

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

APPLICATION BY SUNCOR ENERGY INC. FOR AMENDMENT OF APPROVAL NO. 8101 FOR THE PROPOSED PROJECT MILLENNIUM DEVELOPMENT

**Addendum B to Decision 99-7
Application No. 980197**

1 INTRODUCTION

1.1 Application

Suncor Energy Inc. (Suncor) applied, pursuant to Section 14 of the *Oil Sands Conservation Act*, to amend Approval No. 8101 in respect of its existing oil sands mine and processing facilities in the Fort McMurray area. The project, referred to as Project Millennium, consists of an expansion to the mining area and the addition of new processing units. The project would be located at the site of the existing Suncor operation approximately 35 kilometres (km) north of Fort McMurray in the Regional Municipality of Wood Buffalo, in Township 92, Range 10, West of the 4th Meridian and Townships 90, 91, and 92, Ranges 8 and 9, West of the 4th Meridian (Figure 1). The proposed development (Figure 2) would increase the production capacity to a minimum level of 12 185 000 cubic metres per year of crude oil products by 2002, provides for the continuation of Suncor's operations until the year 2033, and includes

- an expansion to the Steepbank Mine based on a 30-year mine plan,
- an oil sands extraction plant on the east side of the Athabasca River,
- modifications to the current oil sands extraction plant on the west side of the Athabasca River,
- addition of a second processing train to upgrade oil sands products,
- utilities and other infrastructure associated with the mine and processing units, and
- an integrated reclamation plan for all of Suncor's mining areas.

Under a coordinated application process adopted by Alberta Environment (AENV) and the Alberta Energy and Utilities Board (the Board), Suncor filed a joint application and environmental impact assessment report. Suncor also filed for specific approvals under the Alberta Environmental Protection and Enhancement Act (AEPEA) and the Water Resources Act.

1.2 Decision

In Decision 99-7 (see Appendix 1) issued on 29 March 1999, the Board indicated that it was prepared to approve Suncor's application for the Project Millennium Development. In Addendum A to Decision 99-7 (Appendix 2), issued on 29 June 1999, the Board outlined its views on the extraction froth treatment plant. This addendum sets out the Board's detailed reasons for its decision and the conditions for the entire project.

1.3 Background

Suncor has operated a mine and upgrading facility within the Athabasca oil sands deposit near Fort McMurray since 1967. As part of its long-term growth strategy, it submitted and had approved debottling applications in 1994 and 1995. The Board approved modifications to the fixed plant in 1996. The Board approved Suncor's Steepbank Mine, located on the east bank of the Athabasca River, in 1997. The Steepbank proposal, together with the Production Enhancement Phase (PEP), would increase capacity to 20 540 cubic metres per calendar day (m^3/cd) or 130 000 barrels per calendar day (bbl/cd), by 2001.

1.4 Hearing

A public hearing of the application was held in Fort McMurray, Alberta during 12 - 15 January 1999 and in Calgary, Alberta, on 2 February 1999, before Board Members F. J. Mink, P.Eng. (Presiding Member), J. D. Dilay, P.Eng., and T. McGee.

Table 1 lists the participants in the hearing and abbreviations used in the report.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)

Suncor Energy Inc. (Suncor)
 D. R. Thomas, Q.C.
 A. E. Domes
 S. C. Lowell, P.Eng.

Witnesses

M. Shaw, P.Eng.
 D. J. Klym
 G. J. Welsh
 R. C. Sisson, Ph.D., P.Eng.
 I. Noble, P.Eng.
 M. Holysh, P.Eng.
 B. H. Sanden, P.Eng.
 R. P. Galachiuk, P.Eng.
 R. Allan
 S. Tuttle
 C. Fordham, Ph.D., P.Geol.
 M. R. Digel, of Golder Associates
 (Golder)
 J. Gulley, P.Biol., of Golder
 M. G. Rankin, of Golder
 M. A. Rawlings, P.Eng., of Golder
 G. Kemp, P.Eng.
 B. Lotochinski, P.Eng.
 D. Hodson, P.Eng.
 H. Keele, P.Eng.
 B. Doucette, P.Eng.
 M. McEvoy-Bussey

THOSE WHO APPEARED AT THE HEARING (cont'd)

**Principals and Representatives
(Abbreviations Used in Report)**

Witnesses
Oil Sands Environmental Coalition (OSEC)

K. E. Buss
R. C. Secord

D. Smith
M. Kitagawa
A. Dort-McLean
T. Marr-Laing

Friends of the Athabasca (FOTA)

H. Scott

H. Scott

Anzac Metis Local #334 (Anzac)

P.E.S. Kennedy

J. Malcolm
R. Coulter
P. Cardinal
E. Cree
J. Powder

Government of Canada

S. Faulknor

F. Hnytka, of the Department of Fisheries
and Oceans (DFO)
G. Hamilton, of Environment Canada
K. McDonald, Ph.D., of Environment
Canada
L. Lockhart, for Environment Canada

Government of Alberta

W. A. McDonald
M. A. Harquail

J. Nagendran, P.Eng., of Alberta
Environment (AENV)
K. K. Singh, P.Eng., of AENV
A. Hale, of AENV
A. MacKenzie, of Alberta Health

Alberta Energy and Utilities Board staff

D. A. Larder, Board Counsel
D.I.R. Henderson, P.Eng.
A. Sellick, P.Eng.
M. Dmytriw, RET
R. Germain, P.Eng.
R. Creasey, P.Biol.
J. Baker, P.Biol.
K. Eastlick, P.Eng.

