A REVIEW OF THE BIOPHYSICAL IMPACT ASSESSMENT AND RECLAMATION PLAN FOR NEW MINING AREAS IN SUPPORT OF APPROVED NEW FACILITIES AT THE SYNCRUDE CANADA LTD MILDRED LAKE PLANT

VOLUME I

Prepared By:

THE FT. McKAY COMMUNITY
Ft. McKay, Alberta

January, 1986

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January 31, 1986

Mr. Vern Millard
Chairman
Energy Resources Conservation Board
640 - 5th Avenue S.W.
Calgary, Alberta T2P 3G4

Dear Mr. Millard

I have enclosed a copy of our report entitled:

"A Review of the Biophysical Impact Assessment and Reclamation Plan for New Mining Areas in Support of Approved New Facilities at the Syncrude Canada Ltd. Mildred Lake Plant."

The issues and questions raised in our report are at this time presented for review by the Working Committee. Nevertheless we believe that they are valid questions which if not properly addressed may be raised at an ERCB hearing on this matter. We are of course hoping that this process would not be necessary.

Secondly the thrust of our recommendations is to set up on-going procedures and mechanisms by which the community of Fort McKay may become more actively involved in environmental data collection, monitoring, mitigation, and enhancement. We believe that in addition to identifying negative affects and assisting in their mitigation that the community may play a role in other aspects concerning environmental monitoring.

Yours truly,

Dorothy McDonald
Chief
Ft. McKay Indian Band

RRW:jct

EXECUTIVE SUMMARY

This is the first of two volumes produced on behalf of the Ft. McKay Band pertaining to oil sands developments. Here, environmental issues relating specifically to the Syncrude Canada, Ltd. application for new mining areas are discussed in some detail.

The second volume deals with wider, regional environmental issues resulting from oil sands mining operations in Northeastern Alberta.

The first volume, being directed toward the application for new mining areas, deals chiefly with aquatic, land and wildlife issues. The second volume deals with these broad issues and includes more detailed atmospheric questions.

The Proponent has assembled a comprehensive and valuable compilation of environmental literature relating both to the project and to the impact of oil sands mining operations in general. The data are well-presented and provide reviewers with useful check-lists of various categories of impacts which are known, or predicted, to occur. Mitigation strategies are likewise presented.

Deficiencies in the presentation, or requests for more information, are discussed in sections of our report which deal with broad topics of aquatic, wildlife, land reclamation issues.

Definitive conclusions or recommendations are not possible in some areas touched in our review. More data, or clarifications, have been requested in those cases. It is anticipated that these questions can be dealt with as part of ongoing discussions between the Band, proponent and appropriate Alberta government agencies. It is recommended that these discussions be dealt with through the mechanisms established by the Ft. McKay Interface Committee and/or the Community Environmental Education Committee.

Several broad conclusions or recommendations have been reached regarding the new mining areas. Obviously, such conclusions may not be strictly limited to specific aspects of the mine site development proposal, but they do attempt to focus on it. Other, more general recommendations, regarding regional environmental impacts resulting from oil sands operations are contained in the second volume.

Recommendations made in Section 5 of this report are summarized below:

It is recommended that company representatives, government scientists and representatives of Ft. McKay jointly co-operate in a review of current and proposed reclamation strategies. A scientific review session is proposed which would be followed by regular, ongoing progress reviews. Subjects to be addressed would include reclamation biomass production, reclamation procedures, land capability studies and forest productivity. Questions and comments raised in our assessment should be first addressed before any review meetings are attempted.

It is recommended that discussions between the Ft. McKay Band and appropriate Alberta government agencies be initiated to review past research and to identify new research programs which could be implemented on short or long-term effects of atmospheric deposition and acidification.

It is recommended that a thorough review be conducted of long-term aquatic monitoring and protection strategies at the mine site, particularly as they relate to possible enhancement strategies of fishery resources.

It is recommended that Ft. McKay , the proponent and appropriate Alberta government agencies co-operate in the evaluation, formulation and implementation of a regional wildlife management strategy. The strategy should contain elements of conservation, protection and augmentation of important species.

It is recommended that the previously-noted recommendations be structured within the context of regional and interactive potential effects of oil sands development. Specifically, animal species and renewable resources of importance to Ft. McKay should be carefully re-assessed with a view to possible programs to augment existing resources.

It is recommended that studies be commenced as to potential joint-venture, training or business development opportunities for Ft. McKay, and other Native communities, related to the New Facilities Application.

INDEX

LIST OF FIGURES

"Having regard for the stringent Alberta air quality standards, the 1983 monitoring results which indicate compliance with those standards, and the scope of environmental research which has been undertaken respecting oil sands operations, it appears reasonable to conclude that neither the environment nor the health of local people is in danger. Notwithstanding that conclusion, evidence presented at ERCB hearings in 1984, discussions with local people and accounts in the media make it abundantly clear that some local residents would not agree with that view. Indeed, the evidence presented to the ERCB by representatives of the Fort McKay Indian Band at the last Syncrude hearing indicated that in their view the environmental and health impacts from past and current oil sands operations has been devastating. In contrast, the applicant contended that on the basis of its evidence, environmental impacts were minimum. The tremendous gap between these two views is of major concern to the ERCB and is a problem that must be resolved if oil sands production is to achieve its potential."

Vern Millard
Chairman
Energy Resources Conservation Board
Proceedings Workshop on Oil Sands/
Heavy Oil and the Environment
April 24-26, 1985; pg. 15

NOTICE

This report was funded through the Alberta Energy Resources Conservation Board. Additional community support was provided by Syncrude Canada, Ltd. and Suncor, Inc.

Dr. Ron Wallace of Dominion Ecological Consulting, Ltd., Calgary, provided overall editorial and project direction. The team of scientists noted below provided assistance in specific areas:

Atmospherics:	Dr. Al Legge Kananaskis Environmental Sciences Centre Calgary, Alberta
Reclamation:	Dr. Everett Peterson Western Ecological Services, Ltd. Victoria, B.C.
Wildlife:	Mr. Dave Westworth Westworth and Associates Edmonton, Alberta

Chief Dorothy McDonald, Mr. Peter Ladouceur and Mr. Marvin McDonald of the Fort McKay Band provided much helpful direction and support for the Study.

ACKNOWLEDGEMENTS

The initiative and funding for this review study are derived from the Alberta Energy Resources Conservation Board. Mr. Vern Millard, Mr. Norm Strom and Mr. Ed Brushett are due special thanks for their encouragement and support in the preparation of this Study.

In particular, Chief Dorothy McDonald, Mr. Marvin McDonald and Mr. Peter Ladouceur provided co-ordination and support from the community of Ft. McKay which allowed the Study to receive the necessary input of the Band and community residents.

Special thanks are due Mr. John Howard of Syncrude Canada, Ltd. and Mr. Bill Oliver of Suncor, Inc. for their initiative in supporting the concept of these studies. Drs. J. Clemments, G. Lesko and Mr. R. Wood provided data necessary for the research. Mr. K. Sadler and Mr. B. Prasad of the ERCB provided valuable background data and advice in the formulation of the report.

