s. 22).

Within 20 days following the issuing an order for a project report, the Executive Director must prepare the project report specifications which are then subject to a review period of 15 to 30 days for comment by the government, First Nations and the public (Environmental Assessment Office, 1995, 5-1). The final specifications are issued within twenty days of completing the review period. There is no timeline for completion of the project report (Environmental Assessment Office, 1995, 5-3). The time required will depend on the project, the availability of environmental assessment information, and the proponent's schedule (Environmental Assessment Office, 1995, 5-3).

Outstanding questions related to the Huckleberry Mine process are : (1) Did the Huckleberry Mine project report contain each of these different categories (a-n)? (2)

What were the contents of the Huckleberry Mine project report? (3) Were the objectives of the project report clear and concise? (4) Did it address all of the issues posed by the mine development? (5) Were the data collected complete and thorough? (6) Were sufficient methods used to collect the data? (7) Were there any outstanding issues which should have been included in the project report and were not?

4.7 Concurrent Permitting

The proponent is able to apply for concurrent permitting any time after the acceptance of an application for review, but no later than the date of submission of the project report (Environmental Assessment Office, 1195, 6-5). Concurrent permitting is the ability of the proponent to apply for certification and all required permits at the same time. Traditionally, certification is given and then the proponent has a number of different tasks to complete before the responsible ministry will provide the appropriate permits. The ability to process concurrent approvals will depend upon the proponent providing the necessary information and adequate details in the application. Controversial issues identified by the Huckleberry Mine process were, did Huckleberry Mine attempt to apply for concurrent permits? Were they successful? Is the logic of concurrent permitting realistic?

4.8 Recommendations of the Project Committee

In making a referral under this section of the *Environmental Assessment Act* for a project approval certificate, the Executive Director must take into account the application,

the project report and any comments received about them (The *Environmental Assessment Act*, 1994, s. 29 [1]). The Executive Director must refer the application for a decision within 70 days after the expiration of the time for receipt of comments under section 16 (2) (public comments on steps in the review process) of the *Environmental Assessment Act* (*Prescribed Time Limit Regulations*, 1995, s. 15). With respect to Huckleberry Mine, were recommendations provided by the Huckleberry Mine Project Committee? Were they realistic and extensive?

4.9 Ministerial Decision

After review of the project report, the Minister of Environment, Lands and Parks has 45 days to make a decision whether or not to certify a project or require that a public hearing be held (*Prescribed Time Limit Regulations*, 1995, s. 16).

- 1 (b) The minister with the concurrence of the responsible minister may
 - (i) issue a project approval certificate to the proponent and attach any conditions to the certificate that the ministers consider necessary,
 - (ii) refuse to issue the project approval certificate to the proponent, or
 - (iii) refer the application to the Environmental Assessment Board for the public hearing required under section 52,
- (c) The ministers must give written reasons for the decision under subsection (1)
 - (b) (The *Environmental Assessment Act*, 1994, s. 30).

With respect to Huckleberry Mine, what was the Minister's decision? Was the project approved on condition?

4.10 Conditions on Project Approval Certificates

Monitoring plans are generally considered conditional on permitting. They should specify the parameters which need to be monitored such as: unforeseen impacts during the construction or operational phases, the sampling protocol and the analytical procedures.

(1) A project approval certificate may contain, in addition to other conditions attached under this Act, conditions that require the holder of the certificate, on an ongoing basis,

- (a) to monitor any effect of the project,
- (b) to compare the anticipated effects of the project, as set out in the project report with the *Environmental Assessment* Actual effects of the project,
- (c) to evaluate the adequacy of the measures taken by the holder to prevent or mitigate any adverse effects of the project, and
- (d) to report in writing to the Executive Director the results of the activities described in paragraph (a) to (c).

(2) The conditions that, under this section or another provision of this Act, may be attached to a project approval certificate for a reviewable project include conditions applicable to the construction of that reviewable project and, after completion of its construction, to the subsequent operation, modification, dismantling or abandonment of the facilities constructed (The *Environmental Assessment Act*, 1994, s. 38 [1][2]).

Questions related to Huckleberry Mine were (1) did the Huckleberry Mine monitoring plans meet the requirement of section 38? (2) Were monitoring plans in place for Huckleberry Mine to handle metal contamination or Acid Rock Drainage? If not, when will they be established? (3) Was there any indication what Huckleberry Mine intends to do for reclamation, wildlife habitat enhancement and emergency situations?

4.11 The Project Registry

The Project Registry is designed to facilitate public access to relevant documents and records. The Executive Director must ensure that documents are promptly placed on the Project Registry and the specified time lines are met. Filing documents on the public registry must be completed seven days after receipt or acceptance of a document by the Environmental Assessment Office (Environmental Assessment Office, 1995, 2-5). With respect to Huckleberry Mine, was the Project Registry designed to facilitate easy public access to documents? Was the placing of documents on the Project Registry timely? How effective is the establishment of the project registry?

4.12 Offenses and Penalties

A person commits an offense if he or she undertakes or carries out an activity that is a reviewable project or construct, operate, modify, dismantle or abandon the facilities of a reviewable project unless the person first obtains a project approval certificate for the project. An offense is also committed if an individual does not comply with the requirement provided for certification. The penalties can range from \$100, 000 to \$200, 000 depending on the severity of the offense. In reference to Huckleberry Mine, were these penalties stiff enough? Were they supportive of environmental protection? Did the penalties support the optimal goal of sustainability by holding offender accountable for their actions?

4.13 Evaluative Criteria

Table 1 is a summary of the relevant evaluative criteria headings outlined in this chapter. The criteria will be used for following chapters to ascertain (1) whether or not the Huckleberry Mine environmental assessment process fulfilled the requirements of the *Environmental Assessment Act*, (2) if the outlined criteria were present in the assessment process and if they were adequately completed, (3) whether or not the process thorough, open and fair and (4) whether or not the process represent an “ideal” environmental impact assessment outlined by the contents of the *Environmental Assessment Act*. In addition, these criteria will be used to evaluate the *Environmental Assessment Act* itself. Aside from utilizing criteria from the *Environmental Assessment Act* alone, evaluative criteria were also be identified from the *Guidelines to the British Columbia Environmental Assessment Process*.

4.14 Guidelines and References for Environmental Assessment

The *Guidelines to the British Columbia Environmental Assessment Process* is designed to describe the requirements of the *Environmental Assessment Act* in British Columbia. It is intended to assist proponents, government agencies, first Nations and the public in understanding the environmental assessment process (Environmental Assessment Office, 1995, ii). Although the guide is only a tool to explain the process, it contains pertinent information which is important for ensuring a comprehensive process will be undertaken; therefore, elements of the Guidelines were identified as evaluative criteria.

Table 1. List of headings for evaluative criteria used for the Huckleberry Mine process based on the requirements from the British Columbia *Environmental Assessment Act* and Regulations. (The questions or criteria used to evaluate the project under each of these headings are found in the text of this chapter).

Section of The <i>Environmental Assessment Act</i>	Headings of Criteria Evaluated
Transition	
Section 93	Transition of a project
Committees	
Section 9	Project committee
Section 11	Public Advisory Committee
Amendments to an Application	
Section 12/13	Discretion to allow amendments
Distribution of Information for Comments	
Section 14	Public/First Nations Consultation
Section 15	Cost of Advertisement
Section 16	Public/First Nations Commentary on Project Report
Section 18	Proponent's response
Preparation of a Project Report	
Section 21/22	Project Report rational site selection direct/indirect effects alternative methods potential effects of the alternatives impacts of Aboriginal rights health issues potential accidents potential cross-boundary effects
Review of a Project Report	
Section 27	Concurrent process under enactments
Section 29	Project Committee Recommendations
Section 30	Ministerial Decision
Project Approval Certificate	
Section 38	Conditions of Project Approval Monitor effects Compare anticipated effects Prevent/mitigate effects
Administration of the Process (Section 61)	
Sanctions	
Section 76 -78	Project registry Offenses and penalties

4.14.1 Assessing Environmental Effects

Environmental effects include impacts on physical and biological attributes and related ecosystems functions, natural processes, and the effects on land and resource uses (Environmental Assessment Office, 1995, Appendix I, 4). The proponent should discuss specific requirements for data collection and analysis with the responsible government agencies. Depending on the project circumstances and setting, one or more of the following may be incorporated into the project study (Environmental Assessment Office, 1995, Appendix I, 4-5):

1. the scope, timing, and methods of baseline inventory studies, all of which are typically addressed early in the project planning, since an initial question is whether or not sufficient reliable baseline information exists to determine the current background environmental characteristics and conditions of the project setting.
2. the collection of regional-scale, and cumulative impact information and the respective responsibilities of proponents and government agencies in providing data which are not strictly project-specific in nature.
3. data collection and analysis, focused on addressing specific issues related to project design, and mitigation, clearly defining the suspected cause and effect linkages and undertaking targeted studies to resolve these issues.
4. project design in the context of ecological constraints, with an emphasis on sustaining ecosystem integrity, productivity and diversity.
5. ensuring that environmental data collection and analysis complement provincial databases and employ approved methods.

The *Guidelines to the British Columbia Environmental Assessment Process* suggest the environmental areas to be considered for analysis are: climate and air quality, hydrology and water quality, terrain and natural hazards, soil and vegetation, wildlife resources, aquatic resources, recreation and tourism, forest resources, agricultural resources and finally, mineral and petroleum resources. In light of Huckleberry Mine, some questions relating to the environmental effects assessments are as follows: (1)

Were appropriate and approved methods used to collect data for a baseline inventory? (2) Were cumulative effects addressed and analyzed efficiently? (3) Was the project designed appropriately to consider ecological constraints and how these effects could be mitigated? (4) Were the data collection and analysis focused on addressing issues related to the project design?

4.14.2 Assessing Economic Effects

Economic effects generally include impacts on employment, income, infrastructure and economic and regional development, but may also include indirect economic effects arising from the biophysical effects of the project (Environmental Assessment Office, 1995, Appendix I, 8).

1. Employment information, such as outlining proposed strategies to provide fair opportunities and fair wages for the four employment equity target groups of the provincial government (women, visible minorities, the physically challenged and Aboriginal), in addition to other specific groups which are characterized by high unemployment in a particular area or region.
2. Economic analysis to identify potential secondary opportunities for regional economic development, especially value added processing of natural resources, employment and training opportunities for local businesses arising from the construction and operation of the proposed project (Environmental Assessment Office, 1995, Appendix I, 8).

Questions directly related to the Huckleberry Mine process include: (1) Were there employment regulations in place for hiring potential employees to work at the Huckleberry Mine? If so, what were these regulations? (2) Were the four target groups established by the provincial government considered in any hiring plans? (3) Were there economic benefits which will be provided to this northwest region of the province? If so,

what were they? (4) Was there an opportunity to have value added processing to provide further employment and training opportunities?

4.14.3 Assessing the Social Effects

Social effects generally include impacts on population, social characteristics, housing and accommodation, social services, land use, traffic, transportation, community infrastructure, community stability and cohesion.

1. An effective starting point for social impact assessment is to prepare a concise social profile of the affected community, describing the key indicators of existing conditions, available local services potential project-induced demands on these services. The extent to which direct jobs created by the project are filled by non-resident workers may be a major detriment of social effects.
2. Social impact assessments generally require local community data such as, estimates of the current usage of social services, the capacity of existing facilities and their staffing, the supply of accommodation and the anticipated demands on social services and facilities and created by the proposed project,
3. Aboriginal issues represent special concerns for social impact assessment and examining them requires the direct involvement of Aboriginal people.
4. Social impacts are often less predictable than either environmental or economic impacts and therefore require vigorous and committed impact management response capabilities. Community liaison mechanisms for the monitoring and management of impacts should be documented in the project report, where requested. (Environmental Assessment Office, 1995, Appendix I, 10).

In the context of the Huckleberry Mine, how was the social profile of the bordering communities to the mine completed? Was there extensive information on the degree of existing facilities, social services, accommodation and potential constraints of these resources with the mine development? How well were Aboriginal issues considered in the social impact assessment? On behalf of Huckleberry Mine will there be

monitoring programs in place to determine if over the long term the mine will have an impact on the existing communities? Is there a sufficient data base on the regional economy and on its social qualities?

4.14.4 Evaluative Criteria from the *Guideline to the Environmental Assessment Process in British Columbia*

Table 2 is a summary of the headings used for evaluative criteria obtained from the *Guideline to the Environmental Assessment Process in British Columbia*. These criteria will be used in Chapters 5 and 6 to determine whether or not the Huckleberry Mine had a comprehensive environmental assessment process. Although the guidelines are not incorporated into the legislation, they make a significant contribution to the environmental assessment process. The *Guidelines* provide detailed information to aid in the success of an environmental impact assessment. The following chapter evaluates the Huckleberry Mine environmental impact assessment. The criteria outlined in this chapter will be used to determine the content of the Huckleberry Mine impact assessment.

Table 2. Headings for the criteria evaluated from the *Guidelines to the Environmental Assessment Process*. The three areas evaluated were: environmental, economical and social impacts.

Environment	Economic Stability	Social Impacts
<ul style="list-style-type: none"> • Baseline Studies • Scoping • Timing • Methods • Cumulative Impacts • Data Collection & Analysis • Addressing Specific Issues • Mitigation • Ecological Constraints • Environmental data collecting methods 	<ul style="list-style-type: none"> • Fair opportunity • Fair Wages • Incorporating jobs for the four provincial groups: • Women • Aboriginal • Visible Minorities • Physically Challenged • Address of increased unemployment • Regional Economic Development • Natural Resource Processing • Opportunity for local businesses 	<ul style="list-style-type: none"> • Social profile of the community • Existing facilities identified/strains on existing facilities • Direct jobs for non-resident workers • Aboriginal concerns and involvement • Community Liaison • Accomodations

Chapter Five:
Results and Discussion: Evaluation of the Huckleberry
Mine Environmental Impact Assessment Process

5.0 Introduction

This chapter will evaluate the Huckleberry Mine environmental assessment process and the environmental impact statement which are to adhere to the specifications outlined in the *Environmental Assessment Act* and the *Guidelines to the Environmental Assessment Act*. The objective is to determine whether or not the environmental assessment process and the environmental impact statement were adequately completed. This will be determined by (1) reviewing letters, reports, memos, minutes available from the project registry and newspaper reports; (2) analyzing information received from personal interviews with members of the Project Committee; (3) using the evaluative criteria from the *Environmental Assessment Act* and questions raised in the previous chapter; (4) assessing the extent to which each step, phase and component adhered to the law to determine how complete and accurate these were; and (5) identify any gaps or problems identified in the process.