Representatives of Shell Canada Limited, Syncrude Canada Limited, and the Athabasca Chipewyan First Nation (ACFN) were present at the hearing but did not present oral submissions. In its written submission, ACFN indicated that its general concerns regarding water quality, aquatic resources, and the end pit lake had been resolved through a memorandum of understanding with Suncor dated 7 December 1998. The Government of Saskatchewan submitted a letter of interest on the project and advised that its concerns could be addressed through consultation and participation in the Regional Sustainable Development Strategy launched by Alberta Environment.

2 ISSUES

The Board has considered all the evidence to assure the project is in compliance with regulatory and environmental standards in the province. It is satisfied that the proposed project generally meets or exceeds those expectations. The Board notes that no concerns were expressed respecting the upgrader technology selection. The Board accepts the upgrading technology selection of delayed coking in light of the synergies with the existing facility. The Board believes that delayed coking may not be the best technology selection for a green field site.

In considering the merits of the project in the public interest, the Board had particular regard for the following:

- Need for the project
- Mine planning/resource conservation
- Tailings management
- Bitumen extraction technology
- Environmental effects
- Socio-economic effects
- Cumulative impacts

3 NEED FOR THE PROJECT

3.1 Views of the Applicant

Suncor advised that it believed a suitable market window of opportunity exists for its oil sands products and that Suncor had the experience and ability to take advantage of these opportunities. It noted that timeliness of approval was important in respect of the United States markets, as these could be satisfied by other suppliers, notably Venezuela. It stated that it had a demonstrated reputation of economic viability in an environment of low commodity prices, having exhibited continuous improvement in its existing operations. Suncor noted that, since initiating its oil sands growth strategy, it had reduced its supply costs per barrel to the current \$88.1/m³ - 94.4/m³ (\$14 - 15/bbl) from \$122.6/m³ (\$19.50/bbl) in 1992. It expected that, after full Millennium production is reached, average cash operating costs would be in the order of \$62.9 - 69.2/m³ (\$10 - 11/bbl). This would further improve Suncor's competitive position in the marketplace and reduce the vulnerability of the operation to world oil price volatility.

3.2 Views of the Interveners

The interveners did not provide comments regarding the need for the project.

3.3 Views of the Board

The Board is satisfied that market opportunities exist and that Suncor is positioned to take advantage of those opportunities if the project proceeds. Subject to resolution of other concerns, the Board believes that there is a need for the project.

4 MINE PLANNING AND RESOURCE CONSERVATION

4.1 Mine Ore Recovery Criteria

Ore recovery is a critical component of the Board's resource conservation responsibilities. In discharging that mandate, the Board generally reviews the conceptual mine plan and cutoff limits at the application stage. The Board satisfies itself during the operation of the project by monitoring detailed mine plans and periodic reviews of the appropriate criteria.

4.1.1 Views of the Applicant

Suncor developed and submitted an extensive mine plan for consideration by the Board. It stated that a cutoff grade of 7 weight per cent bitumen with a 3 metre (m) minimum mining thickness was appropriate for the Steepbank Mine when standard drill-hole compositing procedures were used and that these criteria and procedures were applied to establish the mineable reserves for the entire east bank mining area. Suncor further stated that it determined the pit boundaries by a method termed "net cost" and that it used a net cost contour of \$62.9/m³ (\$10/bbl) of recoverable bitumen to define the pit. Suncor noted that it made an adjustment to pit boundaries for a 200 m setback from the crest of the Steepbank River escarpment to allow for a 100 m wide no-disturbance zone and a 100 m wide road allowance. Suncor stated that it had performed a sensitivity analysis on overburden pit slopes in areas of potential problem materials and that all cases examined were feasible for the given pit design and scheduling sequence. Suncor also indicated that the final decision on pit slopes would be based on continued geotechnical investigations and that it would consider slope stability and resource recovery in the final design.

At the hearing, Suncor acknowledged that the use of total volume to bitumen in place (TV/BIP) or total volume to net recoverable bitumen (TV/NRB) ratios as a replacement for the net cost method of pit limit determination had been discussed as part of the operating criteria¹ initiative. Further, Suncor indicated that, even if the Board did not accept recommendations from the operating criteria initiative, Suncor could accept the use of a TV/BIP or TV/NRB ratio for the purpose of reporting performance on resource recovery. Suncor accepted that the \$62.9/m³ (\$10/bbl) cost contour was generally equivalent to a TV/BIP equal to 15 m³/m³ or a TV/NRB equal to 2.8 m³/bbl for the Pit 2 area.

¹ Operating criteria — A regulatory reform initiative under which specific criteria define the expected performance from a particular project.