Mr. Jerome Slavik was an invaluable member of the Study team, through his efforts at co-ordination and project development.

1.0 INTRODUCTION

In the Preface to this volume, the Chairman of the Energy Resources Conservation Board (ERCB) is quoted on the subject of the significant disparity between views presented to the ERCB by residents near oil sands mining operations and oil sands operators on the subject of environmental and health effects. The gap between those views was viewed as being of major concern to the ERCB, one which must be resolved if oil sands production in Alberta is to achieve its full potential.

Here, it is intended to provide a view of the documentation relating to the application by Syncrude Canada, Ltd. to the ERCB for new mining areas. Two documents were used in this review:

1. An Application to the ERCB for New Mining Areas in support of Approved New Facilities at the Syncrude Canada, Ltd. Mildred Lake Plant (ERCB Application No. 851024, Submitted Sept. 23, 1985).

2. Biophysical Impact Assessment and Reclamation Plan for the New Mining Areas in support of Approved New Facilities at the Syncrude Canada Ltd. Mildred Lake Plant (ERCB Application No. 851024, Submitted Sept. 23, 1985).

The terms of reference for this review derive from correspondence between Mr. J. Slavik (Lennie and Martin, Barristers & Solicitors) and Mr. V. Millard of the ERCB, subsequent to meetings held in Ft. McKay on October 17, 1985:

> Proposed new and innovative approaches to dealing with environmental issues and concerns raised by Syncrude's ERCB Application was supported by the Ft. McKay Band. Consultants were retained to assist the Band assess the environmental impact of the Syncrude Application based on the data provided by Syncrude, and also to review other relevant environmental data and as well be notified of deficiencies noted by the ERCB and DOE.
>
> The consultants were to meet with the leadership of the Band and community, possibly in conjunction with the representatives from Syncrude, to explain the proposed application and review the environmental impact. As well the consultants, in conjunction with Syncrude, will attempt to address concerns of the community leadership and members and suggest solutions.

Thereafter, the parties-at-interest were to meet in a joint working group to review and discuss environmental data and concerns. The group was to attempt to resolve any outstanding issues or concerns of the residents of Ft. McKay and attempt to agree on proposed terms and conditions of the approval.

Significantly, the communication noted:

> "In the event that the Ft. McKay Indian Band is not satisfied with the results of this process, then unresolved issues may be settled through an ERCB Hearing. However, at present it is the hope of all parties that a formal hearing can be avoided by a full and proper airing of environmental issues with all concerns being resolved outside of the Hearing process."

Since the time of that communication, it has been decided that two separate documents will be produced:

1. A detailed review of environmental issues associated with the Syncrude application for new mining areas (represented herein).

2. An overview of broader environmental issues associated with oil sands mining activities in the region.

The former will be dealt with through direct discussions between the Band, the ERCB and associated agencies and the proponents. The latter volume will be dealt with through a newly-formed Community Environmental Education Committee (CEEC) established between the Band, oil sands operators and Alberta government agencies.

It is the intent of both volumes to provide a critical review of environmental issues in relation to Ft. McKay in order to better define those issues for resolution between the Band and pertinent parties.

2.0 THE PROJECT PROPOSAL

On 9 February, 1984 Syncrude Canada Ltd. applied to the ERCB for approval to construct and operate new facilities at the Mildred Lake site to extend the project life to 2013. The application was approved in January, 1985.

New mining areas needed to support the new facilities to 2013 were not, however, included in the Application. On 23 September, 1985 Syncrude applied to the ERCB under Section 31(1) of the Oil Sands Conservation Act for an amendment to Syncrude's existing Approval No. 2959 (1979) to allow expanded mining activities west and north of existing mining operations and for five discard sites.

The mine development plan addresses two new mining areas - a West Extension and a North Mine Area. The New Mining Areas were said to disturb 5675 ha. of land as:

- Mine Areas:	2540.6 ha
- Discard Sites:	1303.2 ha
- Granular Storage Areas:	71.9 ha
- Interval Areas:	1759.3 ha

In 1986, mining is proposed to begin in an Auxiliary Pit at the SE section of the North Mine Area. In the year 2000, major mining operations with draglines and bucketwheels are planned to be relocated from the Base Mine to the North Mine Area. Other equipment will be relocated there from the NE and NW quadrants of the Base Mine in 2001 and 2004, respectively. Equipment from the SW quadrant will mine through the West Extension until 2013, at which time it will be relocated to the North Mine Area (Fig. 1).

The North Mine Area is sub-divided into two areas: the Auxiliary Pit and the four quadrants of the North Mine. The ERCB have advised Alberta Environment, Energy and Natural Resources and Syncrude (28 November, 1985) that since the Ft. McKay Band have no objections to approval of the Auxiliary Mine and Discard Area, the Board does not perceive a need for a public hearing. Once remaining issues have been resolved, the Board would issue appropriate approvals. Approval is anticipated in early 1986.

Initial site preparations for the North Mine Area are slated to begin in 1996 (four years prior to the initiation of mining). The West Extension mining operations will be initiated upon the exhaustion of

the SW Base Mine quadrant. Sections of the West Interception Ditch will be relocated as the mines develop (Syncrude, 1985b).

Production at the existing Base Mine derives from 4 dragline/bucket-wheel reclaimer/conveyer systems and an Auxiliary Production System (APS) (Syncrude, 1985b). The present source of oil sands feed for the APS is rapidly depleting and is expected to require replacement by 1987. Further sources of mineable deposits are projected to be developed by 2000 to replace exhausted supplies in the Base Mine. The Auxiliary Pit area could provide production for up to 27 years (until 2013). Discard sites are needed to provide for storage of overburden and reject material during the early years of the Auxiliary Pit and the North Mine.

Syncrude Canada Ltd. is a consortium made up of several participants holding an equity investment in the project who receive their share of final profits or losses according to their equity shares on the following basis:

	%
Esso Resources Canada, Ltd.	25.00
Petro-Canada	17.00
Alberta Oil Sands Equity	16.74
Canadian Occidental Petroleum, Ltd.	13.23
Alberta Energy Company, Ltd.	10.00
Gulf Canada, Ltd.	9.03
HBOG Oil Sands Limited Partnership	5.00
PanCanadian Petroleum Limited	4.00

At start-up in the late 1970's, Syncrude was capable of producing up to 40×10^6 barrels/year of synthetic crude oil (Syncrude, 1984). In 1981, with their "Debottlenecking Program" production was elevated to a capacity of 44×10^6 BBL/yr. With the plant expansion program approved in January, 1985 plant production is hoped to reach 50.4×10^6 BBL/yr of synthetic crude oil and 2.3×10^6 BBL/yr of naphtha product. Further significant expansions of the plant production capabilities are currently under consideration.

The community of Ft. McKay is located north of existing major oil sands mining operations, at the confluence of the MacKay and the Athabasca Rivers. The community is inhabited by approximately 300 people, and has developed facilities for Band Offices, a school, a health clinic and related community services.