5.1 Transition Process

Since there is no longer a *Mine Development Assessment Act*, Huckleberry Mine was subjected to the transition phase set out in the *Environmental Assessment Act*. Thus:

to ensure a smooth transition of this project from the *Mine Development Assessment Act* new environmental assessment process, the Environmental Assessment Office ensured review of the Project Report was within the spirit of the new Environmental Assessment Act. In keeping with this principle, an invitation for membership on the interagency committee, titled the Huckleberry Project Committee was extended to all local, provincial and federal agencies and First Nations, whose jurisdictions or interest could potentially be affected by the project (Environmental Assessment Office, 1995, 9).

Huckleberry Mine submitted a pre-application in October 1994. The issues addressed in the pre-application for the Huckleberry Mine were: geology, mine plan, waste management, tailings, employment, infrastructure, electrical power, soils, land use, meteorology, water quality, groundwater, fisheries, resources fish, fish habitat, botany, vegetation, wildlife, land tenure, archeology, heritage resources and reclamation. The pre-application is considered to be analogous to an application under the *Environmental Assessment Act*. Due to the fact that more than 25, 000 tonnes of mineral ore per year would be extracted it was legally required that the review of this project be completed under the *Environmental Assessment Act*. Therefore, a Project Committee was established and the Executive Director gave consent to accept this as a project under section 19 of the *Environmental Assessment Act*. The proponent was required to submit a project report (environmental impact assessment) required under sections 21 and 22.

The terms of reference were established in the beginning of 1995 and the project report was submitted in May 1995. The terms of reference are fundamental specifications for the proponent provided by the governing body. They are used as a guideline for conducting an environmental impact assessment. Whenever a project report is received by the Environmental Assessment Office the terms of reference are compared with the environmental impact assessment to ensure the proponent has adequately addressed the concerns and problems. It is important to note that the government agencies were continuously providing their terms of reference to Huckleberry Mine (Ringstad, pers. comm., 1996). When the Environmental Assessment Office received the project report from Huckleberry Mine, the required time to determine if the terms of reference were

satisfied was seven days. The Environmental Assessment Office did not have the expertise to conclude whether or not the project report was sufficient (Ringstad, pers. comm., 1996). The project report should have been sent to technical experts within the governmental agencies to determine if it met the standards set out in the terms of reference. However, as a result of this omission, the project report was accepted and this caused inherent problems in the future assessment process. In order to meet the required timelines specified by the *Environmental Assessment Act*, Project Committee members had to act as consultants. The Project Committee spent a lot of time using their resources to fill the gaps in the data. This was outside the scope of their role in the assessment process. Future projects now have their project reports reviewed for 25 days by the Environmental Assessment Office and the expert members of the Project Committee analyze the document to guarantee it meets requirements set out in the terms of reference.

Once the project report was accepted, there were approximately 45 days for the public and other stakeholders to respond. At the end of this time period, the Project Committee deliberated from July to December 1995 and provided their recommendations to the Ministers for project approval. The technical transfer of Huckleberry Mine from the *Mine Development Assessment Act* was not confusing. However, once at a Stage Two (Project Review Period), the process proved to be difficult (Wolfe, pers. comm., 1996). The newness of the environmental assessment process caused most of the problems began, starting with the project report.

5.2 Project Report

The project report contained a total of nine volumes which are listed in Table 3. The proponent provided information on such topics as road access, social and economic impacts in the region, detailed vegetative description, a comprehensive site plan of the mine, and sufficient static tests for the Acid Rock Drainage, however, there were some concerns from some members of the Project Committee as to the methods and techniques used for data collection. Overall assumptions were made without adequate data to support these conclusions. Since the focus of this chapter is to evaluate the Huckleberry Mine in consideration of the content required by the *Environmental Assessment Act* specific issues dealing with the information dealt with in the *Guidelines* will be addressed in the next chapter.

While the project report itself complied with the *Environmental Assessment Act*, there were some major problems. Some important details were not considered until after the project report was submitted for commentary and the public review period was over. For example, the ethnographic information provided by Dr. Diane French (consultant for the Cheslatta) and Mr. Bernie Gollenbeck (representing the Wet'suwet'en) was not completed until the end of the summer. This was past the required date for public comments. These reports should have been completed with the environmental impact statement so that the public would have the opportunity to comment on them. In addition, there were exclusions of important data (i.e.: wildlife and kinetic test) which should play a large role in the decision-making process and, finally, inconsistent

Table 3. A list of the project report contents submitted on behalf of the Huckleberry Mine as required by section 22 of the Environmental Assessment Act in British Columbia.

Volume	Title
I	Executive Summary
II	Project Description
III	Environmental Description
IV	Access Road & Power Lines
V	Environmental Assessment & Mitigation
VI	Regional Socio-Economic Analysis
VIIa	Appendix to Volume 2 and Volume 4
VIIb	Appendix to Volume 2 and Volume 4
VIII	Appendix to Volume 2 and Volume 4

conclusions were made from incomplete data. This will be discussed in greater detail later in this chapter.

5.3 Project Committee

The function of the Project Committee is to provide policy and technical advice, perform analysis and make recommendations to the acting Ministers. This particular project committee covered a wide range of disciplines and expertise. The Project Committee members were made up of individuals from various agencies and Aboriginal stakeholders. There were 40 members in total (see Table 4 for a more detailed description of members on the Huckleberry Mine Project Committee) (Project Committee Meeting Minutes, July 1995). Agencies who were invited to sit on the project committee but chose to monitor the committee's proceedings rather than to participate formally were: the Ministry of Agriculture, Fish and Food, the Ministry of Municipal Affairs, the Ministry of Skills Training and Labour, the Canadian Environmental Assessment Agency, Health Canada, the Town of Smithers, the Village of Burns Lake, the Regional District of Bulkley-Nechako, Carrier-Sekani Tribal Council and the Haisla (Environmental Assessment Office, December, 13, 1995, 22). They were provided with documentation generated by the project committee's work. These agencies also monitored the review to ensure that the project would not have a material impact on their programs or interests.

Table 4. Members of the Huckleberry Project Committee (Project Committee Report, December 13, 1995).

Federal Agencies	Provincial Ministries	Municipalities	Stakeholders
<ul style="list-style-type: none"> • Department of Fisheries and Oceans (DFO) • Environment Canada (EC) 	<ul style="list-style-type: none"> • Attorney General (MAG) • Energy, Mines & Petroleum Resources (MEMPR) • Employment and Investment (MEI) • Environmental Assessment Office (EAO) • Environment, Lands and Parks (MELP) • Forests (MOF) • Health (MOH) • Small Business & Tourism (MSBTC) • Social Services (MSS) • Transportation & Highways (MTH) 	<ul style="list-style-type: none"> • District of Houston 	<ul style="list-style-type: none"> • Wet'suwet'en Treaty Office • Frog Clan of the Wet'suwet'en Nation • Cheslatta Carrier Nation • Princeton Mining

The Project Committee was divided into working groups which dealt with technical concerns which the project presented. For this particular project, there were five different working groups within the function of the Project Committee: Acid Rock Drainage, Aboriginal Concerns, Fish, Cumulative Effects and Port Outload Facilities. The numbers of individuals sitting in these groups varied depending on the issues and the levels of expertise needed.

Although they had a legal right to be on the project committee, a number of groups were excluded. The Skin Tyee and the Broman Lake Band were not invited to sit at the table until the process was almost complete. The earliest recording of the Skin Tyee and the Broman Lake Band at the Project Committee meeting was September 13, 1995. When the project was originally initiated, people from the MEMPR office approached the Carrier Sekani Tribal Council and the Traditional Office of the Wet'suwet'en and asked them to identify bands in the area which would potentially be affected by the project. Immediately the project was recognized as having the greatest impact on the Wet'suwet'en and Cheslatta. However, the communication barrier broke down and the Skin Tyee and the Broman Lake band were not approached (Harris, pers. comm., 1996). Even though the Ministry is responsible to ensure that all of the appropriate people are involved in the process, it is also up to the proponent to take an active role in ensuring that the project committee is complete.

Another group missing from the Project Committee was the non-Aboriginal stakeholders. There is no legal requirement for non-Aboriginal stakeholders to be present on any project committee; this may be considered a major flaw in the *Environmental*

Assessment Act. The opportunity to incorporate representatives from this group is crucial to the inclusion of the public in this process. The fact that there were no non-Aboriginal stakeholders on the project committee caused some inherent public perception problems of the process (Interior News, 1995). The Project Committee agreed to maintain flexibility about the attendance of public stakeholders during the meetings. Public stakeholders could be invited by the Project Committee to provide knowledge about the area (Project Committee Meeting minutes, June 13, 1995, 5). Experts were invited to the meetings, however, they did not represent the views of the public but rather the views of their respective fields. There must be an opportunity for the views of public interest groups to be heard at the meetings. Lay people may not have the technical expertise but, in many instances, they do have a common knowledge about the area which is often overlooked. This knowledge can be used to benefit both the proponent and the government. If the Project Committee refuses to allow public stakeholders at the table, an alternative solution to the need for lay knowledge would be to establish a Public Advisory Committee.

Aside from excluding some of the Aboriginal bands who had a right to be involved in the process, the *Environmental Assessment Act* does not recognize the importance of public stakeholders to sit on the Project Committee. The public is to be seen as an important source of local knowledge and information. Even if the *Environmental Assessment Act* restricts the opportunity of public stakeholders to be involved in the process, there are tools in the legislation such as the Public Advisory Committee which help to facilitate the transition of information.

5.4 Public Advisory Committee

The role of the Public Advisory Committee is to act as an unbiased mediator between the project committee and the public (Environmental Assessment Office, 1995, 4-3). The members of the Project Committee decided against having a Public Advisory Committee feeling that it would slow the process and infringe on issues which could be discussed (Ferris, pers. comm., 1996). The Huckleberry review process received some negative media coverage from the local press. Had a Public Advisory Committee been established some of these perceptions may have been avoided. On August 9, 1995 an Interior News reporter tried to sit in on a meeting between Princeton Mining and the government's Huckleberry project review committee only to be informed the meetings were closed (Interior News, August 16, 1995). The success of environmental assessments is related to the iterative process which provides an opportunity for experts to express their points of view in an open discussion. Due to the technical nature of the issues it is appropriate to exclude the media from these meetings because it is too easy to misunderstand the complexities of the issues (Harper, pers. comm., 1996). Nevertheless, there must be an opportunity for the media to report on the progression of the Project Committee.

The purpose of the Public Advisory Committee is to give feedback to the public and present issues and concerns raised up by the Project Committee and, in turn, to present the views of the public as they relate to these issues to the Project Committee. Reports from the Project Advisory Committee can be incorporated into the agenda for the Project Committee meetings. In the case of Huckleberry Mine, it would have been

beneficial to have a non-biased presentation of the issues which were raised at the table reported to the public and the concerns of the public relayed to the Project Committee. This would have opened the communication barrier and some of the negative media coverage would be avoided if the public felt it was involved through media access to the process as a result of the establishment of this committee. Depending on the severity of the issue, the public may still be hostile but they will have had ample opportunity to express their personal views and concerns.

In the future, the Public Advisory Committee should try to facilitate and incorporate public participation. Since there is no opportunity for non-Aboriginal stakeholders to take part in the project committee meetings, the development of a Public Advisory Committee is an effective tool to aid in the communication between the proponent, government and all stakeholders.

5.5 Public and First Nations Consultation

Public and First Nations consultation took place on behalf of the proponent and it was initiated in two different ways: newspaper advertisement and public meetings. As a component of the New Canamin Resources Ltd. Public Consultation Program, the company initiated a series of Open House presentations in three communities most affected by the project: Houston, Smithers and Burns Lake (Huckleberry Mine, 1995, 4). Public consultation began March 24-26, 1993, and a second series of presentations was November 22-24, 1994. The final series of public consultations was June 27-29, 1995.

The total number of participants for each of the meetings in years 1993, 1994 and 1995 were 162, 182 and 180 respectively.

In 1995, each open house for the three different communities was publicized by a series of advertisements and articles in the week of May 22 to the 26 announcing the availability of the application for a Mine Development Certificate in the local libraries. Two weeks prior and the week before the week of the open houses local newspapers carried the announcements. Figure 5 is a sample of the advertisement placed in the Interior News. The advertisement contains pertinent details as to the: date, time, location and contacts representing the proponent and the government. All costs of advertisement were borne by the proponent.

Issues presented and discussed at the meetings were: the project summary, mine development/environmental assessment process, corporate structure, terrestrial environmental studies, aquatic environmental studies, regional benefits, project schedule, work force, mining and milling process, project location, general site facilities and exploration (Huckleberry Mine, 1995). At these meetings the data for the effects of the mine on the terrestrial environment, Acid Rock Drainage, wildlife, hunting, fish habitat, reclamation and closure plans were considered to be inadequate and they are still being collected. The details of these issues were not available for public comment at this time.

The public consultation held in June may have been a little premature. The beginning of the iterative process did not commence until much later. The only other project committee meetings held before the public consultation date in June were March

**NOTICE OF THE AVAILABILITY OF A PROJECT
REPORT FOR REVIEW UNDER THE
PROVISIONS OF THE ENVIRONMENTAL
ASSESSMENT ACT**

The public is advised that New Canamin Resources Ltd., has submitted a project report on its Huckleberry Project – open pit copper mine, located 122 km by road from Houston, between the south flank of Huckleberry Mountain and the north shore of Tahtsa Reach, in the Morice Forest District.

The complete application and relevant records can be viewed at the Smithers Public Library, or by contacting Mr. John Marczyk, at the Environmental Assessment Office and its Project Registry, located at: 5th Floor, 3301 Douglas Street, Victoria, B.C. Phone 952-0573 or the proponent at the address below.

If there are comments about the project, they can be submitted to the Environmental Assessment Office until the close of business on July 7, 1995.

Persons submitting comments are informed that all submissions from the public will be placed on the Project Registry (Smithers Public Library). All documents on the Project Registry are available for viewing during regular business hours.

**OPEN HOUSE PRESENTATIONS WILL BE HELD
IN SMITHERS, JUNE 29, 1995, AT THE ELKS HALL
3908 2ND AVENUE., SMITHERS B.C.
2:00 to 9:00 p.m.**

For further information, feel free to contact:

New Canamin Resources Ltd.
Box 875, 2924 Yellowhead Hwy. East,
Smithers, B.C., V0J 2N0
(604) 847-5853

Huckleberry Mines Ltd.
2000-1055 West Hastings St.,
Vancouver, B.C., V6E 3V3
(604) 688-2511

Figure 5. A sample of the advertising used by Huckleberry Mine to announce public meetings about the proposed open copper pit mine in the area (Huckleberry Mine, 1995).

30 and June 13, 1995. There was not a substantial amount of time to address concerns to inform the public. This concern was addressed at a committee meeting.

Many of the issues apparent in the review of the Project Report were not known at the time of the open house. A researcher from the Cheslatta suggested that an ongoing involvement program was needed to ensure the public was aware of the emerging issues. He also suggested that the public involvement on this project to date was not effective. Similar comments were made on the effectiveness of the satellite repositories in the region (Project Committee Meeting Minutes, August 8 & 9, 1995, 7).

The Chair of the project committee responded to these concerns by:

1. ensuring project committee minutes were a very detailed and accurate reflection of the meetings, and that final minutes approved by the project committee were placed on the Environmental Assessment Office registry and in regional repositories within 21 days of a meeting;
2. attending, upon request, Town of Smithers and District of Houston council meeting to provide status reports on the project committee's progress and to answer process related questions raised by council members. Core and advisory members of the project committee from MELP and MEMPR also attend these council meetings and responded to questions that fell within their mandates to address;
3. issuing two newsletters (September 1995 and October 1995) for general distribution to all individuals and stakeholder groups identified on the project's mailing list and to regional and provincial daily and weekly newspapers and radio stations that had taken an interest in the proposed mine during the review of Huckleberry Mine's application for a project approval certificate;
4. ensuring an environmental assessment. project registry was in place to ensure the timely placement of all documents produced or reviewed by the project committee that would be of public interest in the project registry in Victoria and regional repository in the Town of Smithers, District of Houston, and the Town of Burns lake; and
5. ensuring a list of all Environmental Assessment Office registry document is for the project was maintained and updated on a regular basis to facilitate public review (Environmental Assessment Office, 1995, 29-30)

Although the intentions of the Chair were good, these solutions did not solve the problems. For example, the last date for a document on the project registry list was

December 7, 1995. Certain parts of the project registry were well maintained with important information while others were not. The minutes for the project committee meetings for October 11-12, October 25-26 and November 8-9 were not listed. If documents are available for the public, it is important for the lists to be maintained so that the public is aware of recent and relevant information.

Ultimately, these solutions are only significant if communication is between both the Project Committee and the public. Otherwise there is no feedback mechanisms to ensure that public concerns are addressed. The public has a legal right to be incorporated into the consultation process, however, there is a potential bias if all of the consultation is initiated by the proponent. There was no point in time when the proponent, the public and the government met together to discuss the issues. If the public is unaware of the issues a project presents, the purpose of incorporating them is defeated. The Project Committee must keep the public informed of recent issues in order to fulfill the requirements of an open process.

At all of the meetings people were given a survey to fill out and hand back anonymously if they so desired. The surveys were designed to obtain information on peoples' work experience, residency, and overall impressions of the project. In June, 1995, out of 146 survey received 141 were in support of the project with 3 people uncertain and 2 forms incomplete. The majority of visitors who completed the forms were employed by the construction industry (23%), the mining industry (18%) and the forest industry (16%) (Huckleberry Mine Project Consultation Report, 1995, 11). There were 64 business owners, 33 were contractors and 31 were in the service industry. Most

of the people who replied to the survey treated them as part of a job interview. They were more interested in learning how and when to apply for a job than asking questions or commenting on the environmental issues from the mine development.

Public consultation is not the only measure of addressing public concerns. People need to express their opinions and not feel threatened. One of the ways to accomplish this is through the use of questionnaires in which respondents can remain anonymous (Burdge *et al*, 1995, 25). If the people have legitimate concerns they can be addressed without feeling they have risked employment opportunities.

The First Nations were already incorporated into the project committee, therefore, they obtained more information than they would by going through the public consultation process. The First Nations were invited to attend the public meetings and there were also some separate meetings designed to incorporate further consultation. There were 16 meetings between the proponent and the First Nations people. Consultation began in March 1993 and continued to November 1995. The bands contacted were the Wet'suwet'en, the Frog Clan, the Cheslatta, and the Broman Lake band. The Wet'suwet'en were taken to the mine site for a tour.

In this study, Public and First Nations consultation was found to be inefficient, incomplete and insufficient. Information and public meetings were held before the major issues and solutions were identified. Future projects should require open consultation with the public and Aboriginal people after some of the problem areas are identified, even if this occurs during the deliberations. Responsibility does not rest solely with the proponent, the project committee has an obligation to keep the public involved through

all stages of the process. This should be included in the deliberations since this process occurs behind closed doors. There was a substantial lack of communication between the proponent, project committee and the public. There needs to be strong leadership to take the initiative and disperse the essential information to the public so they can make informed decisions about development in their area.

5.6 Project Registry

The Project Registry for this particular project was divided into nine categories: Aboriginal comments/submission, application and supporting studies, committee-generated documents, federal comments/submission, general technical documents, local government comments/submissions, notices-news releases, provincial government comments/submission and finally proponent comments/correspondence. Documents submitted by committee members and comments received by the public were posted within seven days of their receipt. The project registry is intended to serve as a useful tool to aid the public in obtaining documents projects subjected to the *Environmental Assessment Act*.

However, some of the documents were not placed on the registry promptly. For example, minutes submitted for the Project Committee meetings were not placed on the registry until one month after the meeting had occurred. Minutes for the June 13 meeting were not posted until July 11. Likewise, the minutes for August 8 and 9 meeting were not posted on the registry until September 7, 1995. The next Project Committee meeting was held on the 13th of September. Approved minutes for September 13 and 14 were not

added until October 18. Although the Chair had intended for the minutes to be available 21 days after the meeting, it does not appear that this took place. By this time the documents were available for the public to view, the issues were no longer significant and the Committee moved on to other contentious issues. Also, it is difficult for the public to observe and become involved in some of the smaller changes brought about through the iterative process.

In dealing with the minutes, part of the problem arose from the fact that the project committee Chair took minutes for the meetings. This was inefficient. The job of the Chair is not to be a secretary for the meeting but to ensure the meeting runs in an orderly fashion. The Chair could easily misinterpret what is being said and alter the context of a discussion. There is not sufficient time between the three different stages of the environmental assessment process to permit this kind of time delay. Obviously, a mistake of this nature would inevitably affect the acceptance of the minutes and affect the time constraints already placed on the project. Even though there were provisions for members of the project committee to amend the minutes, this was time consuming. Not only was this process cumbersome, but the minutes were often edited and had to be presented at the next meeting for acceptance. If there were any omissions or errors, they needed to be addressed and altered. Finally, once the process was complete, the minutes were available to the public. Essentially there was not enough time for comments to be received and incorporated into the next meeting. With this particular method of conduct, the public will continually be behind on the issues to be discussed at the following

meeting. To aid in the efficiency of the meetings a stenographer, court reporter or secretary from the Environmental Assessment Office should have recorded the minutes.

It is apparent that the only way of obtaining “true” public consultation is in a Stage Three process (the Environmental Assessment Board). A Stage Three is initiated if the Ministers at the end of the project report review period (Stage Two) decide to refer the project to an Environmental Assessment Board. In the Stage Three process there is a public hearing timeline incorporated into the process and the final decision is made by the Environmental Assessment Board not the Minister. The Minister of Environment, Lands and Parks approved the Huckleberry Mine and, therefore, Huckleberry did not reach this stage in the environmental assessment process but rather, finished at Stage Two.

Although the public was incorporated in the process, the way in which it was done was ineffective and insignificant. Incorporating the public would have dramatically altered the negative perceptions Huckleberry received. There are ways to incorporate the public without disrupting the iterative process and future project committees should entertain the idea of trying alternative solutions.

5.7 Amendments

An amendment to the application is sought if the proponent wishes to make material changes to a project. The proponent did in fact make changes, however, they did not file any amendments for the project. The confusion arose due to the fact the definitions of a “material” and a “routine” change is somewhat ambiguous. There are no legal definitions. There were no overall changes made to the footprint of the mine. The

Project Committee Chair stated that small shifts in design of the mine are routine in response to issues raised by the Project Committee over the course of the review as opposed to material or "substantive change". The Project Committee concluded the changes were considered "routine" and not material based on the following reasons:

1. The changes were not in response to any increase in production capacity of the mine.
2. The surface area disturbance of the project
3. The revised materials handling plan submitted by Huckleberry Mine represented changes made by the company to their Project Report's mine design in an attempt to mitigate the adverse effects identified by the Project Committee; the changes reduce the potential for any adverse effects.
4. Representatives of the ARD working group had recommended changes to the materials handling plan as a means of eliminating or minimizing adverse effects.
5. The Project Committee members believed this change was not material; but rather, agreed with the viewpoint given by the ARD working group that the changes were routine; and
6. The decision was consistent with the interpretation of "routine" versus "material" change given in a *Guide to the British Columbia Environmental Assessment Process* (Project Committee Meeting minutes, September 13, 1995, 17).

The Sierra Legal Defense Fund claims that Princeton Mining made substantial changes to the project and the Project Committee reviewing the application failed to insist that the company go back through the approval process for those changes through the amendments and acquire public consultation (British Columbia Report, January 15, 1996, 21). Since the Project Committee agreed the proponent was not required to undergo an amendment in the *Environmental Assessment Act*, the proponent is not responsible for initiating this process. There needs to be a consistent definition for the terms "routine" and "material" change which does not provide room for interpretation. This will be discussed in greater detail later in this chapter.

5.8 Project Review Period

The Project Review Period for the Huckleberry Mine commenced in mid May and ended in July. In general, the length of time for the project review period is 45 to 60 days. For this specific project, the report review period was 45 days in length (Project Committee Report, December 13, 1995, 28). At the end of this time, comments from the public and the Project Committee were summarized into a document which was submitted to the proponent for response. Once this step was completed the Project Committee provided their recommendations to the Minister. The Project Committee has 70 days after the Project Report Review Period to provide a recommendation to the appropriate minister. On December 13, 1995 the Huckleberry project was approved by the Project Committee. It is important that the Project attempt to reach consensus on the issues at the table (Stewart, pers. comm., 1996). Upon receiving the recommendations from the Project Committee, the Minister of Environment, Lands and Parks along with the Minister of Energy Mines and Petroleum Resources approved the project certificate for Huckleberry mine.

Since the mine was deemed to have a potential adverse effect on anadromous fish habitat, the Department of Fisheries and Oceans is the responsible federal agent. Even though Department of Fisheries and Oceans gave consent to the project there must be certain mitigation and compensation measures in place to ensure there is in fact a "no net loss of fish habitat". Due to the fact that the federal government is involved, the requirements under the Canadian Environmental Assessment Act must also be met. Under this Act, there is a requirement for public input. The Canadian Environmental

Assessment Agency cannot give their recommendations to the Department of Fisheries and Oceans until all of the public input has been received. The final day for submission of public comment for the Huckleberry Mine was March 15, 1996. The Canadian Environmental Assessment Agency does not have the authority to reject or accept this particular project since the federal involvement is only one component of provincial jurisdiction and they are not the responsible ministry. They can request the project undergo further public review if they feel the review process was inadequate but they cannot veto the project. The Canadian Environmental Assessment Agency only submits its recommendations to the Department of Fisheries and Oceans, and the Department of Fisheries and Oceans has the final say since they are the responsible federal ministry.

5.9 Evaluation of Huckleberry Mine According to the *Guidelines of the Environmental Assessment Process in British Columbia*.

The rest of this chapter will focus on the Huckleberry Mine with respect to the *Guidelines of the Environmental Assessment Process in British Columbia*. The evaluative criteria are listed in Table 2 (p. 85). While the *Guidelines* are not enforced by any legal authority, they do contain valuable details to assess the environmental, economic and social concerns of a project development. The environmental impact statements are the largest component of the environmental impact assessment. They provide a fundamental basis for predicting the impacts of a project, measuring the changes in an area after a project has been developed and providing an overall opportunity for monitoring the progress of a specific development. Issues identified in

the environmental impact statement are what the Project Committee and members of the public discuss. In the case of Huckleberry Mine, there were some problems with the project report. For example, the wildlife data and the assumptions made from the data were inconclusive and the proponent lacked consistent survey design and appropriate sampling methods. The data collection from the kinetic tests were still being completed as of January 1996. Even mitigation and monitoring plans are still being decided and many have been left to permitting. This work is still in the process of being finished.

Due to the mine development there will be environmental impacts. In order to mitigate and understand the adverse effects it is essential to have a fundamental understanding of the pre-mine site in order to have substantial and comprehensive reclamation plans devised before the disturbance occurs.

5.10 Baseline Studies, Methods and Timing

Baseline studies are done before any mine development. In the case of the Huckleberry Mine, most of the data collected does not classify as "true" baseline data. For example, the data for water quality, soil and sediment chemistry and aquatic biota were collected subsequent to exploration disturbance at the mine site and may not reflect the undisturbed conditions (Project Committee Report, 1995, 33).

It was interesting to note that the proponent had undertaken an extensive aquatic and terrestrial insect inventory and related this information to the presence of different fish species. Insects are important in the ecological functions of natural ecosystems through diverse activities ranging from decomposition of organic matter to provisions of

food for fish and wildlife (Rosenburg *et al*, 1986, 773). Insects provide valuable information to an environmental impact assessment because they are so diverse and are integrated into ecosystems in so many ways (Rosenburg *et al*, 1986, 780). Due to the time and skills needed to identify the different species, it can be extremely expensive and insects are often overlooked, however, the Huckleberry Mine project report contained a detailed description of the insects present in the area of the mine site.

Although the vegetation data are thorough in description, there is no mention of the methods used to collect these data. It should not be up to the reader to interpret the methods used. Missing information includes the size of the plot, the distance between plots and the number of replicates in each area. These are important points of information which should have been addressed. In 1995, Hallam, Knight and Piesold surveyed twenty plots in the Huckleberry project area following the methods of Luttmerding *et al* (1990). This is irrelevant without further description.

The wildlife data are also confusing and questionable. Once again, the method of design for data collection is not given. The only valuable information obtainable from the data was species presence or absence. It cannot provide any information on abundance. Hatler (1995) provides a thorough critique of the wildlife data methods and content from the project report. Some of the issues he addresses are :

1. inadequacy/absence of methodology description
2. minimal study effort
3. rarity of true data summaries/analysis
4. errors of fact
5. unsubstantiated records
6. unsupported statements
7. insufficient evidence
8. oversights

There are different sampling techniques for different species. There must be strict guidelines on how to survey different species according to scientifically accepted practices. The consultant must maintain communication levels with the government bodies to ensure they are performing appropriate methods for the proper species (Wolfe, pers. comm., 1995). Currently there are no well defined guidelines on appropriate methods to collect proper information for preparing a mine impact assessment and subsequent mitigation components for wildlife. There is no provincially consistent basis for assessing the adequacy of such assessment and programs. Hence, a submission which is acceptable in one administrative region may not be in another. There is also discrepancy between different agencies about what is acceptable information (Hatler, 1995, 2).