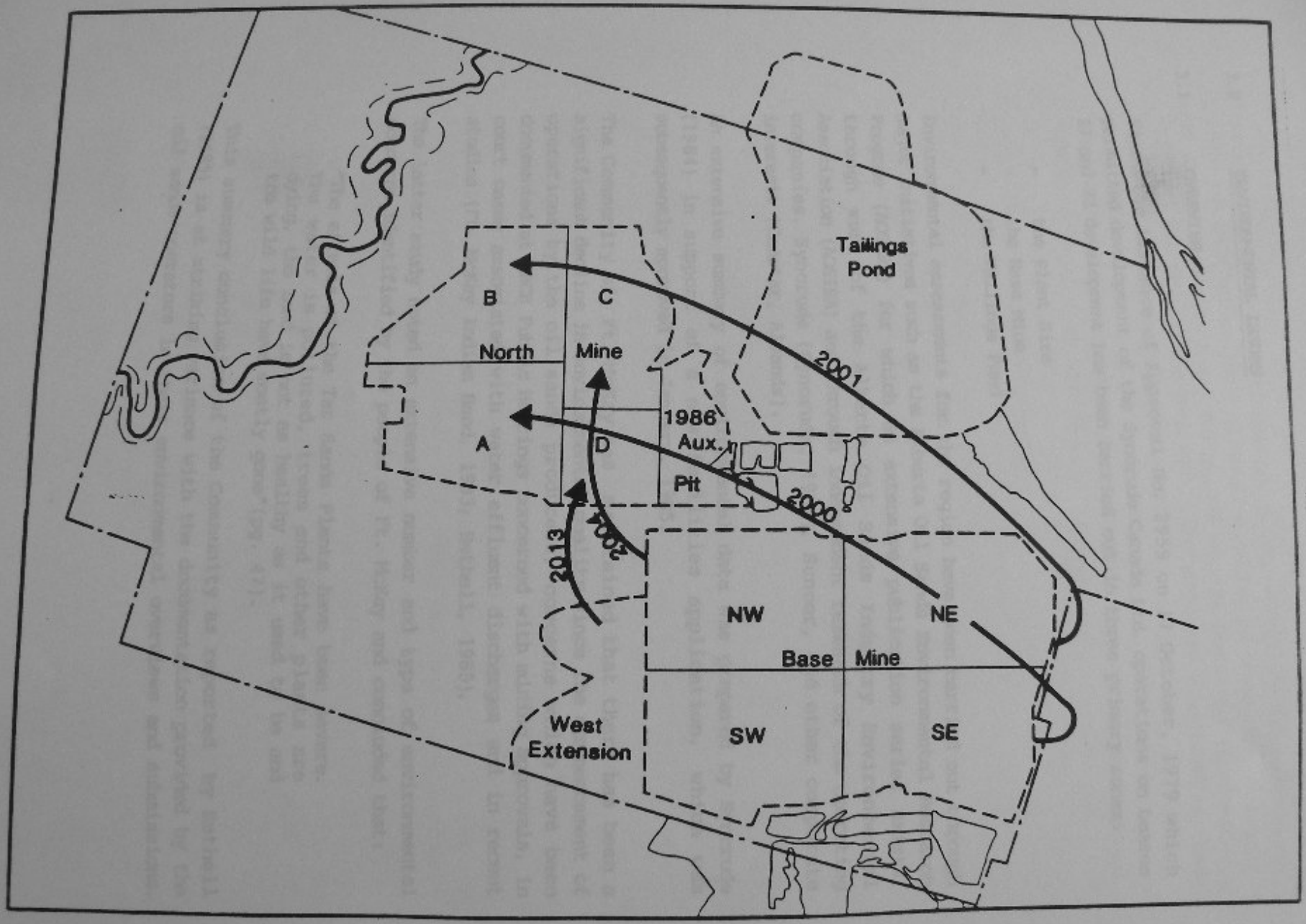

Fig. 1 Proposed Mine Development Sequence (Adapted from Syncrude, 1985 a)

3.0 ENVIRONMENTAL ISSUES

3.1 OVERVIEW

Since the issuance of Approval No. 2959 on 17 October, 1979 which permitted development of the Syncrude Canada Ltd. operations on Leases 17 and 22 development has been carried out in three primary zones:

- the Plant Site
- the Base Mine
- the Tailings Pond

Environmental assessments for the region have been carried out through major initiatives such as the Alberta Oil Sands Environmental Research Program (AOSERP) for which an extensive publication series exists, through work of the Alberta Oil Sands Industry Environmental Association (AOSIEA) and through independent research of the operating companies, Syncrude (Syncrude, 1984), Suncor, and other corporate interests (Canstar, Alsands).

An extensive summary of environmental data was prepared by Syncrude (1984) in support of a new facilities application, which was subsequently approved in January, 1985.

The Community of Ft. McKay has maintained that there has been a significant decline in environmental quality since the commencement of operations by the oil sands producers, concerns which have been documented at ERCB Public Hearings concerned with mining approvals, in court cases associated with water effluent discharges and in recent studies (Ft. McKay Indian Band, 1983; Bethell, 1985).

The latter study noted an extensive number and type of environmental concerns identified by the people of Ft. McKay and concluded that:

> "The effects of the Tar Sands Plants have been severe. The water is polluted, trees and other plants are dying, the land is not as healthy as it used to be and the wild life have mostly gone"(pg. 47).

This summary conclusion of the Community as reported by Bethell (1985) is at striking variance with the documentation provided by the oil sands operators in their environmental overviews and submissions.

In relation to the present application (No. 851024) by Syncrude Canada Ltd., the ERCB has recently directed a series of questions on behalf of Alberta Environment and Energy and Natural Resources (4 November, 1985) and the ERCB to the proponent. The proponent responded to that Deficiency Letter on 20 December, 1985.

These data and other, summary documentation noted above, are reviewed herein.

3.2 RECLAMATION, SOILS AND VEGETATION

3.2.1 New Mine Area Concerns

Syncrude (1985 b) pg. 2 (Figure 1.0-1) - Discard site N-1 is shown to extend close to the edge of the MacKay River escarpment edge. Pages 24 to 27 Syncrude (1985 b) did not clarify the proposed methods of slope stabilization or buffer zones proposed to prevent movement of discarded material into the river valley. Even if the discard material is prevented from reaching the escarpment edge, will the slopes of the discard dump reach to the edge of tree clearing as shown for site N-1 on Figure 5.2-10 (pg. 26)?

3.2.2 Reclamation

Syncrude (1985 a) pg. 5, column 4 and Syncrude (1985 b) pg. 30, column 4 states that dominant boreal forest vegetation is reclaimed to more diverse vegetation types. The implication is that this will be a change for the better because greater diversity is generally considered to be more desirable, from an ecological point of view, than simple and less diverse habitats.

Contrary to this implication, on pg. 30, para. 5 Syncrude (1985 a), it is stated that lack of water in reclaimed areas will restrict the value of the new habitat to aquatic furbearers and waterfowl. This end result seems to be less diversity of habitat than is provided by the pre-disturbance vegetation and drainage patterns.

Syncrude (1985 a) pg. 55, last para. - It is probably not an issue of concern to either the Fort McKay band or ERCB, but it is hard to understand how drainage pattern alterations have had no major impacts on vegetation. If this were so, much of the ecological literature on relationships between boreal vegetation patterns and soil moisture and water table variations must be wrong. Note that on pg. 77 it is stated that "the distribution of these vegetation types depends on local factors of drainage, depth to water table, depth of peat, and water chemistry".