In addition, there were inherent problems with the habitat capability mapping. The four different government agencies involved (MELP, MOF, MEMPR, DFO) did not join forces until October to decide how the mapping was to be completed to satisfy all the guidelines of all the different ministries. It would be much easier if there were standards within the ministry for projects which only dealt with that ministry as well as standards for projects which cross ministerial boundaries.

The fault is not entirely at the government level, the proponent is responsible for ensuring that they are proceeding in the appropriate manner by constant communication with the government agencies throughout all stages of the project development. The crucial point is for the proponent to understand that one type of methodology may not cover all of the detailed areas to be considered in an environmental impact statement, but

rather a number of methods will be needed to illustrate and understand the dynamics of wildlife in an ecosystem. To rely solely on the habitat capability mapping is misleading and insufficient to provide all of the information about the dynamics and interactions of wildlife. The proponent used original data to do the maps, however, if these data are insufficient, the maps will reflect that fact. Habitat capability mapping is a judgment call used by professionals. The maps do not provide the quantity of animals in an area, rather based on the vegetation type present, they provide an estimate for which animals are capable of living in the area.

One of the problems with habitat capability mapping is that the only species used are grizzly, marten, moose, and caribou. The use of indicator species is limiting by only considering one species to describe a specific ecosystem region; therefore, indicator species are not the most efficient way to determine the presence of other species in an area. (Karr, 1987, 250). In addition, the use of species diversity is conceptually invalid because the interdependence of richness and abundance is confused and information on species function is lost. In contrast, the Guild concept provides a more integrative ecological perspective for environmental assessments. It considers all levels of vegetation, habitat and presence of various animal species to describe a site. The use of guilds as a way of evaluating expectations in certain kinds of communities depends on establishing the baseline structure of these communities and their range of natural variability over time (Karr, 1986, 253). Therefore, it is essential that adequate daily monitoring be conducted from the beginning of the project and throughout the project's

life. This information is particularly important in the reclamation strategies and it should have been provided at the time the project report was initially submitted.

Some suggestions and recommendations have already been made to enhance the wildlife habitats in and around the project area. Unlike the fish habitat compensation plans which are permitting issues, there is no legal obligation for the proponent to ensure this is done. Presently, there is no information on the number of hectares and what types of habitat will be affected by the mine development. This information should have been provided before certification was approved.

5.11 Methods

As previously mentioned, the guidelines for the environmental assessment process request information on methods used for data collection. The rationale for particular dates and times selected for data collection, the choice of survey types and location of flight lines and observations locals were not given anywhere (Hatler, 1995, 7). The site selection criteria, locations and characteristics of the track count surveys were not described. Although wildlife concerns were not considered to be important at certification, it is important information which should be readily obtainable if done correctly. By not providing any indication as to the types of methods used or the time of day sampling occurred, the proponent did not satisfy the wildlife data requirements according to the guide. The proponent relied solely on visual reconnaissance and inferred points of information rather than finding out what was in the area.

According to the proponent, there is no evidence that caribou, white tailed deer, elk, mountain goats or big horn sheep ever occur in the project area (Hallam *et al.*, 1995, III 8-45). If local knowledge and historical references were used in addition to physical data collection, the proponent would have found out there are caribou and mountain goats in the area. Timing of data collection is crucial and it is also important for seasonal variations to be considered. Just because an animal is not seen does not mean that it does not exist. Even the notion of seasonal ranges was ignored. Local people should have been incorporated to provide information about the animal species in the region. There was no incorporation of historical information or local knowledge in this area.

Not only is the time of year and day important for sampling, the length of time is also crucial. For example, marten tracks were counted at the mine development area on February 27-28, six tracks were found over a distance of 3950 m meaning approximately 1.5 marten tracks/km which is considered to be a low number (Hallam *et al.*, 1995, III 8-37). There is no indication as to the time of day this sampling was done, the weather conditions, or the temperature. Two days out of the year cannot possibly provide enough information on the species population in the project area. The vegetation data, as thorough as it is, should be used in a comprehensive manner to relate it the potential for wildlife food, habitat and protection and speculate the animals which could be found in the area and then conduct the methods to determine whether or not these conclusions were complete.

In Hallam *et al* (1995, III, 8-36) the presence of both black bear and grizzly bear in the project area is considered to be sporadic. There is no mention of the territory and

habitat range needed by grizzlies. There may be a low count of grizzly but there is no connection to the range required. The mine will potentially affect grizzly territory and mitigation measures must be in place to ensure there is as little impact from humanity as possible.

5.12 Cumulative Effects and Mitigation

Cumulative impacts were considered under section 16 of the *Canadian Environmental Assessment Act*. Areas which were considered were:

1. Reservoir creation and interaction with mine discharge.
2. Mine discharge and interaction with the proposed recovery of submerged timber in the reservoir.
3. Incremental loss of forest habitat associated with erosion creation and mine development.
4. Combined impacts to forest habitat/wildlife by mine development and existing proposed land based forest activity.
5. Incremental loss of wetland habitat and fish habitat associated with reservoir creation and mine development (Project Committee Report, 1995, 3-5).

The overall cumulative effects were considered to be low. However, the Cheslatta believe that the six effects should be evaluated jointly as well as separately (Project Committee Report, 50, 1995). This environmental assessment approach would be more holistic if the criteria were considered together. Interactions in the world never occur in isolation. Therefore, to get a true sense of cumulative effects it is important to assess these factors as they would interact with each other.

In some instances, it would have been more effective to have addressed these issues before certification was granted. Although wildlife and water quality may not be significant enough issues to cease the development of the mine they are still important

components which should be addressed. There are still potential Acid Rock Drainage problems with the east zone pit. Tests are still ongoing because this pit has a higher than .3% sulphide concentration which is above the British Columbia standards. It is extremely difficult to monitor something if there is nothing to compare the changes with over time. The tendency in the past has been once proponents receive their certification to forget about all of the clauses and conditions the certification (Van Zalingen, pers. comm., 1996). The agencies and stakeholders have more power and control before certification time because there is an underlying assumption permits will be granted. To deal with the issues beforehand would aid in the approval of the required permits. The strict time regulations of the *Environmental Assessment Act* may restrict the amount of time to resolve these issues before certification. Aside from the environmental issues and concerns the mine poses, there will also be social and economic benefits and repercussions.

5.13 Socio-Economic Considerations

Huckleberry Mine is committed to opening an office in Houston which will serve as a local point of hire for the duration of the construction of the mine (Project Committee Report, 1995, 163). There has been a strong encouragement by the provincial Ministry of Employment and Investments for northwestern residents to be involved in the employment opportunities. There are a number of closed mines in the area. Typically the average unemployment rate is 16-20% (Hallam *et al.*, 1995, VI 10-1). There are a

number of skilled people in the Houston, Smithers/Granisle area to serve the needs of the mine. Wages will range from \$35, 000 to \$80, 000 per year.

New Canamin hiring standards will be straightforward: individuals who possess the necessary skills (including safety awareness), have good references and exhibit the desire to work will be given first priority for all positions. Further, those who are hired on a temporary basis for the construction may be evaluated on actual performance for their potential as full-time employees once the facility is operational (Hallam *et al*, 1995, Volume VI. 3-3).

Huckleberry Mine has indicated that it would commit to a hiring policy that placed preference on the northwest with a point system for residency and that an individual will be retained to implement this hiring (Project Committee Report, 1995, 163). The Ministry of Employment and Investments requires that the proponent maintain an up to date report of compliance with the policy of local hire. There were no specific details of integrating women, visible minorities or the physically challenged into the employment opportunities. However, Aboriginal concerns were addressed to some extent. Keeping with the company's philosophy of "equal opportunity", Huckleberry Mine is trying to hire a staff of 5-10% First Nations people. There has been no mention on how to incorporate Aboriginal and non-Aboriginal if there are not enough skilled people in the area. In the likelihood that there will be inexperienced people applying for these jobs, there needs to be a training program in place to ensure that northern residents are indeed considered for the work. There must be commitment from the proponent to incorporate the interests of the people in the region into this development because, if there is an environmental disaster, it will be the people of this region who will suffer the most.

Huckleberry Mine has stated its commitment to providing on-going training and apprenticeship opportunities for staff. It is understood that Huckleberry Mine has the right to hire whom they want. However, most of the people who attended the public consultation meetings were individuals who have a vested interest in seeing the project proceed. Many of these people were contractors, truck drivers, miners, caterers, etc. Since the mine will operate in their area, it would be beneficial for these individuals to have employment opportunities with Huckleberry Mine. However, the final decision rest with the mine personnel.

5.14 Regional Economic Development

Consideration was given to impacts on regional infrastructure. Issues which were covered were electrical power, telecommunications, fuel, oil, gas, traffic, rail and air service. The mine will potentially increase economic development throughout the area as a result of their job creation. Mill operators will work four days in and four days out (twelve hour shifts) while management will work four days in and three days out (ten hour shifts). This length of the work week does not provide an ample amount of time to travel to other parts of the province, therefore, it is strongly encouraged that people live in the area. The Huckleberry project represents a viable source of employment for some of the many unemployed miners in British Columbia, plus a boost to local business which have been set up to serve the mining sector (Hallam *et al.*, 1995, VI 10-1). Obviously development will bring economic growth to all of the communities throughout the

proposed life of the mine. The provincial government alone will receive 130 million dollars in total tax revenue as a direct result of the Project (Hallam *et al.*, 1995, VI 10-1).

The community impacted most is Houston. There is a medical clinic which is open eight hours out of the day (8:30 to 4:30). There is no hospital in the community which has been a problem for many residents. The mine will add extra stress to the already scarce medical services.

A comprehensive job was done by the proponent to assess the social impacts on communities. However, the Cheslatta are frustrated because they feel that inadequate social and economic studies have been conducted to assess the effect of Huckleberry upon the Cheslatta (Cheslatta, 1995, 5). Future social and economic issues should be addressed separately for Aboriginal and non-Aboriginal people/communities. Impacts are potentially different between the two groups since there are different issues at stake. For example, traditional uses and land issues will have different implications for Aboriginal than for non-Aboriginal people. It would be beneficial for First Nations to have this information with respect to their own social and economic benefits so they would be able to determine the magnitude and scale of the project as it will directly effect and/or alter their personal needs.

Apart from the specific failings and problems identified above, the proponent met the requirements of the evaluative criteria for the guidelines for Economic and Social Impacts. Thorough information was provided on concerns in the project scope. This section of the impact assessment was completed in greater detail than the environmental information. Problem areas were addressed and the issues were explained in detail.

There is no doubt there were some unfortunate growing pains in the Huckleberry Mine process. In this case, there were some problems with the data and conclusions of the environmental impact assessment were weak, inconclusive and controversial. There were valuable lessons to be learned which should be incorporated into the success of future projects. Nonetheless, some of the problems discovered with the Huckleberry Mine process were not directly related to the lack of information in the project report, but the relationship to the content of the *Environmental Assessment Act*. The next chapter examines the *Environmental Assessment Act* in greater detail to determine the nature and intent of the *Environmental Assessment Act*.

Chapter 6
Evaluation of the British Columbia *Environmental
Assessment Act*

6.0 Introduction

This chapter will focus on the contents of the *Environmental Assessment Act*. The *Environmental Assessment Act* contains additional changes in the environmental assessment process for projects that were not included in the *Mine Development Review Act*. These changes consist of the following administrative requirements: the establishment of a neutral governing body (the Environmental Assessment Office), the creation of the Project Registry, the formation of the Project Committee and the opportunity to have an independent Environmental Assessment Board. Generally, the intention of the *Environmental Assessment Act* is to provide an all-encompassing piece of legislation which promotes sustainability by protecting the environment and fostering a sound economy and social well being (The *Environmental Assessment Act*, 1994. s. 2). However, the implementation and practice of this philosophy is quite different. In order to establish credibility for the *Environmental Assessment Act*, it will be compared with (1) Canadian environmental legislation e.g. the *Canadian Environmental Assessment Act*, (2) other provincial environmental legislation e.g. the *Forest Practices Code of British Columbia Act*, and (3) the prescriptive theories of environmental assessment in the literature.

The reasons for choosing the *Canadian Environmental Assessment Act* are: (1) aside from the British Columbia *Environmental Assessment Act* it is the most recent environmental legislation in Canada, (2) it is supposed to harmonize with the provincial legislation, and (3) the *Canadian Environmental Assessment Act* process is applicable in the Huckleberry Mine process. In reference to Huckleberry, Department of Fisheries and

Oceans was the federal responsible authority because, under section 35(2) of the Fisheries Act, there is a policy for “no net loss of fish habitat”. This stipulation appears as item 6 (e) on the federal Law List regulations.

The *Forest Practices Code of British Columbia Act* deals with environmental concerns indirectly. The most significant attribute of *Forest Practices Code of British Columbia Act* legislation is that it has extensive regulations which provide the governing agencies with substantial power. Hence, the regulations of the *Environmental Assessment Act* will be compared to the regulations of the *Forest Practices Code of British Columbia Act*. In addition to comparing the regulations between the two pieces of legislation, I will assess how effectively environmental goals can be incorporated into the legislation and determine how well the regulations of the *Environmental Assessment Act* compare with those of the *Forest Practices Code of British Columbia Act*.

The literature presents ideas and theories which may not have been considered in creating the *Environmental Assessment Act*. The literature also provides a theoretical basis for environment assessment and suggestions regarding essential components for a successful impact assessment and the process involved. The *Environmental Assessment Act* will be compared to the “ideal” contents required for a successful environmental assessment process as suggested in the literature. Since the *Environmental Assessment Act* was new, there could have been a prime opportunity for those developing the *Environmental Assessment Act* to ensure recent research and experience was incorporated into the creation of the Act.

6.1 Theories from the literature review

Chapter two described the components that should be considered in an environmental impact assessment. These components include: scoping, prediction, evaluation, mitigation, monitoring, the contents of ecological and socio-economic impact assessments. The outcome of the Huckleberry Mine process has revealed that, in light of the *Environmental Assessment Act*, there were some flaws in the process.

It is difficult to determine how the scoping, prediction and evaluation process identified problematic issues from the creation of the mine. There is no documentation of these events. This may be due to the fact that since the project was transitional, these documents may not be available to the public. There was no prior requirement for the public to view any documentation between the government, proponent and stakeholders. The *Environmental Assessment Act* is extremely vague about the scoping requirements in an environmental impact assessment process. The *Environmental Assessment Act* focuses more on the actual contents of the documents rather than the decision-making process to determine which issues must be included in a particular document. For example the *Environmental Assessment Act* states (subject to the nature of the project) an environmental impact assessment should contain information on the following: rationale for the project, environmental, economic social, cultural, heritage and health characteristics affected by the project, direct and indirect effects, potential impacts on Aboriginal rights, cross boundary effects, probable cumulative effects, alternative methods and health issues (The *Environmental Assessment Act*, 1994, section 22). Smith (1993) acknowledges the need for these topics to be considered in an environmental

impact assessment, however, there is no legislated process to determine which issues must be considered in the documents submitted by the proponent.

Even though the *Environmental Assessment Act* requires monitoring and mitigation plans, the Huckleberry Mine process has revealed it is irrelevant whether or not these documents exist before certification. Mitigation considers a number of topics such as: avoidance, preservation, rehabilitation, restoration, improvement, development and diversification (Erickson, 1994, 241-243). Monitoring focuses on measuring and recording the physical, local and economic variables associated with developmental impacts of a project (Glasson *et al.*, 1994, 166). Monitoring plans would aid the mitigation process to ensure these issues are recorded and followed. The Huckleberry Mine was awarded certification even though none of these plans were in place. Section 38 of the *Environmental Assessment Act* ensures that monitoring and mitigation concerns are considered. Apparently this is not a major concern to the Minister when it comes to certifying a project. In the case of the Huckleberry Mine, there was opportunity to have mitigative measures in place when dealing with such issues as fish concerns, wildlife enhancement, and preventing spills from tailing ponds, but they were held off until permitting. Even though mitigation and monitoring are considered in the *Environmental Assessment Act* they obviously bear little weight in determining whether or not a project should be certified. According to Karr (1987), the literature both monitoring and mitigation play a crucial role in the success of the environmental assessment process.

The *Environmental Assessment Act* is clear on the need for ecological, and socio-economic impact assessments. However, the *Environmental Assessment Act* is unclear on

the process involved to collect the data for these assessments. There were some problems, as discussed in Chapters Five with the methods used for collecting wildlife data, excluding important Aboriginal groups from the consultation process, providing Aboriginal ethnographic information in a timely fashion and failing to assess Aboriginal socio-economic impacts from the non-Aboriginal sector. There was little effort made to tie the ecological and socio-economic assessments together and determine how the impacts on the environment may or may not affect the social well being of these northern communities. The ecological and socio-economic impacts were analyzed in isolation of each other.

According to Smith (1993) the environmental assessment process should be dedicated to maintaining local, national and global sustainability. There is no mention of sustainability in the *Environmental Assessment Act*. Compared to the *Canadian Environmental Assessment Act* which clearly states one of the objectives is to achieve and maintain sustainable development, the provincial act does not consider this at any level.

Environmental assessments should be as broad as possible to cover all decision-making which potentially involves negative environmental effects (Gibson, 1993, 15). The *Environmental Assessment Act* requires that all levels of government have the opportunity to sit on the project committee. Whether or not they choose to do so is at their own discretion. This also provides the opportunity for different agendas between the agencies to be considered. For example, forestry practices in an area slated for mine

development will have to be considered to determine if there will be over cutting in the area.

To do this, the process must require proponents to define and defend the objectives of their undertakings, to demonstrate that they have examined alternative ways of satisfying these objectives in light of the environment as well as financial and technical consideration to show that their proposals represent the best available means of serving sustainability and the public interest (Gibson, 1993, 17).

The *Environmental Assessment Act* lacks direction in the evaluative criteria used to determine the acceptability of an environmental impact assessment and determine whether or not a process adequately addresses all of the concerns. The terms of reference are supposed to be used as a guideline for determining if the proponent has completed all of their requirements, however, there are no methods available for ensuring the proponent has met the goals of the terms of reference. According to the Canadian Environmental Assessment Research Council (1987, 2), an evaluation should examine:

1. measured changes in social, economic and environmental conditions compared to program objectives and predicted impact,
2. project-specific as well as cumulative impacts from multiple projects
3. costs and benefits of mitigative and compensatory measures
4. the impact management process during project construction and implementation; and
5. public consultative processes involving government, the proponent and public interest groups.

Not only is it difficult to determine how the project committee evaluated the project, the Minister has given absolutely no indications as to the acceptable standards for projects. Evaluation plays a significant role because it is the basis for the decision-

making process. Therefore, there is a general lack of consistent criteria determining the acceptability of a project report and granting a project certificate.

Gibson (1987, 19) believes that efficient decision-making must have public participation. Public involvement is crucial to the success of any project. The environmental assessment process of the Huckleberry Mine was mediocre. Although there are strict requirements in the *Environmental Assessment Act* to incorporate public comments in all three stages of the process, the *Environmental Assessment Act* is flawed by not considering public input in the deliberation stage and by not permitting the public to be a part of the project committee. This must change for future projects especially since the tax payers of this province should have a legal right to voice their concerns from a position on the Project Committee.

The provincial Act, in unison with the federal Act, attempts to address large scale issues and concerns. This is accomplished more readily when both governments work together. Even though the *Environmental Assessment Act* considers biophysical and socioeconomic concerns in the environmental impact assessment, it neglects to consider cumulative effects. As resources become scarce and projects are affecting each other, cumulative effects play a significant role. The *Environmental Assessment Act* attempts to ensure matters are addressed in a timely manner, but it neglects to deal with cumulative effects in a comprehensive manner. For example, in the Huckleberry Mine process cumulative effects were considered due to the federal involvement in the project, however, for other projects without federal participation the provincial legislation is not

strong enough to consider cumulative effects. It is left to the Executive Director to decide if cumulative effects must be considered in the assessment or not.

The *Environmental Assessment Act* provides the public with the opportunity to comment at the end of each of the three stages. Both the federal and provincial Acts have their weaknesses and strengths. The federal Act does not require public participation in all stages while the provincial one does, but the *Canadian Environmental Assessment Act* is much more comprehensive when it comes to cumulative effects. The optimum way to receive complete environmental benefits is the incorporation of both processes. Currently, both levels of government are trying to reach a harmonization agreement.

6.2 Harmonization

The federal and provincial governments are continuing to work on a harmonization agreement aimed at delegating to British Columbia all administrative responsibilities which are primarily under provincial jurisdiction but which are subject to both the *Canadian Environmental Assessment Act* and the *Environmental Assessment Act* (Environmental Assessment Office, 1995). The concept is to eliminate administrative overlap and duplication while ensuring effective environmental assessment of proposed developments. Key features included in the draft of the harmonization agreement are (1) the retention of each government's environmental assessment decision-making responsibilities; (2) delegation of specified administrative responsibilities under the *Canadian Environmental Assessment Act* to British Columbia's environmental assessment process; and (3) direct involvement of the federal government in the British

Columbia process as members of project committees, working with First Nations, provincial and local government representatives (Canadian Environmental Assessment Agency, 1995)

There are a few areas in the environmental assessment process where the provincial and federal harmonization is still inadequate. For example, the Comprehensive Study assessment does not require public comments until after the Comprehensive Study Report is finished. At the provincial level, this report is submitted to Cabinet at the end of a Stage Two process. Provincially, it seems like a waste of time, money and energy to ask for public comments after the report has already been submitted. It is recommended that the federal government should either use the provincial public consultation period to fit their requirements, or have the federal public commentary before the Comprehensive Study Report is completed.

In the example of the Huckleberry Mine, although the Department of Fisheries and Oceans gave their approval for the project, it still had to go through the federal process. It is counter productive to have another agency comment on the project once the regulatory body has already given their consent. It would be productive if the provincial and the federal governments would incorporate the Canadian Environmental Assessment Agency as soon as the extent of federal involvement was determined. The Canadian Environmental Assessment Agency would have the opportunity to ensure that the public consultation met their standards instead of addressing this issue after the provincial cabinet and the Department of Fisheries and Oceans have approved the project. Although the concept of harmonization is still under negotiation, it is essential to avoid confusion

and duplication. These issues must be considered in order for an adequate harmonization to exist.

6.3 Definition of the Environment

Neither the *Forest Practices Code of British Columbia Act* nor the *Environmental Assessment Act* have a definition for the term “environment”. It is preposterous to have an *Environmental Assessment Act* without defining what is meant. The *Canadian Environmental Assessment Act* (1995, s.2) states “environment” means the components of the earth and includes:

- a) land, water and air including all layers of the atmosphere,
- b) all organic and inorganic matter and living organisms and,
- c) the interacting natural systems that include components referred to in paragraphs (a) and (b).

Although the lack of a definition is not a crux in the environmental process, it is still important to define the terms and how the *Environmental Assessment Act* relates to the definition of the environment. According to the literature, environment, in the context of environmental impact assessment, has come to include the social and economic milieu of development proposals as well as the natural (biophysical) environment (Beanlands and Duinker, 1983, 18).

6.4 Specific Details

6.4.1 Timelines

The provincial environmental assessment process has strict timeline regulations. These timelines cover a wide variety of areas from public participation to the establishment of a project committee, project committee deliberation, length of each stage and the length of time the Minister has to respond to the recommendations put forth by the project committee. Federally, there are no time regulations to complete the assessment. Timelines have advantages of keeping the process efficient. Traditionally, proponents would spend substantial amounts of money on a process which would go on indefinitely.

A disadvantage with timelines is they do not facilitate an iterative process. In the instance of Huckleberry, the public had 45 days to comment on the project, at the end of this time the project committee had a maximum of 70 days to deliberate. Many issues were not discovered until a number of meetings passed. Meanwhile the time becomes shortened. Outstanding issues for Huckleberry, such as fish and wildlife, were not identified until much later in the process. By the time they were discovered there was little time left in the process to deal with them adequately. Timelines are important yet they must be flexible.

6.4.2 Iterative Process

The iterative process is initiated by the project committee after the project report review period is finished. It is concerned with open debate and discussion of issues

raised by the Project Committee members. Obviously, with a diverse group of individuals there will be a number of varying interests and opposing points of view. The formation of a project committee is not required by federal legislation. However, federal agencies tend to form project teams, but these teams are composed only of federal officials. The public, proponents and other levels of government are not included on a project team. Project teams are generally formed on precedent.

The only time an iterative process occurs federally is during the Public Review Panel. At this point, there are public hearings and public stakeholders are able to voice their opinions about a project. Even though there are public comments at the Comprehensive Stage the comments are directed to a person from the Canadian Environmental Assessment Agency. At the Public Review Panel, the public is involved in scoping the issues and creating the guidelines for the proponent. Once the guidelines are developed, the proponent submits an environmental impact statement which goes back to the public to ensure it fulfills the guidelines previously established. If the environmental impact statement meets the standards of the guidelines hearings are held. As with the provincial standards for the environmental impact statement, the Federal standards require consideration of the following factors:

- a. the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out
- b. the significance of the effects referred to in paragraph a.
- c. comments from the public that are received in accordance with this Act and the regulations
- d. measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project

- e. any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority may require to be considered (The *Canadian Environmental Assessment Act*, 1992, s.16).

The contents are very similar for both Acts and they are designed to complement each other. However, there are subtle differences. For example, the *Environmental Assessment Act* contains additional information on the contents of an environmental impact assessment, it addresses fines and penalties to a certain extent, and it also has a section on concurrent permitting.

6.4.3 Concurrent Permitting

At any time after the acceptance of an application for review, but no later than the date of submission of the project report, the proponent may request concurrent permitting consideration be given to specified approvals under other enactments (Environmental Assessment Office, 195, 7-1). The concept behind concurrent permitting is to save time. However, since the application for concurrent permitting must be in before the submission of the project report, the Project Committee has not had the opportunity to deliberate and identify all of the issues which a project presents. Concurrent permitting is a misnomer and misleading. The proponent is under the impression they will save time, however, in reality, according to this research, few government officials interviewed agreed with the philosophy of concurrent permitting. Through the iterative process, issues are identified and there are sometimes changes made in the project plan and to handle these changes. Since the request for concurrent permitting is in the beginning

stages of the environmental assessment process, the conditions for permitting would be based on "old" or "incorrect" material. When the changes become subject to certification approval, the permits must be changed because they are no longer valid. Although concurrent permitting is an option available in the *Environmental Assessment Act*, it is futile and redundant. The proponent will have to reapply for the permits and the regulating agency will have re-do the paper work. While the government has attempted to reduce the duplication and overlap through concurrent permitting, this step often results in duplication of the permitting process.

6.5 Power of the *Environmental Assessment Act*

Although Huckleberry Mine had gone through the provincial assessment process, the requirements for the federal process still have yet to be met. In the meantime, Princeton Mining has begun construction. Although no federal jurisdiction was being affected by the construction of the mine site, it seems inane to allow the mine to begin development until both the federal and provincial processes have been completed. Huckleberry is still under a court injunction which has not yet been resolved. The land is currently being developed and if the court rules in favour of the Cheslatta and the Sierra Legal Defense Fund, the land will no longer be in its original state. There must be enough authority in the legislation to handle these types of situation in the future. Princeton Mining is taking a chance but there is no legislation stopping them from doing this and they should not be allowed to create any disturbance to an area until all levels of government and proceedings have been satisfied.

6.6 Transitional Projects and Advertising

There is no consideration of transitional projects at the federal level. Broken Hills Properties, a potential diamond mine in the Northwest Territories was the last project to undergo the *Environmental Assessment Review Process*. Amendments for a federal project do not have to go through an amendment procedure in the *Canadian Environmental Assessment Act*. There may be changes through a project's development, but there is no formal procedure which rectifies these changes.

The provincial legislation requires proponents to pay for the advertising of projects. Projects which fall under federal jurisdiction are advertised by the responsible agency. It would be logical to have the proponent pay for the advertising since they are the ones who are initiating the project.

6.7 The Regulations

There are eighteen comprehensive regulations in the *Forest Practices Code of British Columbia Act*. They cover a wide variety of topics including administrative appeals, cutblock and road review, forest recreation, operation planning, silvicultural practices, strategic planning and timber harvesting practices. The information contained in the regulations is detailed and to the point. For example British Columbia Reg. 181/95 states:

A person carrying out a timber harvesting operation on applicable land must not deposit a harmful amount of slash or debris resulting from a timber harvesting operation in, or in a location where it could be reasonably expected to be transported into,

(a) a lake

- (b) a wetland
- (c) a fish-sensitive zone or a marine-sensitive zone
- (d) a fish or a stream with known downstream domestic water uses
- (e) an unstable gully or stream that is capable of transporting debris and which is a direct tributary to an area referred to in paragraphs (a) to (d).