The missing explanation may be that there has not yet been enough time for major vegetation changes to be readily observable as a major impact. In view of the high proportion of the area covered by poorly drained soils (see Syncrude (1985 a) pg. 71 and 74 and map on pg. 76),

it is considered that drainage pattern alterations must eventually have a large impact on soil moisture, water table levels and vegetation.

Syncrude (1985 a) pg. 40, fourth and last paragraphs, and Section 3.1.5.3 on pg. 42 - We are assured that after 9 years of operational reclamation experience, including "experience with soil fertility, biomass production, desired herbage production and fertilizer nutrient availability" all of the chosen species "perform well". There is no reason to doubt the integrity of these statements, but in view of the monitoring data that has been gathered (see 3.1.5.3 on pg. 42) it is unfortunate that some data on biomass accumulation rates since 1976 were not provided. Without such data it is impossible to judge whether the revegetated areas lag behind or exceed naturally occurring vegetation types in terms of total plant production or "desired herbage production". For example, pg. 62 suggests that provision of useable moose habitat will depend on "the rate at which browse plants are regenerated". Do the 9 years of data tell us anything yet about rates of production of shrubs used as browse?

Syncrude (1985 a) pg. 140-141 - The reclamation plan in Chapter 6 is not sufficiently detailed to generate specific questions or comments. Several photographs of reclaimed areas would have helped to support the contention that "Syncrude has established reclamation procedures, based on years of research and operating experience, that have proven successful to date", in the same way that data on post-reclamation biomass accumulation rates would have made the contention more convincing. The successes may be evident to anyone who inspects the reclaimed areas in the field, but the information presented with the application forces the reviewer to accept the statements without documentation. Do ERCB and other government officials have the opportunity to observe in the field the successful reclamation that the applicant claims to have achieved since 1976? If so, are those data available from the proponent.

3.2.3 Vegetation Analyses

Syncrude (1985 a) pg. 130, para. 6 - Peterson and Levinsohn (1977) has been re-read and it cannot be found where it is stated that the area contains no rare or endangered plant species. Those authors were contracted by Syncrude Canada Ltd. to sample the area vegetationally so that a generalized map of vegetation types could be prepared and a pre-disturbance estimate of productivity would be available. The specific objectives of the contract are listed on pg. 1 of Peterson

and Levinsohn (1977) and they did not include a search for rare or endangered plant species (see Appendix I). In fact, on pg. 7 of Peterson and Levinsohn (1977) the reader is cautioned: "the species mentioned in Appendix II should not be taken as a complete list of vascular plants present in the west part of Lease 17 because the study did not set out to prepare an exhaustive compilation of the area's flora".

Presumably the author of the biophysical impact statement looked at the list of plant species that occurred on the 27 sites sampled (Appendix I and Appendix II of Peterson and Levinsohn 1977) and saw that our list of 115 vascular plant species seen on the west half of Lease 17 contained none of the plant species considered by Packer and Bradley (1984) to be rare in Alberta. That does not prove that there are no rare or endangered plant species in the area under lease by Syncrude Canada Ltd. It is unfortunate that the impact statement attributes to authors a statement that they did not make and which their data do not support.

3.2.4 Land Capability Studies

There is one concern which emerges from the exchange of correspondence between ERCB and Syncrude Canada Ltd. because 26 of the 32 questions in the deficiency letter and their resulting answers are essentially a dialogue on mining engineering. Because the latter subject appears to be the dominant one of interest to ERCB, I do not have a very clear picture of what role is played by the biophysical impact assessment documents. My main comment follows.

1) Question 31b is the one that I find most confusing. It deals with the comparison of pre-mining and post-mining land capability. The first uncertainty is the source of the productivity data. The reader is referred to Table 3.3.7 (pg. 81 of the biophysical impact statement (Syncrude 1985 a)), the footnote of which says that the forest productivity classes (measured in cubic meters of wood per hectare per year) are taken from the Phase 3 inventory maps of the Alberta Forest Service. Paragraph 3 on pg. 80 says that forest productivity classes shown in Table 3.3.7 are "based on soil capability". But it did not cite whose soil capability data were being used.

In the 1984 Syncrude impact assessment, on page 308 it states that the productivity values (Table 4.2.8, pg. 315) are classified according to the Alberta Land Inventory system of classifying soils. It is confusing to the reader to know whether that is synonymous with the

Phase 3 inventory maps of the Alberta Forest Service which is the stated source for the productivity values shown in Table 3.3.7 (pg. 81 of Syncrude 1985 a).

The question of the source of the soil productivity data should be clarified because a reviewer could assume that Peterson and Levinsohn (1977) is the source of soil productivity estimates because pg. 146 of Syncrude (1985 a) and pg. 417 of the 1984 Syncrude impact assessment said that they were the authors of a report on vegetation and soil productivity (photocopies of pages 146 and 417 attached: Appendix I). A photocopy of the title page and the objectives page of the 1977 report is attached. Note that it does not address soil capability. In fact, as indicated in the third paragraph of page 1 of Peterson and Levinsohn (1977), Syncrude Canada Ltd. contracted the company to estimate productivity on the basis of vegetation sampling and to express the results in terms of potential wood fibre production, independently of productivity estimates derived from soil criteria. The idea was to estimate pre-disturbance productivity from several independent points of view - one based on vegetation, one on soil sampling and one on wildlife habitat carrying capacity. The filed documents attribute to Peterson and Levinsohn statements about rare and endangered plants which were not made and, as the attached pages show, those authors are also incorrectly identified as a source of information on soil productivity.

Assuming that Table 3.3.7 (pg. 81 of Syncrude (1985 a)) is based on productivity values from the Alberta Forest Service inventory classes, there is a problem with the argument on pg. 23 of the responses to the ERCB deficiency letter. That argument goes as follows:

a. Alberta Forest Service phase 3 inventory maps show that pre-disturbance spruce-aspen forest in this area produces 4.2 cubic meters of wood per hectare per year and pine forest produces 2.8 cubic meters per hectare per year.
b. Syncrude Canada Ltd. is going to re-create spruce-aspen and pine forest types.
c. Those re-created forests are going to have productivities of 4.2 m^3/ha/yr for spruce-aspen and 2.8 m^3/ha/yr for pine.
d. Therefore post-mining productivity will be as good as pre-mining productivity.

One does not need to be a forest productivity specialist to see the circular argument involved here. The problem is that Syncrude Canada Ltd. has not explained how they will accomplish step C. One cannot

fault the goal of creating a new soil that will support a forest at least as productive as the Alberta Forest Service estimates of pre-disturbance productivity, but the "answer" on page 23 does not explain how this will be accomplished. It would be more reassuring if the field documents contained data from the 9 years of reclamation experience to show that the newly created surface soils do in fact produce wood at a rate of 2.8-4.2 m^3/ha/yr and that they will have a physical structure and nutrient status (or fertilizer regime) to maintain that productivity.

These data should be submitted to the ERCB, and reviewed as part of the ongoing application process.