This type of regulation compared to those in the *Environmental Assessment Act* are extremely weak. The regulations of the *Environmental Assessment Act* occur in two sections: (1) the *Prescribed Time Limits* and (2) the *Environmental Assessment Reviewable Projects*. The *Prescribed Time Limit Regulations* provide, in detail, the number of days it should take to complete each component of the environmental assessment process. The *Forest Practices Code of British Columbia Act* is not designed to incorporate public input to the same extent as the *Environmental Assessment Act*, and therefore, it does not have these types of *Prescribed Time Limit Regulations*. The *Environmental Assessment Reviewable Projects Regulations* define projects that are legally required to undergo the environmental assessment process.

One of the features of the *Forest Practices Code of British Columbia Act* which is not in the *Environmental Assessment Act* is the presence of an appeals process (British Columbia Reg. 163/95, 1995). Perhaps with the extent of opportunities for public involvement in the environmental assessment process, there was felt to be no need to grant the possibility of an appeals process. However, in the case of the Huckleberry Mine, the Cheslatta people have filed a complaint with the courts that the environmental assessment process was not legally adhered to and through this route they have in fact created their own appeal. Regardless, the question is to determine whether the amount of public participation is adequate to ensure that those who are opposed to a project have the

opportunity to voice their opinion without the involvement of the judicial system. When the courts are involved in these situations it is time consuming and costly. It may have been better to have the appeals process as an option.

The regulations may not be as significant for mining project as they would be for projects which are under one of the other two processes. For example, the only comment about mines in the regulations is defining what is meant by a mine.

The construction of a new facility constitutes a reviewable project for the purpose of the *Environmental Assessment Act* if

- (a) the facility is a mineral mine and
 - (b) the facility has, or when the construction plan is completed will have a production capacity of 25, 000 tonnes or more of mineral ore per year
- (Reviewable Project Regulations, 1995)

There is nothing in the regulation about protecting riparian zones, avoiding development on unsuitable ground, contamination, or any other biophysical hazards which must be avoided. For these types of issues and concerns there is supposed to be other legislation which will address these areas of concern. With a mine, or other mega-projects, there are a number of other Acts which will come into effect. For example with the Huckleberry Mine, the following Acts were used to provide substantial information and the project certificate was subject to different sections of these Acts: *Fisheries Act*, *Forest Act*, *Health Act*, *Mineral Tenure Act*, *Mines Act*, *Waste Management Act* and the *Water Act*.

Essentially, the *Environmental Assessment Act* is an environmental planning document. Therefore, the regulations have not concentrated on environmental protection. The notion was that any project subject to the *Environmental Assessment Act* would have

other Acts to provide regulations for environmental protection. The concern is the availability of regulations for those projects which may not have an extensive list of Acts to provide substantial regulations. If the purpose of the *Environmental Assessment Act* is to be an all encompassing act it needs enforceable powers to ensure people will not break the law and there will be serious consequences if they do.

Both the federal and provincial environmental assessment regulations define mining projects subject to this review process according to the amount of ore extracted. The federal definition of a mine is a metal mine other than a placer gold mine, with an ore production capacity of 3000 t/d or more (*Inclusion List Regulations*, 1994, s. 16). Once again, there are no requirement as to the construction of the mine or any other projects. Assuming there are other Acts to handle these details, the idea is that the *Environmental Assessment Act* should be adapted to act as a sole piece of legislation with comprehensive regulations and provide adequate authority to the regulatory bodies similar to that of the *Forest Practices Code of British Columbia Act*. The regulations are weak and insufficient. Ideally, the regulations should be entail as much environmental protection such as those in the *Forest Practices Code of British Columbia Act*. They should contain the majority of the administrative power.

Overall, the regulations for the *Environmental Assessment Act* are focused on forming planning timelines. They are insignificant and irrelevant for environmental protection. The regulations are not designed to address environmental issues, they were constructed only to determine what is meant by a project and the length of time which is necessary for a project to complete the environmental assessment process. If

environmental regulations do not exist for all projects in other acts, additional regulations should be created to ensure the concepts of sustainable development, mitigation and monitoring are addressed.

6.8 Offenses and Penalties

The *Canadian Environmental Assessment Act* does not deal with offenses or penalties. The Canadian Environmental Assessment Agency has decided to handle this concern by promoting compliance with the *Environmental Assessment Act* through education of proponents. If there is a gross disregard for the *Environmental Assessment Act* or process, the public can write the Minister and inform him or her of the failure to comply with the *Environmental Assessment Act* in a particular process, or the complaint can be brought up in a court of law if it is serious. According to the *Environmental Assessment Act* (1994, s. 5),

Offenders are considered to be people who undertake or carry on an activity that is a reviewable project, or construct, operate, modify, dismantle or abandon the facilities of a reviewable project unless the person first obtains a project approval certificate for the reviewable project.

A person is also liable if they do not comply with a project approval certificate. The maximum fine is \$100,000 and for each subsequent conviction \$200,000 (The *Environmental Assessment Act*, 1994, s. 78).

The offenses are only committed when a project is developed without a project certificate and the required legal documents. There is no mention of fining people or ensuring they do not cause adverse effects to the environment. If some catastrophic event

happens, there is no indication as to whether or not the offender will be financially liable to pay and clean up the disaster. Some of these concerns are considered on condition at certification but the government must monitor the proponents and ensure they are complying with the conditions specified for project approval. This is a problem with constant government cutbacks.

On the other hand, the *Forest Practices Code of British Columbia Act* has an elaborate section dealing with Offenses and Court Orders. Not only does the Code have the power to levy fines, but people can be prosecuted for the following: unauthorized timber cutting, unauthorized cutting or storage of hay, unauthorized recreation site and trail building. Offenses committed against the *Forest Practices Code of British Columbia Act* are timber spiking continuation of various offenses and irreparable damage which carries a \$1, 000, 000 fine.

The *Environmental Assessment Act* needs to have the power to prosecute people who intentionally commit adverse environment effects. It should be mandatory for large projects which are subject to the regulations to have a monitoring plan for the project approval certificate. The plans are fundamental to understanding the changes in the environment and what is to be done if there are any damages.

Monitoring plans should be based on environmental, socio-economic/health and cultural heritage categories and they should specify key parameters which need to be monitored, the sampling protocol and the analytical procedures (Environmental Assessment Office, 1995 10-1). If there are no plans in place, it is impossible to determine minor project impacts. These should be required by law and proponents

should be penalized for not providing them or failing to keep the plan up to date for the sole reason of withholding valuable information.

The penalties of the *Environmental Assessment Act* are weak and somewhat insignificant. There is not enough power provided for the regulating bodies which would prevent people from neglecting the environment. Even though regulations from other Acts may apply, the *Environmental Assessment Act* should be designed to consider issues beyond the definitions of reviewable projects. The *Environmental Assessment Act* could be stronger by addressing and incorporating a course of action against people who commit environmental offenses and describing what these offenses could be.

6.9 Conclusion

The federal and provincial environmental assessment Acts are similar in many ways. They both involve public participation, they both have a project registry and they both provide public funding for people to attend hearings. The federal screening process is similar to a provincial application (Stage 1), the comprehensive study compliments a project review period, however, the project report (or environmental impact statement) is required at the beginning of the provincial Stage Two while the environmental impact statement is not required federally until the public review panel. The public review panel is most similar to the Environmental Assessment Board. Both of these stages are independent of government authority. They are established by the Minister and experts are appointed to chair the panel or board. This is also the most extensive because of the public involvement by holding public hearings and utilizing expert testimony. The two

pieces of legislation have the power to subpoena people (The *Canadian Environmental Assessment Act*, 1992s. 35; *Environmental Assessment Act*, 1994, s. 56).

Although there are a few details which need to be worked out for harmonization between the province and the federal government, both the *Canadian Environmental Assessment Act* and the *Environmental Assessment Act* are designed to complement each other. In some instances it is apparent where the federal Act is strong the provincial Act is weak (i.e. cumulative effects), therefore, harmonization is beneficial. Strengths are gained when both bodies of legislation are used in one process to compliment each other.

In comparison with the regulations of the *Forest Practices Code of British Columbia Act*, the regulations of the *Environmental Assessment Act* are powerless for environmental protection. The regulations should be designed to implement substantial regulating power. The regulations are scheduled to be revised in 1996, and there are two areas which should be addressed. First, the regulations should have the power to penalize people who deliberately or intentionally cause damage to the environment (i.e. lakes, streams, wildlife habitat). Second, in addition to having the legislation in place, there needs to be sufficient power given to the governing agencies to allow them to enforce these regulations.

In summary, the *Environmental Assessment Act* generally complies with the prescriptive theories contained in the literature, except in the instance of scoping, prediction and evaluation. It is difficult to ascertain which methods were used to scope the issues for the Huckleberry Mine. There is no information provided in the *Environmental Assessment Act* on how scoping and predicting issues should be

considered for documentation. This research has demonstrated that the regulations of the *Environmental Assessment Act* are weaker than those of the *Forest Practices Code of British Columbia Act*. The *Forest Practices Code of British Columbia Act* regulations are much more complete and defined. The *Environmental Assessment Act* is also weaker than the *Canadian Environmental Assessment Act* with respect to the requirements and details of the cumulative effects and overall lack of definitions. However, the *Environmental Assessment Act* proved to be more conclusive in penalizing individuals than the *Canadian Environmental Assessment Act*. The whole environmental assessment process is more rigorous when both the provincial and federal Acts are harmonized together into one process.

The following chapter presents the conclusions of this research. Recommendations will be provided to assist in the conduct of future projects.

Chapter Seven

Recommendations and Conclusions

7.0 Introduction

The government has been under pressure from the mining community and foreign investors to approve the Huckleberry Mine. The Huckleberry Mine would not only provide \$210 million as taxes to all levels of government (Hallam *et al.*, 1995), but it would create jobs in the northwestern region of British Columbia where two mines have recently closed. In support of Economic Development, the provincial government has provided \$15 million to build the 8 km connector and the power lines. Even though Huckleberry was a transitional project, the research identified flaws in the new environmental assessment process which should be considered for future projects. This chapter is divided into two main sections: (1) conclusion of the environmental assessment process, and (2) recommendations. The *Environmental Assessment Act* attempts to address environmental concerns and ensure a fair and timely environmental assessment process. The problem is not solely with the *Environmental Assessment Act* itself but the process under which it operates. The purpose of this chapter is to present conclusions of this research and to make recommendations for improving the review of future projects subject to the provincial environmental assessment process.

7.1 Conclusion of the Huckleberry Mine environmental assessment process.

The Huckleberry Mine environmental assessment process did not meet the first objective of the *Environmental Assessment Act* which is to promote sustainability by protecting the environment and fostering a sound economy and social well being. Perhaps some of confusion arises from the fact that sustainability is not defined in the

Environmental Assessment Act, therefore, there is nothing against which to measure the success as the process. If sustainability is to include such concepts as material well being for future generations then this objective was clearly not met. At the time the project certification was granted there was no monitoring, reclamation or strategic plans available; hence, this does not promote environmental sustainability. On the other hand, this region of the province has a high unemployment rate and therefore the objectives of providing a stable economy were met for the short-term. The economic sustainability of the Huckleberry Mine is expected to be 17 years.

The second objective of the *Environmental Assessment Act* is to provide a thorough, timely and integrated assessment of the environment and socio-economic concerns. There is no doubt that, with respect to the Huckleberry Mine, the environmental assessment process was timely. The project report review period was only 40 days which is, in fact, less than the required time allotted by the regulations. However, this was made up in the deliberations which took approximately five months (from July to December 1995). A true grasp of the time could be inaccurate because the Huckleberry Mine was brought in at a Stage Two. It is difficult to determine the exact number of days required by the transition.

The integration of the environmental, economic, social, cultural, heritage and health effects were incomplete. Socio-economic assessments and health effects were considered together, however, there were no links made between these concepts and the environment. Cultural heritage was not even considered until after the project report was completed. The ethnographic studies were directly linked with the environment because

Aboriginal people have a long tradition of using the land for resource and spiritual values. Therefore, while the ethnographic studies integrated the intent of the *Environmental Assessment Act* it was only due to the fact that this is a way of life for Aboriginal people. Generally these assessments were not integrated and they did not meet the clear objectives stated in the *Environmental Assessment Act*. For example, there was no connection between a loss of 515 hectares and potential destruction of hunting territory.

The third objective of the *Environmental Assessment Act* is to prevent or mitigate adverse effects. This objective was not met by the Huckleberry Mine process. There are no monitoring plans in place to determine or regulate any potential catastrophes at the present time. Most of these concerns were delayed until permitting. The objective of this Act does not consider permitting issues, it is only concerned with the issues of certification. If mitigation and the prevention of adverse effects are not considered at the stages before certification, than there is no logistical way this objectives of the *Environmental Assessment Act* could be met.

The fourth objective is to provide an open, accountable and neutrally-administered process for the assessment. The Chair for the Huckleberry Mine Project Committee tried to be as neutral as possible, however, this was not entirely successful. The process was not open because most of the consultation on significant issues occurred during the deliberations which do not legally require public participation. There was limited access for media coverage and public involvement throughout the deliberations. The Project Committee members were given a communications protocol to follow to ensure that members would not speak out of line about the impacts discovered in the

project review (Environmental Assessment Office, 1995). With these types of guidelines and restrictions in place the process was not open, accountable nor neutrally administered.

The final objective of the *Environmental Assessment Act* is to provide for participation, in an assessment, by the public, First Nations, municipalities, regional districts and governmental bodies. More could have been done to incorporate public involvement in the process. Recommendations will be provided in the latter half of this chapter. It is important to note that, aside from the public, the other groups considered (First Nations, municipalities, regional districts and governmental bodies) have a right to be on the Project Committee, therefore, they are automatically included in the participative aspect of the process. In addition to the failure of the Huckleberry Mine environmental impact assessment process to conform to the objectives of the *Environmental Assessment Act*, there were some problems discovered with the Act itself.

One of the major flaws of the *Environmental Assessment Act* is the lack of definitions. The terms "routine" and "material" changes are not defined and currently, there is a court case against Huckleberry Mine indicating they had made "material changes" in their mine plan. To prevent ambiguity in future cases, the Environmental Assessment Office must define all important terms.

The key to the success of any project is communication which enhances the understanding of the different parties. It is difficult to enforce a communications protocol between the proponent and government, however, there must be a way for the proponent and government to be receptive of each others ideas and discuss decisions in a logical

manner. To monitor or provide guidelines would be extremely useful but almost impossible to enforce. There is no real solution to ensure open communication between the various parties. Often, new approaches dealing with the lack of communication are made through the knowledge gained in unsuccessful attempts.