3.3 AQUATIC ECOSYSTEMS

3.3.1 Tailings Management and Groundwaters

Tailings pond water, as noted in Syncrude (1985 a) (pg. 27), is acutely toxic to aquatic organisms and the tailings pond must be reclaimed under the terms of the Development and Reclamation Approval OS-1-78. Other authors (Barton and Wallace, 1979) have early documented the extreme toxicity of tailings pond residual materials to aquatic life.

Page 27 (para. 4) of Syncrude (1985 a) notes:

> "Natural groundwater could potentially be contaminated by process effluent from the tailings pond."

The document goes on to discuss the natural barriers to downward movements of tailings waters afforded by Clearwater clay-shales and the McMurray Formation. On page 55 (para. 2), however, the document notes:

> "Contamination of groundwater in the vicinity of the tailings pond by process water has not been definitely demonstrated by the piezometric monitoring program, and is not expected to occur because sealing of the pond's interior by tailings sludge and the ultimate reclamation of the tailings pond. There is no evidence of any groundwater contamination at on-site sources **other than at the foot of the tailings dyke.**" (our emphasis).

In the earlier Biophysical Impact Assessment (Syncrude, 1984) (pg. 237) it is noted that:

> "Since some of the water trapped in the compacted sand will slowly seep from the dyke, and since it is necessary to provide relief of internal hydrostatic pressures, internal gravel filter drains were incorporated into the dyke. Any water running out of or off the dykes is caught by a collector ditch, and pumped back into the tailings pond, preventing escape of any tailings water into natural surface waterbodies."

The document goes on to describe the extensive (38) system of piezometers set up to monitor "the quality and quantity of groundwater in the vicinity of the tailings pond area." They then state:

"If unacceptable levels of groundwater contamination are observed, contingency plans (hydraulic cut-off trenches and/or drawdown wells) could be implemented."

These measures imply considerable concern on the part of the operator regarding the management and control of waters through the dyke (although only briefly mentioned in the subsequent application). While this preparation is laudable, questions vis a vis the long-term operation of the pond and associated mine pits arise.

1. No data on quality or quantities of seepage waters are presented. Are those data available, and if so do they indicate toxicities to aquatic species?

2. What are the times and durations of piezometric monitoring operations and what constitutes "unacceptable levels of groundwater contamination?" Who has established criteria for "unacceptability" and how are the waters monitored and by whom?

3. Given the proximity of the lower Beaver Creek drainage to the tailings area and its ultimate connection to the Athabasca River immediately upstream of Ft. McKay, these concerns would be of some importance to the community. Have the ground and surface waters been examined for trace contamination and potential aquatic impacts, given the extreme toxicity of tailings material?

4. Presumably heavy metals and complex organic compounds are monitored in such seepages. Are these data available and if so why are they not presented? Are "tracer compounds" being used to detect seepages? (see Syncrude (1985 a: pg. 144)). Complex organics would not be caught in standard "oil and grease" testing, yet toxicity could be of most concern in this area of chemistry.

Syncrude (1985 a) pg. 27, para. 5 states that the only location that is susceptible to groundwater movement is to the east and northeast of the tailings pond, where about 9 m of surficial sands and gravels of Pleistocene deposits occur. Occurrence of these gravels and sands is shown on the map on pg. 28 of the application (Figure 5.3.-1). As stated on pg. 27 of the impact statement, natural groundwater could potentially be contaminated by process effluent from the tailings pond.

Fort McKay is omitted from most maps in this documentation (except Figure 5.2-2 on pg. 12 of the application) so that it is not convenient for the reader to visualize where a mapped feature occurs relative to Fort McKay Settlement. In the case of groundwater movement through the sands and gravels, one could assume that flow would be eastwards into the Athabasca River escarpment edge (Syncrude (1985 b) Figure 5.2-2 on pg. 12). On pg. 70 of the impact statement it is indicated that most groundwater flow is towards Lower Beaver Creek, but there is not any information in the applicant's documents which would absolutely rule out movement of contaminated groundwater towards the Fort McKay area. Fort McKay residents should ask for such assurances, and these data should be lodged with the ERCB.

Further, in Syncrude (1985 a) pg. 130, paragraphs 1 and 3 - Full recovery of groundwater conditions is expected to occur and it is stated that "these new conditions should resemble pre-mining conditions in the surficial aquifers". If that is the prediction, then how can the applicant say that "final landscape condition is expected to be an improvement in site conditions for forest growth, in comparison with the higher groundwater surface in muskeg deposits presently covering large parts of the new mining areas." It is hard to understand how both statements can prevail. This should be clarified.

3.3.2 Water Quality Monitoring

In Syncrude (1984) (pg. 243) grab samples (1) are noted to be collected from the "surface of the tailings pond during the summer" and analyzed for various components. In Syncrude (1985 a), however, (pg. 143) three grab samples of liquid effluent are cited as being taken, and the list of chemical and biological tests is changed.

1. Which set of statements is correct and how do these surface effluent tests relate to groundwater seepage tests below the dyke?

2. It appears that only one sample (or sample series of 3) is taken. Given a tailings pond surface area of 10 sq. miles, how significant are these samples:

   (a) in the short-term (summer, winter, etc.)?
   (b) in the long-term (yearly trends)?

Is one annual sample considered to be statistically reliable?

3.3.3 Tailings Pond Reclamation Plans and Aquatic Habitat Augmentation

Syncrude (1984: pg. 247) notes that: "Reclamation plans for the tailings pond have not been developed: however, two general options are being researched..." (clarification and detoxification and natural recolonization and detoxification).

Although the Tailings Pond will be a crucial component of the ongoing expansion mining operation, only secondary components (Beaver Creek, Poplar Creek and West Interception Ditch) are noted in the Impact Assessment and Reclamation Plan (Syncrude 1985 a: Chapter 6).

1. Are there data available to demonstrate the progress being made in tailings pond detoxification?

2. What are the long-term plans for tailings pond waters and is Syncrude willing to absolutely rule out any possibility of water decanting operations during the mine life or in subsequent reclamation attempts?

3. Are there data available to demonstrate the use of the ponded areas for eventual fisheries development programs to compensate for the loss of aquatic productivity in the Beaver River system? If so, how will this be designed to equal previously existing productivity of fisheries? Are there adequate pre-impact data available for the Beaver River basin and, if so, what are the productivity levels being assessed for future reclamation?

4. Given the expense of "remaking" the lower Poplar River drainages and the West Interceptor Ditch, has thought been given to actively promoting or augmenting recreational fisheries in areas accessible to the public (lower Poplar River)? There appears, indeed, to have been a decline in quality of fish habitat in such areas:

> "Although fish species diversity and abundance increased in Poplar Creek between 1974 and 1977 (lake whitefish, mountain whitefish, Arctic grayling, northern pike, and walleye were found), by 1984 only Arctic grayling and northern pike remained." (Syncrude, 1985 a: pg. 67).

What is the cause of this erosion of habitat and species found there?

The ERCB Letter of Deficiencies of 4 November 1985 also noted that "... the final disposition options of the Poplar Creek Reservoir and spillway are not identified ...". Syncrude has responded only that they are required to study the subject "as a condition of our current Development and Reclamation Approval No. OS-1-78."

Since 8 years have elapsed since the issuance of that Approval, surely some concept of planning must have emerged? If not, a fuller discussion of this issue should be sought before additional approvals are granted. In this regard, the local communities, the industry and government have interests in the enhancement or augmentation of local fisheries opportunities. As is suggested later (Section 5.3), all such opportunities afforded by the mining operations in the region should be carefully examined for any possible habitat improvement programs which could be linked to community development.

3.4 ATMOSPHERICS

3.4.1 The Quality, Composition, and Location of Fugitive Emissions From The Mildred Lake Plant

In any industrial operation there are fugitive emissions to the atmosphere. By definition these emissions are generally uncontrolled and released near or at ground level. The chemical composition of the fugitive emission may or may not contain constituents which are currently addressed by the Ambient Air Quality Objectives (SO_2, H_2S, NO, NO_2, CO, O_3, total suspended particulates, and dustfall) because compounds addressed by the AQO's are usually primary and secondary products of combustion. Although fugitive emissions are generally not products of combustion, some fugitive emissions are the products of incomplete combustion.

From the standpoint of human and animal health it is important that the quality, composition, concentration, and frequency of release of fugitive emissions be determined. A good starting point would be a characterization and quantification of hydrocarbons released to the atmosphere. One potential source of fugitive atmospheric hydrocarbons would be from the 10,000-12,000 barrels of non-recoverable bitumen lost to the tailings pond per day at the Syncrude plant.

The resuspension of dust in the vicinity of the Syncrude operation should also be addressed. This should include deposition rate and chemical characterization. Some of the dust may be very alkaline and some may be coated with hydrocarbon.

3.4.2 Long Term Potential For Soil Acidification In The Oil Sands Region As A Result Of Industrial Activity

It is stated that "there is no conclusive scientific evidence for the region, that soil acidification is taking place or will become a problem." [Syncrude, 1984 (p. 303)]. This is a very curious statement to make in view of the fact that acidification is a natural process which is continuously occurring over time as a soil profile develops. What should be stated is: "Is there an increase in the rate of soil acidification as the result of industrial emissions in the Oil Sands region?"

The only way to know whether a problem exists is to know what the normal natural rates of soil acidification are in the Oil Sands region. One needs background information. Basic research and monitoring of this phenomena is required.

The fact that acidic species are being emitted by Oil Sands operations suggests that accelerated soil acidification may become a problem in the long term. The Brunisolic soils of the region have low cation ion exchange capacity and as a result are prime candidates for accelerated acidification.

The statement is made that "SO_2 is easily converted to H_2SO_4 by sulphur oxidizing bacteria, causing acidification of soils." [Syncrude, 1984 (p. 300)]. This is not true. It is sulphur which is converted to H_2SO_4 by sulphur oxidizing bacteria.

3.4.3 Is There A Measureable Impact On The Terrestrial Environment In The Oil Sands Region Due To Industrial Activity?

The answer to this question is a function of the criteria that you use. The presence of visible symptoms on vegetation due to air pollution stress is commonly used as an indicator of terrestrial impact. The reason that visible symptoms have been used is because researchers could see a direct cause and effect relationship between the development of visible symptoms on vegetation and the presence of an air pollutant such as SO_2 or O_3, as noted in the papers cited below:

Jacobson, J.S. and A.C. Hill. 1970. Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Information Report No. 1, TR-7 Agricultural Committee, Air Pollution Control Association, Pittsburgh, Pennsylvania.

Malhotra, S.S. and R.A. Blauel. 1980. Diagnosis of Air Pollutant and Natural Stress Symptoms on Forest Vegetation in Western Canada. Environment Canada, Canadian Forest Service, Northern Forest Research Centre, Edmonton, Alberta. Information Report NOR-X-228, 84 pp.

The problem in the Oil Sands region is that the concentration and duration of air pollutant exposure required to elicit visible symptoms on sensitive vegetation on a large scale are not encountered. On a small scale, however, visible symptoms due to SO_2 stress have been observed on poplar and jack pine.

If one does not see visible damage on the vegetation, does that mean that the ecosystem is unaffected by the presence of air pollutants?

The short-term answer to this question is YES. In fact, if we were dealing with ecosystems in a short term which were sulphur and nitrogen deficient, and we were only concerned with low level sulphur and nitrogen emissions, the effect of the emissions on the ecosystem might be positive.

The long-term answer to this question, however, is NO. The recent observations of forest decline in Europe support this conclusion. Sensitive ecosystems will be altered by the long-term presence of air pollutants: See:

McLaughlin, S.B. 1985. Effects of air pollutants on forests: a critical review. Journal Air Pollution Control Association 35: 512-534.

The conceptual work of Manion (1981) has shown that it is a combination of stress factors which adversely effect vegetation. What this means is that air pollution as an environmental stress can weaken a tree and make it more susceptible to other subsequent natural stresses such as insects, frost, and drought: See:

Manion, P.D. 1981. Tree Disease Concepts. Prentice Hall Incorporated, Englewood Cliffe, New Jersey.

The point is that with chronic low concentration air pollution stress we are not dealing with a direct cause and effect relationship with the ecosystem but rather an indirect cause and effect relationship. Indirect effects on the ecosystem such as altered nutrient cycling and soil acidification take years to express themselves.

It has been stated that industrial activity at the Mildred Lake plant will continue well beyond 2013. The year 2013 corresponds to 35 years of operation for the Mildred Lake plant and 46 years of operation for the Suncor plant. There are indications as well that additional Oil Sands plants will be built in the future.

The conclusion from this discussion is that there is a real potential in the long term for there to be a negative impact of air pollutants on the forest ecosystem in the Oil Sands region as a result of industrial activity.

Long term environmental monitoring and research is required. Here again, there exist possibilities for meaningful training and development opportunities in local communities in conjuction with programs currently operated by corporate and governmental agencies.

3.5 WILDLIFE

3.5.1 Baseline Information on Habitat and Wildlife Populations that will be Affected by Mine Expansion

Baseline information provided by Syncrude for the New Mining Areas is generally quite good. Peterson and Levinsohn (1977) conducted a vegetation inventory of the west part of Lease 17 which provides a useful base for assessing the habitats of the proposed mine expansion area. That inventory is becoming somewhat dated, however it is unlikely that significant changes in habitat composition have ocurred since 1977.

The first detailed wildlife surveys were conducted in the area in 1975-76 (Penner 1976). Syncrude subsequently established a wildlife monitoring program which included annual aerial surveys of ungulates and semi-aquatic furbearers (beaver and muskrat) in the New Mining Area (Pauls 1985). Extensive information is also available concerning the use of the major waterbodies in the Syncrude project area (none are located in the New Mining Areas) for waterfowl. Terrestrial breeding bird populations in four major vegetation types were surveyed in 1984 (McLaren and Smith 1985). The only major wildlife group for which population data are lacking is terrestrial furbearers. Syncrude is relying on data obtained from winter track counts conducted during 1975-76 as its source of information on the importance of the affected habitat areas for squirrel, fisher, coyote, weasel and other species of terrestrial furbearers.