There must be acceptable standards among the ministries for surveying, data collection and mapping techniques. A guide should be developed to assist government agencies and developers to integrate evaluation into their environmental assessment and management practices (Canadian Environmental Assessment Research Council, 1987).

This guide should first, document current methods used for a range of projects so that these methods will be applied more systematically across the country. Second, the guide should address both regulatory (permit compliance) and non-regulatory (i.e. wildlife impacts) components of environmental impact assessment to ensure that all significant component of the science and process used in environmental impact assessment are evaluated. Third, the guide should include reference standards for acquiring environmental data and analytical techniques to be used in audits such that these should have a sound scientific basis (Canadian Environmental Assessment Research Council, 1987).

There are universally accepted tests for Acid Rock Drainage (i.e. static and kinetic), however, when it comes to wildlife and vegetation this is not the case. There must be consistency for all survey methods and design. Ideally, there should be a list of species along with a standard method to survey the presence of animals and guidelines to assess the importance of an area with respect to seasonal ranges. With the Huckleberry Mine, the wildlife data in the project report was seriously flawed. If the ministries had strict guidelines, they would be provided with the power to regulate projects and enforce proper data collection.

The ministries have relied on indicator species for their habitat capability mapping using the grizzly, moose, caribou and marten. The Guild approach provides a better opportunity to choose from a variety of species which can be found in the same successional stages of the forest as the traditional indicator species. Who is to determine which animals should be accounted for and which should not? With an indicator species approach, there must be a way to account for the other species found in a specific stand type and their value to the ecosystem must be considered. The indicator approach is limiting and it neglects to consider all factors and the interaction of the species.

Not only should there be standards for data collection, there needs to be consistency among the agencies for acceptable mapping procedures when projects cross administrative boundaries. One of the problems with Huckleberry was the five months it took for the ministries to agree upon a suitable method for completing the maps. Although each ministry has its own individual standards for projects, there must be flexibility and procedures for projects which need approval from more than one agency.

There should be stipulations for permit approval to ensure habitat enhancement is enforced. While the Huckleberry Mine will displace some wildlife, it is ironic that there is a federal policy for "no net loss of fish habitat" but for terrestrial animals this not an issue unless they are an endangered species. The underlying assumption is that animals are able to relocate. For territorial animals it is not easy for them to move in on another animal's territory. Consideration should be given to seasonal ranges for animals which rely on the area. Unless there is enhancement in the area, these areas will be decimated and death will be inevitable. There should be regulations ensuring this type of situation

does not occur. Companies are obligated to have wildlife enhancement programs in place from the onset of the project. Currently, there is no legislation in place to force developers to meet any standards or requirements.

Mega-projects should have their funding secured before they are permitted to develop. Young (1996,1) states: "although big money questions remain unanswered, preliminary development work is expected to get underway soon". It makes no sense to allow forest harvesting to proceed before the Huckleberry Mine has their finances guaranteed. Not only are their finances not in place, Huckleberry Mine had not been approved by the federal environmental assessment process. There must be regulations in place to disallow the development of projects until they have been approved through both environmental process and all finances are 100% secured. Currently, there are no regulations to ensure financial security is in order before development occurs. In the meantime, wildlife habitat is being destroyed and there is no confirmation from the company to ensure they have the finances to continue the mine development. These actions should not be permitted to continue but there are no regulations dealing with these issues.

The regulations themselves lack goals and objectives. Regulations should be designed to provide power to the governing bodies and they fail to accomplish this task. There are definite areas of improvement: (1) ensuring finances are secure, (2) not permitting development until all processes are satisfied, (3) making wildlife enhancement mandatory, (4) levying fines for unauthorized, intentional or accidental environmental effects, (5) forcing proponents to provide monitoring plans, (6) requiring emergency

contamination clean-up plans, (7) demanding mitigative measures, and finally, (8) having uniform survey methods and data collection for wildlife and vegetation. The regulations must be re-evaluated and changed in order to provide a reasonable source of environmental information. For an all encompassing Act which covers many different project areas, the regulations should also focus on environmental protection.

7.1.1 Public Participation and the Process

Through the use of the project registry and meetings conducted by the proponent, there was a satisfactory attempt to include the public in the environmental assessment process. The public had the opportunity to comment in each of the three stages. Nonetheless, with the Huckleberry Mine, the public participation process was unacceptable. To begin, the public were only able to comment on the project before the project committee began deliberations. Many of the issues were not revealed until the iterative process began. The public meetings held by the proponent did not contain the crucial environmental information necessary to make informed decisions for the approval of the mine.

Public incorporation could have been handled in ways which would have provided beneficial information for all parties involved. The establishment of a Public Advisory Committee is an excellent opportunity to keep the public informed. Press releases to the media would provide up-to-date information on the progress of the project and the issues being tabled. Once the project committee met after the completion of the project review stage, there is no legal obligation to consider public concerns. For most

projects in the future this may not be a problem because the public would have a greater opportunity to be involved from the onset, however, with a transitional project, this is more difficult to accomplish.

The only logical way to involve the public in the deliberating process is to include them on the Project Committee. Representatives of interest groups must be considered because they can provide substantial knowledge about the area. It is unsuitable not to allow the public on the project committee. Although the process prides itself as being open, in reality it is still closed. To include Aboriginal stakeholders but neglect non-Aboriginal stakeholders is prejudicial and demeaning. The rights to the land are not only for Aboriginal people but all citizens of British Columbia who pay their taxes and contribute to the stability and economy of this province. The public is not to be feared but rather seen as a source of information. Providing the option of public commentary by using the project registry is minimally acceptable at best. The public can not observe the changes which are only revealed through iteration.

One positive movement is the establishment of the advisory committees for the Huckleberry Mine. The Acid Rock Drainage Technical Review Committee and the Aboriginal Liaison Committee are open to the public, the proponent, people from the Aboriginal communities and the government. This is an excellent approach to provide on going monitoring of the mine. Once the project has been approved it would be useful for future projects to establish committee of this nature

All of the public consultation for the Huckleberry Mine was initiated by the proponent. There was an inherent bias of information presented. Even open discussion

groups given by representatives of the project committee would help to present unbiased points of view.

There are definite areas of improvement in the public participation process in the *Environmental Assessment Act*. The *Environmental Assessment Act* is designed to facilitate public discussion, but with the Huckleberry Mine it was not implemented in a way that provided an open process.

7.1.2 Provincial and Federal Harmonization

The concept of harmonization between the federal and provincial regulatory bodies is admirable. Obviously, there are still some areas for this to be accomplished in full, but the idea of having one process is a positive step. Japanese foreign investors with the Huckleberry Mine have threatened to pull out of partnership because they were frustrated by the lengthy approval process (Young, 1996). This is not to suggest that the Canadian environmental assessment process should be sacrificed to meet the needs of foreign investors. At the same time, the two levels of government must work towards a single process which satisfies both agendas. One consideration which must be regarded is having the provincial public participation process satisfy the federal requirements. This is presently not the case.

7.2 Recommendations

After studying the Huckleberry Mine environmental assessment process, there are a number of recommendations which would aid in the facilitation of future projects. The

Huckleberry Mine process was an instrumental case study because it was the first mine project to test the *Environmental Assessment Act* and reveal this legislation's strengths and weaknesses. This section of the chapter is dedicated to outlining those recommendations.

First, there were no unreasonable or outstanding issues that would provide a basis for not approving the project, however, the process was time consuming, lengthy and awkward. The seven day period for approving the project report was insufficient. Had there been more time and opportunity for experts to evaluate it, the project report may not have been accepted (Wolfe, pers. comm., 1996). This proved to be a major mistake and the project committee ended up completing a lot of the work. Presently under section 26, of the *Environmental Assessment Act*, the Executive Director and the project committee have 25 days to determine if the project report meets the terms of reference standards. This is an improvement which guarantees that this problem will not occur in the future. A checklist used by the Executive Director and the project committee would be valuable to determine whether or not their specific requests were addressed in the project report.

Second, issues were often lost in the iterative process. Issues would be brought up at one project committee meeting and then neglected at other meetings. There was no consistent method to keep track of individual issues and to ensure they had been resolved. In the future, it would be beneficial to keep a record of the issues with a flow chart or diagram which can be used at every meeting. As the meeting progresses and issues are resolved this would help to keep the project committee on track and identify which issues are still unresolved.

Third, even though a Project Committee can determine its own proceedings and provide for the conduct of its meetings, there should be stipulations which guarantee open and efficient communication with the public. The Huckleberry Mine process took six weeks for minutes of the meetings to be released to the public registry. A stenographer would help to reduce the time lag by keeping accurate minutes.

The time lag is a real problem for the public to be kept up to date with current concerns. The only way the public can understand all of the changes to a project and the issues which arise is to have members of the public on the Project Committee. There are a number of different ways to incorporate public stakeholders in the project committee. First, representatives of various interest groups (i.e. hunters, trappers, anglers, hikers etc.) could have observer status. They would not be permitted to comment throughout the meeting, however, they would still be able to observe the changes to the project and have a feeling for the issues raised. There were concerns from the project committee for the Huckleberry Mine that the public stakeholders would disrupt the process and delay the proceedings. If time is an issue, this recommendation is a logical solution for time management and public inclusion.

Second, time could be set aside on the agenda to have a question and answer period in which the public stakeholders would have the opportunity to comment. This approach would keep the public involved and overcome some of the time lags which prevents them from receiving current information quickly. Even though non Aboriginal stakeholders are not permitted on any Project Committees, the *Environmental Assessment Act* has given consideration to Aboriginal stakeholders and all levels of government.

Unless the *Environmental Assessment Act* is changed, it is doubtful that future project committees will take on additional members.

Third, the size of the project committee is extremely large. Even though there are no public stakeholders permitted on the project committee, there are representatives from all levels of government and the various agencies, Aboriginal stakeholders and the proponent. For the Huckleberry Mine there were, at times, 40 people in a meeting. It is costly and wasteful for taxpayers to pay for senior government officials to take part in meetings when their input is minimal due to the number of people present who wish to speak. One of the criticisms from a member of the Huckleberry Mine project committee was a lack of consistency in determining which issues were too technical to discuss at the table and which were not. One solution for maximizing the use of senior officials and reducing the amount of unnecessary technical information is to break the project committee into smaller working groups. Although there were working groups for Huckleberry Mine, they could be used more effectively. For example, technical issues could be discussed in the working groups and presented to the project committee made up of senior government staff. Each working group could nominate a leader who would work directly with the project committee Chair. Thus, there would be no need for all the members of the working group to participate in the project committee meetings. The leader of the working group could present the issues and solutions which were discussed. Essentially, these working groups would be subsidiary components within a larger group with a designated leader. The Executive Director would have to keep in contact with all of the working group leaders. It is inefficient to have a huge project committee meeting.

Smaller numbers are ideal and practical to promote discussion and transfer of ideas. The use of representatives expressing the views of the people in their working group is an effective approach to this problem.

Fourth, aside from the Public Advisory Committee or public commentary received through the project registry, other effective ways to incorporate public knowledge, participation and provide an overall sense of involvement is to have a representative of an interest group on the Project Committee. Specific interest groups could be trappers, anglers, hunters, environmentalists, etc. One of the major concerns from the technical project committee members was that lay people would disrupt the process. There was a perception that too much time would be consumed in explaining the fundamental issues as opposed to dealing with mitigation and monitoring of these effects. A solution to the problem would be to give lay people observer status with certain provisions which would enable them to sit in the room and observe the deliberations. Strict rules could be implemented to prevent public stakeholders disrupting the process. For example, no public questions or comments could be allowed throughout the deliberations, but time could be set aside at the end of the day to address the public concerns.

In the case of Huckleberry Mine, the Project Committee would often split into working groups to discuss more technical issues. Some of the Project Committee members felt it was inappropriate for the public to sit in on the working groups because the issues discussed were too technical for the general public. There was a general feeling that if the public was involved, there would not be enough time to resolve the

issues. However, if the working groups presented concerns to the Project Committee members and the observers, this would provide them an opportunity to be exposed to concerns.

Fifth, if this is unsuitable, another option would be to have press releases to discuss the problems and the progress of the project committee meeting for all those not present at the meetings. After every meeting the Chair could provide the media with concerns and involve the public through the local media. Huckleberry Mine has a media protocol in place which essentially stated that the Chair was the only person permitted to speak on behalf of the Committee and about the process. Experts were able to speak about their technical issues, but in the end, there was a general lack of communication. There was confusion on behalf of the committee members about what issues were too technical to discuss and the Chair did not provide regular feedback to the media. If the media were included in the process through press releases or press meetings they would scrutinize the process less. The media and the public would have a greater understanding of the environmental assessment process and they would have a better opportunity to be involved in the issues discussed.

Sixth, one major criticism of the process is the timelines. Understandably, these timelines keep the assessment orderly, however, they also pose a problem by inadvertently causing pressure to deal with the issues. It is difficult to gather sufficient data, hire consultants, write reports and make conclusions if there is not ample time. A key component of the *Environmental Assessment Act* is the iterative process, where experts present their opinions and where there is discussion and debate among

professionals and stakeholders. This type of process is time consuming. Once issues are discovered and debated the time limits decrease. There must be flexibility to have time lines extended. In order for a true iterative process to occur the stress of a time line must not hinder the progression of ideas. In the case of Huckleberry, extensions were granted. The problem arose when major outstanding issues were not discovered until the process was almost complete. There would be little opportunity in offering more time. It is essential that the timelines be flexible, especially in areas of the environmental impact assessment where there is a substantial lack of information and it is difficult to determine the extent of the environmental effects. Consequently, many of the issues in the Huckleberry Mine were not dealt with at this stage but subjected to permitting. Permitting is designated to the appropriate ministries. There is absolutely no reason why many of the issues in Huckleberry could not have been addressed before certification. Timelines should not restrict the process, but promote and nurture it.

Seventh, a major problem with the environmental assessment process is that treaty negotiations are not considered. The issue which needs to be addressed is why land claims are not determined before development can proceed. It is unacceptable for development to occur without providing benefits to the rightful owner. In the meantime, corporations can continue to develop land which is in the negotiation process. There should be uniformity between the Treaty Office and the Environmental Assessment Office to determine who has the traditional right to the land. In the case of Huckleberry, both the Cheslatta and the Wet'suwet'en have claimed this land. It was decided by the

project committee that land claims were not in the scope of the assessment. It would have been too much to consider land claims while determining the impacts of the mine.