3.5.2 Environmental Concerns Identified in Syncrude's EIA

In assessing the impact of the proposed mine expansion on wildlife, Syncrude has relied heavily on information obtained from monitoring the effects of the existing Mildred Lake facility. This approach is advantageous in that it permits impacts to be predicted with greater certainty than is possible in the case of a new project where professional opinions form the basis for the impact assessment.

Syncrude does not identify any major adverse effects due to the construction of new plant facilities. The new facilities will be located within the existing plant site, therefore no additional vegetation clearing will occur. Installation of improved sulphur recovery equipment is expected to result in an overall reduction in sulphur dioxide emissions of 18 percent, thereby possibly reducing the potential for vegetation damage. Syncrude indicates that scavenging

problems associated with an increase in refuse disposal could have a minor, short-term impact on bears and canids.

Major impacts that were identified as part of the mine expansion into the New Mining Areas include:

1. loss of 5675 h of habitat through mine expansion, overburden disposal and storage of granular material,

2. loss of 22.9km of riparian stream habitat,

3. displacement of approximately 11 moose,

4. loss of approximately 31 beaver colonies.

The estimates of the average number of moose and beaver that will be affected is reasonable. The estimate of 11 moose is based on an average density of 0.2 moose/sq km observed between 1975 and 1985. Information presented in the biophysical impact assessment, however shows that 19 moose were recorded in the proposed New Mining Areas in 1985. Pauls (1985) suggests that the higher number observed in 1985 was due to an influx of moose, possibly from the Birch Mountains, brought about by deep snow. This may mean that the New Mining Areas are important to regional moose populations during severe winters.

Under the proposed mining plan, development will occur within 100 m of the MacKay River valley (overburden discard site N-1). The impact assessment notes that MacKay River valley provides important winter range for moose and "can be critical range in severe winters". Syncrude notes that moose in the MacKay River valley could be affected by disturbance caused by machinery and human activity, but considers the impact to be low. They indicate that firearm restrictions in the development area will reduce hunting-related disturbance. Firearm restrictions will likely help, but it is possible that increased hunting pressure could have a significant impact on moose in this previously remote area. Firearm and access restrictions have only been partially successful in the Syncrude development area in the past. Other studies conducted in the area have shown that moose are highly vulnerable to mortality from hunting and poaching when they are concentrated on winter ranges (Westworth 1979).

Apart from beaver, Syncrude does not provide any information on the approximate numbers of furbearers that will be affected. They conclude that numbers of coyotes and wolves will increase because of a

preference for areas of reduced cover. An increase in the number of wolves is unlikely however, since the number of moose (the principal prey species for wolves in the area, Fuller and Keith 1980) will decrease.

3.5.3 Reclamation and Mitigative Measures

The long-term significance of the development on wildlife will depend on the extent to which mitigative measures and reclamation will offset the losses associated with mining operations. Following are the major mitigative measures indicated in the EIA:

Ungulates. Reclamation is the principal mitigative measure identified. Syncrude makes the statement (p. 135, Syncrude, 1985 a) that "reclamation should re-establish ungulate capabilities in the New Mining Areas". If this is to mean that the area will be capable of supporting the same number of moose as before, then they are probably wrong. The preliminary reclamation information provided shows that much of the mining area will be reclaimed to jack pine/spruce aspen forest. Jack pine is the only tree species which has been shown to grow successfully on tailings sand. Pine forests have a very low capability for moose. Although information is lacking for the New Mining Areas, it can be assumed from the somewhat more detailed information provided for the base mine, that the final reclaimed landscape will be higher (due to materials expansion) and dryer than the current landscape. Lowering of the groundwater table is expected, which will adversely affect phreatophytes such as willow.

Furbearers. Syncrude states (p. 135, Syncrude, 1985 a) that loss of aquatic habitat will be partially compensated for by creation of new habitat associated with 9 km of new West Interception Ditch and borrow pits. This leaves a net loss of 13.9 km of stream habitat. As well, the WID will likely have a much lower capability for beaver than the streams that currently exist in the area (due to channel configuration and flow regime). During the operational phase of the project, beaver would likely be removed from the drainage ditch. It is probably that the project will result in a long-term loss of productivity for semi-aquatic furbearers in the New Mining Areas.

4.0 SOCIO-ECONOMIC ISSUES

The major thrust of this review centers on a review of environmental issues associated with the proposed mining expansion. The expertise and mandate of the scientific team assembled also are highly weighted toward environmental issues.

One issue (employment and training), which was dealt with by the ERCB, relates to the broad area of "Socio-Economic Concerns", and is highlighted here for reference and possible future discussions, since clearing activities or community-based environmental monitoring are possible extensions from the new mining activities.

4.1 EMPLOYMENT OPPORTUNITIES

In the ERCB Deficiency Letter of 4 November, 1985 it was noted that:

> "The Company should address the topic of numbers and skill levels of additional employees needed for the project. The company indicates (Page 29) that there will only be a slight increase in permanent job creation but does not provide any supporting information."

Syncrude has responded that the topics of manpower, numbers and skill levels had been previously addressed in the New Facilities Application, approved January 1985. While no further information may be available at this time, the topic is one which could be addressed in ongoing discussions with Native Bands in the area, particularly as relates to potential joint-venture or related business development opportunities.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 NEW MINING AREA AND ASSOCIATED IMPACTS

The documentation provided by the Applicant in support of the proposed expansion at the Mildred Lake oil sands mining project provides a comprehensive review of the issues and scientific data. Indeed, the impact assessments constitute a valuable compilation of scientific literature and reports produced to date in the region. The Proponent is clearly committed to the promotion of sound scientific research as regards environmental assessment and protection.

Based line information provided by Syncrude for the New Mining Areas is generally quite goodand those dataare constantly being re-evaluated through the ongoing monitoring programs of operating and other companies.

Unfortunately, in many cases throughout the Impact Assessments, contentions regarding proved techniques at mitigation (i.e. reclamation) are not accompanied with data to properly document such assertions. For instance, data on post-reclamation biomass accumulation rates are not extensively presented and force reviewers to accept conclusions on good faith. Presumably such data are, indeed, available and have been perused by government regulators?

Worse, the extensive biophysical impact assessments appear to be occasionally clouded by attributions not consistent with scientific reports which are quoted but which are not substantiated by data contained therein. Presumably such instances are rare, however, our review cannot make a definitive judgement at this time as very few original data sources were checked against data, or conclusions, presented.

As is noted in the text, definitive conclusions or recommendations are not possible at this time in many areas. Clarifications and/or additional data are required before judgements on the conclusions presented could be made. Specific conclusions or recommendations are noted below.

5.2 RECLAMATION, SOILS, VEGETATION

Many of the assumptions and conclusions reached by the Proponents could usefully be more thoroughly reviewed. Claims of eventual levels of forest productivity have not been thoroughly documented (although nine years of studies have been carried out). Perhaps not enough time has yet elapsed in which to reach definitive conclusions on reclamation strategies and successes.

The community of Ft. McKay has a long-term interest in both the techniques for, and success of, reclamation measures implemented on the lease(s). It would probably be useful for all parties-at-interest to participate in the formulation and execution of reclamation plans on the disturbed areas.

It may be possible, for instance, for the community to participate in long-term operations in concert with the operators, thus creating local expertise in reclamation techniques and the potential for business creation within the community.

It is recommended that company representatives, government scientists and representatives of Ft. McKay jointly co-operate in a review of current and proposed reclamation strategies. A scientific review session is proposed which would be followed by regular, ongoing progress reviews. Subjects to be addressed would include reclamation biomass production, reclamation procedures, land capability studies and forest productivity.

Questions and comments raised in our assessment should be first addressed before any review meetings are attempted.

5.3 AQUATIC ECOSYSTEMS

Data on the amounts and types of seepages through the Syncrude tailings pond dyke should be made available for a detailed public review. The presence of such materials in ground waters, which perhaps reach the community or the Athabasca River, could have significant long-term environmental consequences.

Further, aquatic monitoring studies should be more thoroughly reviewed particularly as they may relate to long-term management and reclamation plans for tailings ponds and diversion structures. The community also has a long-term interest in participating in, or co-operating with, programs to augment local sport or domestic fisheries. Such enhancement programs could be linked to habitat improvement projects for the community or to recreational sport fisheries business development. There is a strong, and largely unfulfilled sport recreational demand in the Ft. McMurray region and such programs could usefully be directed toward meeting, at least in part, those demands.

It is recommended that a thorough review be conducted of long-term aquatic monitoring and protection strategies at the mine site, particularly as they relate to possible enhancement strategies of fishery resources.

5.4 ATMOSPHERICS

Fugitive emissions, long-term soil acidification potential and the subject of measureable impacts from chronic acidic emissions have been raised in conjunction with general operations at the mine sites.

Although studies have been carried out on this topic in the oil sands region, studies of the quality and magnitude of the Acid Deposition Research Program (ADRP) have not been initiated specifically in Northeast Alberta. Among possible approaches to this problem of local data collection is the formulation of joint venture monitoring programs involving the community and/or government and industry. On-reserve air quality monitoring, for instance, could be developed in conjunction with existing monitoring programs.

It is recommended that discussions between Ft. McKay and appropriate Alberta government agencies be initiated to review past research and to identify new research programs which could be implemented on short or long-term effects of atmospheric deposition and acidification.

5.5 WILDLIFE

Firearm and access restrictions have only been partially successful at protecting important wildlife species in the Syncrude development area in the past. These, and other direct effects such as significant habitat disruption in the lease mining areas, may have exerted a profound, long-term impact on local and, perhaps, regional wildlife populations.

As with aquatic species, no programs have presently been identified to augment disrupted habitat areas or animal populations. There is room for discussion regarding such augmentation programs, especially within the context of regional hunting and trapping interests of the Ft. McKay Band. Such regional aspects are further discussed in Volume II.

Furthermore, plans for land reclamation appear to be questionable in terms of eventual suitability for ungulates.

It is recommended that Ft. McKay, the proponent and appropriate Alberta government agencies co-operate in the evaluation, formulation and implementation of a regional wildlife management strategy. The strategy should contain elements of conservation, protection and augmentation of important species.

5.6 AN HOLISTIC APPROACH TO ENVIRONMENTAL ASSESSMENT

The approach taken by the Proponent on discussing environmental impacts at the New Mining Area has been reductionist in character-identifying and reaching conclusions on many individual impacts. While such a matrix-approach is useful in generally cateloging and listing impacts, it falls prey to the criticism of "missing the forest for the trees."

Many specific impacts are linked in their effects and some have far-reaching consequences for other essential elements in the ecosystems which make up the oilsands region. Ecological evaluations demand an integrated, not reductionist, approach if proper assessments are to be reached. "Destruction by insignificant increments" is probably the most significant cause of widespread, although long-term, diminishment of ecological resources.

For instance, have plant species now used, or slated for use, in ongoing reclamation programs been properly screened for their long-term sensitivity to atmospheric contamination/acidification? It has recently become known that nitrifying bacteria associated with legumes and other plants are sensitive to acidification. This is an area where extensive evaluations, and careful judgements, may be necessary.

Further, there appears to be a lack of co-operative regional programs, throughout the oil sands region, to monitor long-term trends in wildlife populations and there is very little attention devoted to augmentation of those populations.

In short, the community of Ft. McKay is not solely concerned with techniques for environmental monitoring and mitigation but also with strategies to augment those renewable resources. It would be most advantageous if such programs could be structured in a way to mitigate local environmental impacts and perhaps expand the career horizons and employment opportunities for local residents.

These types of programs would allow local participation and also would work to ensure maintenance of renewable resources of importance to the local residents.

Related emissions, outside of those areas which have been extensively monitored at stack-sites, may be contributing to atmospheric contamination. For instance, one potential source of fugitive atmospheric hydrocarbons could be from the 10 to 12,000 BBLS/day of bitumen lost to the tailings ponds per day (Syncrude, 1984: 4.1.6.2).

It is recommended that the previously-noted recommendations be structured within the context of regional and interactive potential effects of oil sands development. Specifically, animal species and renewable resources of importance to Ft. McKay should be carefully re-assessed with a view to possible programs to augment existing resources.

5.7 SOCIO-ECONOMIC ISSUES

Particularly in relation to local participation in environmental monitoring or management projects, there is a significant potential for the use of local residents. Examples include:

- monitoring programs (local and regional)
- resource augmentation programs
- regional data collection
- environmental rehabilitation ventures

It is recommended that studies be commenced as to potential joint-venture, training or business development opportunities for Ft. McKay, and other Native communities, related to the New Facilities Application.

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APPENDIX I

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Western Ecological Services Ltd.

ENVIRONMENTAL RESEARCH MONOGRAPH 1977-6
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VEGETATION TYPES AND FOREST PRODUCTIVITY, WEST PART OF SYNCRUDE'S LEASE 17, ALBERTA

1. INTRODUCTION

1.1 Objectives of this study

The purpose of this study was to obtain baseline information concerning present vegetation on about 9,250 hectares of the west half of Syncrude's Lease 17, near Fort McMurray, Alberta. The study area is on the west side of the Athabasca River, in the vicinity of latitude 57° 00' N and longitude 111° 40' W (Figure 1).

Specific objectives were to: (i) classify the vegetation, on the basis of floristic composition, into reasonably uniform mappable units; (ii) describe the identified vegetation units according to tree, shrub, herb and moss layers; (iii) map the described vegetation units at a scale of 1:24,000; (iv) calculate the area, in hectares, occupied by each mapped vegetation unit; and (v) interpret and quantify forest productivity of each vegetation unit in terms of potential wood fiber production in accordance with methods used by the Canadian Land Inventory system.

The emphasis in this study was upon floristic classification and estimation of capabilities for wood fiber production, omitting integration with data from separate 1977 studies of soil capability and wildlife productivity. Floristic classification was only to a level of detail that resulted in units that would be recognizable on aerial photographs and mappable at a scale of 1:24,000. Phytosociological differences that were not associated with distinct aerial photograph patterns, for example ecologically distinct micro-sites involving different species of *Sphagnum* or different species of *Carex*, were not documented in this study.

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