For Huckleberry, treaty negotiations were a recurring theme which needed to be addressed. Aboriginal people have the right to know who the government recognizes as the traditional user of the Huckleberry Mountain. This would provide them the negotiating power to secure jobs and income for their people. Although Princeton Mining inferred they would hire Aboriginal people, there were no specifications determining the qualifications people needed to be hired and what procedures would be in place to ensure Aboriginal people were given jobs even if they lacked qualifying skills.

If treaty negotiations are outside the scope of environmental assessment, Aboriginal rights must be considered. The First Nations people involved with the Huckleberry Mine project committee claimed fish and wildlife as part of their Aboriginal rights. The data for fish and wildlife were insufficient, therefore, it is unclear if Aboriginal rights were really considered. According to the Comprehensive Study Report, the Aboriginal bands did not support the mine because they believed these issues were not adequately addressed. If land claims are not going to be considered, it is necessary to identify what constitutes an Aboriginal right and address these concerns immediately.

Eighth, concurrent permitting is unrealistic and costly. This should not be an option for any proponent. The whole concept of concurrent permitting creates more paper work and is time consuming. For example, the permits which were awarded at the same time the project report was submitted will be insignificant because there are changes to the project and the proponent will have to reapply for permits to fit the new

changes. This whole concept of concurrent permitting is a waste of time and money . the government which provides the permits, as well as for the proponent who will inevitably have to reapply. Concurrent permitting should be removed from the *Environmental Assessment Act*.

7.3 Summary

The *Environmental Assessment Act* attempts to be comprehensive as it covers all of the following projects: industrial, mine, energy water management containment and diversion, waste water disposal, food processing, transitional, and tourism and recreational projects. The wide breadth of the *Environmental Assessment Act* makes it difficult to incorporate specific guidelines and regulations. There must be more administrative support in the regulations for the responsible governing bodies overseeing the development of a project.

The *Environmental Assessment Act* is weak in its consideration of cumulative effects and involvement of all significant stakeholders on the project committee, however, the process is the real problem. Huckleberry Mine demonstrated that the process in which the *Environmental Assessment Act* was carried out was flawed. Future projects have the advantage of using the knowledge gained from the mistakes committed by those involved in the Huckleberry Mine environmental assessment process.

Even though the Huckleberry Mine was a transitional project and there were no other projects with which to compare this process, the lessons learned are extremely important. Huckleberry Mine provided an excellent educational tool from which the

administrating bodies have the opportunity to learn from past mistakes and to incorporate these changes into future projects. The biggest failure in the whole process will be if the same mistakes are repeated in future projects. Many problematic areas have been identified. It is now up to future Project Committees to incorporate these recommendations as they see fit. Huckleberry Mine may have been a unique case but it has definitely taught the people of British Columbia some valuable insights as to the conduct of an effective environmental assessment process.

Literature Cited

- Amiro, B.D. and Courtin, G.M. 1981. Patterns of Vegetation in the Vicinity of an Industrially disturbed ecosystem, Sudbury Ontario. *Canadian Journal of Botany* 59: 1623-1639.
- Armitage, Derek. 1995. An Integrative Methodological Framework for Sustainable Environmental Planning and management. *Environmental Management* 19 (4): 469- 479.
- Babbie, Earl. 1995. *The Practice of Social Research*. Belmont, Wadsworth Publishing Co.
- Barbour, Michael., Burk., Jack and Pitts, Wana. 1987. *Terrestrial Plant Ecology*. Second Edition. Menlo Park, Ca: Benjamin Cummings Publishing Co.
- Baumgartl, Bernd. 1995. Transitional Transfer of Environmental Awareness: The Role of Private Firms. *Environ Impact Assess Rev* 15: 3-9.
- Beattie, Robert. 1995. Everything You Already Know About environmental impact assessment(but don't admit). *Environ Impact Assess Rev* 15: 109-114.
- Beanlands, Gordon and Duinker, Petak. 1983. *An Ecological Framework for Environmental Impact Assessment in Canada*. Halifax, Institute for Resource and Environmental Studies: Dalhousie University.
- Burdge, Rabel J., Fricke, Peter., Finsterbusch, Kurt., Freudenberg, Robert., Holden, Arnold., Llewellyn, Lynn., Petterson, John., Thompson, James and Williams, Gary. 1995. Guidelines and Principles for Social Impact Assessment. *Environ Impact Assess Rev* 15: 11-43.
- Canadian Environmental Assessment Agency. 1995. *Federal and Provincial Harmonization*. Internet address <http://www.ceaa.gc.ca>.
- , 1995. *Fact Sheet*.
- , 1994. *Canadian Environmental Assessment Process: A Citizen's Guide*.
- , 1992. *Canadian Environmental Assessment Act*.
- , 1987. *Reforming Federal Environmental Assessment: a discussion paper*
- Canadian Environmental Assessment Research Council. 1987. *Evolutionary Environmental Impact Assessment: An Action Prospectus*.

- Campbell, Neil. 1993. *Biology* 3rd ed. Redwood City California: Cummings Publishing Co.
- Canter, Larry and Kamath, J. 1995. Questionnaire Checklist for Cumulative Impacts. *Environ Impact Assess Rev* 15: 311-339.
- Carson, Rachel. 1962. *Silent Spring*. Boston: Houghton Mifflin.
- Castillon, David A. 1992. *Conservation of Natural Resources: a resource management approach*. Dubuque, IA: WMC Brown Publishers.
- Chadwick, Andrew. 1995. Socio-economic Impacts 2: Social Impacts. In *Methods of Environment Impact Assessment*. Edited by Peter Morris, Riki Therivel. Vancouver: University of British Columbia Press.
- Charlie, Marvin and Louis, George. 1995. Letter from the Cheslatta to the Minister of Environment Lands and Parks objecting the Proposed Huckleberry Mine Development. Project Registry.
- Christensen, Bev. 1995. *Too Good to be True: Alcan Completion Project*. Vancouver, Talonbooks.
- Couch, W.J., Herity, J.F. and Munn, R.E. 1981. *Environmental Impact Assessment in Canada*. No. 6. Federal Environmental Assessment Review Office.
- Ellis, Derik. 1989. *Environments at Risk*. New York: Springer-Verlag.
- Environmental Assessment Office. 1995. *Guide to the British Columbia Environmental Assessment Process*.
- 1995. *Prescribed Time Limit Regulations*.
- December, 27 1995. *News Release: Huckleberry Copper Mine approved by Province*.
- December 13, 1995. *A Comprehensive Study Report of the proposed Huckleberry Mine*. Project Registry.
- 1995. The Huckleberry Copper Project Proposal. Province of British Columbia. *Newsletter* (2): 5-7
- 1995. *Project Committee Communication Protocol*. Project Registry.
- September 13, 1995. *Project Committee Meeting Minutes*. Project Registry.

- , 1995. *Project Report Review Period Comments*. Project Registry.
- , August 8 & 9, 1995. *Project Committee Meeting Minutes*. Project Registry.
- , June 13, 1995. *Project Committee Meeting Minutes*. Project Registry.
- , 1994. *British Columbia's Environmental Assessment Act. Environmental Assessment Quick Facts*. Project Registry.
- Erickson, Paul, A. 1994. *A Practical Guide to Environmental Impact Assessment*. San Diego: Academic Press.
- Ferris, Glenda. 1996. Private Consultant for the Wet'suwet'en: Personal Communication.
- Ferguson, K.D and Erickson, P.M. 1989. Pre-mine prediction of Acid Mine Drainage. In *Environmental Management of Solid Waste, Dredged Material and Mine Tailings*. Editors Fortner, U. and Salomon W. London: Springer-Verlag.
- Fuggle, R.F., Shopley, J.B. 1984. A Comprehensive Review of Current Environmental Impact Assessment and Methods and Techniques. *Journal of Environmental Management* 18: 25-47.
- Gibson, Robert. 1993. Environmental Assessment Design: Lessons from the Canadian Experience. *The Environmental Professional*. 15: 12-24.
- Glasson, John. 1995. Socio-economic impacts 1: Overview and Economic Impacts. In *Methods of Environment Impact Assessment*. Edited by Peter Morris, Riki Therivel. Vancouver: University of British Columbia Press.
- , Therivel, Riki and Chadwick, Andrew. 1994. *Introduction to Environmental Impact Assessment*. London: UCL Press.
- Harper, Jesse. 1996. Princeton Mining Biologist: Personal Communication.
- Harris, Jo. 1996. Ministry of Energy, Mines and Petroleum Resources: Personal Communication
- Hallam, Piesold and Knight. 1995. Huckleberry Mine Environmental Impact Assessment. Volumes I to VIII.
- Hildebrand, Stephen., and Connrad, Johnnie. 1993. *Environmental Analysis: the NEPA experience*. Boca Raton Fla: Lewis Publishers.

- Hollick, Malcolm. 1984. Who Should Prepare environmental impact assessment? *Environmental Management* 8 (3): 191-196.
- Hostvosky, Charles. 1989. Social Impact Assessment: Planning for Human Values in Environmental Assessment. *EA Update* 12 (2): 6-11.
- Huckleberry Mine. 1995. *Huckleberry Mine Public Consultation Report*. Project Registry.
- Hutchison, Ian., and Ellison, Richard. 1992. *Mine Waste Management*. Michigan: Lewis Publishers.
- Interior News. August 23, 1995. *Defining the Word Public*.
- , August 16, 1995. *Public urged to be part of review*.
- Jackson, Winston. 1988. *Research Methods. Rules for Survey Design and Analysis*. Scarborough, Prentice Hall.
- Jain, R.K., Urban, L.V., Stacey, G.S., and Balbach, H.E. 1993. *Environmental Assessment*. New York: McGraw-Hill.
- Jefferies, T.W. 1982. The Microbiology of Mercury. *Progr. Ind. Microbiol* 16: 23-75.
- Karr, James. 1987. Biological Monitoring and Environmental Assessment: a conceptual framework. *Environmental Management* 11(2): 249-256.
- Keating, Michael. 1994. *Media Fish and Sustainability: a paper on sustainable development and the Canadian news media*. Ottawa: National Round Table on the Environment and the Economy.
- Kelly, Martyn. 1991. *Mining and the Fresh Water Environment*. New York: Elsevier Science Publishers.
- Kersten, M. 1988. Geochemistry of priority pollutants in anoxic sludges. In *Chemistry and Biology of Solid Waste*. Editors Fortner, U. and Salomon W. London: Springer-Verlag.
- Kravetz, Natalia., MacDonald, William, and Nichols, Peter. 1987. *A Framework for Effective Monitoring*. Ministry of Supply and Services. Canadian Environmental Assessment Research Council.
- Li, Peter. 1981. *Social Research Methods*. Toronto, Butterworth & Co.

- Luttmerding, H. A., Demarchi, D. A., Lea, E.C., Meidinger, D.V. and Vold, T. 1990. *Describing the Ecosystem in the Field*. Manual 11. Victoria, Queens Printing.
- Marshall, IB. 1982. *Mining, Land Use and the Environment: 1. a Canadian overview*. Ottawa: Environment Canada.
- McHarg, Ian. 1969. *Design with Nature*. New York, Garden City.
- Ministry of Energy, Mines and Petroleum Resources. 1990. *Mine Development Assessment Act*. Victoria, British Columbia
- Minister of Environment, Lands and Parks and Minister Responsible for Multiculturalism and Human rights. 1994. *Environmental Assessment Act*. Victoria, British Columbia
- Morin, Kevin. August 12, 1995. *Letter Preliminary Comments on Acid-Rock-Drainage Testwork and Predictions for the Huckleberry Project*.
- Morris, Peter. 1995. Ecology: Overview *In: Methods of Environmental Impact Assessment*. Edited by Peter Morris and Riki Therivel. Vancouver: University of British Columbia press.
- Munn, R.E. 1979. *Environmental impact assessment: principles and procedures*. 2nd ed. New York: John Wiley.
- Nelson, Joyce. August 31, 1995. Mining Public Opinion. In *Monday Magazine*. Victoria, British Columbia.
- Notke, Claudia. 1994. *Aboriginal peoples and Natural Resources in Canada*. New York: Captus University Publications.
- Petak, William J. 1980. Environmental Planning and Management: The Need for an Integrative Perspective. *Environmental Management* 4 (4): 187-195.
- Ringstad, Norm. 1996. Environmental Assessment Office: Personal Communication.
- Ripley, Earle., Redmann, Robert and Crowder, Adele. 1996. *Environmental Effects of Mining*. Delray Beach, FL: St. Lucie Press.
- , Redmann, Robert and Maxwell, James. 1978. *Environmental Impact of Mining in Canada*. Kingston, On: Centre for Resource Studies.
- Robertson, Michael. 1990. The Cheslatta Story. Cheslatta Nation.

- Rosenburg, David., Danks, H.V. and Lehmkuhl, Dennis. 1986. Importance of Insects in environmental impact assessment. *Environmental Management* 10 (6): 773-783.
- Sadler, Barry and Jacobs, Peter. 1991. A Key to Tomorrow: On the Relationship of Environmental Assessment and Sustainable Development. In *Sustainable Development and Environmental Assessment: Perspectives on Planning for a Common Future*. Edited by Peter Jacobs and Barry Sadler Canadian Environmental Assessment Research Council.
- Savory, Allan. 1988. *Holistic Resource Management*. Washington: Island Press.
- Sengupta, M. 1993. *Environmental Impacts of Mining: monitoring, restoration and control*. Boca Raton, Fla.: Lewis Publishers.
- Shoemaker, Darryl. 1994. *Cumulative Environmental Assessment*. Waterloo: University of Waterloo.
- Smit, Barry and Spaling, Harry. 1995. Methods for Cumulative Effects Assessment. *Environ Impact Assess Rev* 15: 81-106.
- Smith, L. Graham. 1993. *Impact Assessment and Sustainable Resource Management*. New York: John Wiley and Sons.
- Stewart, Craig. 1996. Ministry of Environment, Lands and Parks: Personal Communication.
- The World Commission on Environment and Development. 1987. "From One Earth to One World" In *Our Common Future*. Oxford, Oxford University Press.
- Van Zalingen, Sylvia. 1996. Ministry of Energy, Mines and Petroleum Resources. Personal Communication.
- Walther, Pierre. 1987. Against Idealistic Beliefs in the Problem Solving Capacities of Integrated Resource Management. *Environmental Management* 4(11): 439-446.
- Webler, Thomas., Kastenholz, Hans and Renn, Owen. 1995. Public Participation in Impact Assessment: A Social Learning Perspective. *Environ Impact Assess Rev* 15: 443-463.
- Wolfe, Gord. 1996. Ministry of Environment, Lands and Parks: Personal Communication.
- Young, John. 1996. *Mine deal still hinges on foreign financing*. Houston Today. pg. 1