4.1.2 Views of the Interveners

The interveners did not comment on ore recovery criteria.

4.1.3 Views of the Board

The Board is satisfied that the oil sand recovery criteria, including a cutoff grade of seven weight per cent bitumen, mining selectivity of 3 m, and a mining limit of \$62.9/m³ (\$10/bbl) of recoverable bitumen proposed by Suncor are appropriate for the Pit 2 ore body. However, the Board believes that there is value in using a TV/BIP ratio equal to 15, rather than the \$62.9/m³ (\$10/bbl) cost contour proposed by Suncor, to measure ongoing performance with regards to determination of appropriate pit limits and will condition the approval accordingly. The Board believes that this is consistent with the objectives of the generic operating criteria approach.

4.2 Discard Sites and Plant Site

Siting of fixed facilities or discard dumps from the oil sands operation are an important consideration in order to avoid inadvertent resource sterilization.

4.2.1 Views of the Applicant

Suncor stated that, based on the most recent geological interpretation, there was no mineable oil sand identified under the revised north and northeast overburden dump locations. Additionally, Suncor indicated that it did not anticipate additional large-scale changes to mining limits in the areas of the dumps. It acknowledged that it would be reasonable to expect smaller scale changes, in the order of 200 m, to the mine limits as geological data from ongoing drilling becomes available.

Suncor stated that the Pit 2 mining area would require facilities for ore preparation, primary extraction, and support (the Millennium extraction plant). It noted that it had evaluated two potential locations for these facilities, the north and centre locations.

Suncor indicated that the north location immediately northwest of Pit 2 had several advantages compared to the centre location, including

- It had the lowest initial capital cost (more than \$30 million lower) due to shorter pipeline and utility routes.
- It was close enough to use an expansion of existing Steepbank infrastructure, such as mine shops, offices, and change room facilities, rather than construction of new facilities.
- There would be an opportunity for lower cost of operation due to proximity to existing facilities.
- It would have lower logistics cost.

Alternatively, the centre location above the river escarpment on an area devoid of mineable resources had some comparative advantages, including

- The plant would be in the centre of the Pit 2 deposit, resulting in the lowest overall oil sand haulage distances and costs.
- Tailing disposal distances would be less than for the north location.
- The new facilities would be out of the river valley.

Suncor stated that, on balance, the north plant site location was more attractive and, therefore, the north site was the chosen alternative. Suncor further stated that it projected that, as the mine face continues to advance through Pit 2, it would relocate truck-dumps and crushers closer to the active mining area, due to long ore haul distances and in-pit dyke construction. It expected that the relocation would be needed by about 2012, although it would determine the precise timing for this move to the centre plant location on the basis of economics. Suncor stated that, coincident with the move of Pit 2 facilities to the center plant location, there would be a requirement for new primary extraction capacity on the east side of the Athabasca River. Suncor indicated that it would apply at a later date for approval (as required) for the construction and operation of additional extraction capacity in the east bank mining area.

4.2.2 Views of the Interveners

The interveners did not comment on the proposed locations of the discard sites and the plant site.

4.2.3 Views of the Board

The Board is satisfied that the preliminary Pit 2 mining limits and dump limits in the area of the north and northeast dumps are appropriate and that further modification of the limits is not justified based on currently available geological information. However, the Board believes that additional work to more accurately refine the appropriate pit limits and the areas suitable for overburden dumps will be necessary when additional geological data become available. Therefore, the Board will require that Suncor submit a final evaluation of the oil sands resources in the areas of the north and northeast dumps, including determination of final mining limits, for consideration and approval of the Board one year prior to commencement of construction of these dumps.

The Board accepts that the preliminary designs used by Suncor for the north and northeast dumps are reasonable based on the currently available information regarding geotechnical characteristics of the sites and materials and that the use of these designs for long-range planning of waste storage requirements is appropriate. However, the Board will require Suncor to submit for approval detailed geotechnical designs for the north and northeast dumps at least six months prior to field preparation in the dump areas.

The Board accepts the proposed north Millennium extraction plant site as a suitable initial plant site east of the Athabasca River and recognizes that Suncor does not envision the move to the centre site for a number of years. The Board notes that Suncor significantly reduced the size of the waste island upon which the centre site was located after consideration of the most recent drilling information and believes that some further modification to the island may occur in the future for similar reasons. As a result, the Board expects Suncor should be able to place extraction facilities at the centre site without sterilizing mineable oil sands. To satisfy itself that the relocation is appropriate, the Board will require Suncor to submit an assessment of the resulting impacts on resource recovery, environment, and mine and extraction operations two

years prior to the move or the construction of additional extraction facilities east of the Athabasca River.

4.3 Oil Sands Resource Conservation

4.3.1 Views of the Applicant

Suncor stated that there would be two locations within the project area where mineable oil sands could be sterilized. These included a permanent sterilization of mineable oil sands contained in an in situ plug at the northwest corner of the end pit lake (Pond 12) and a temporary sterilization of mineable oil sands under a portion of the external tailings pond (Pond 8a).

Suncor indicated that the in situ plug of ore and overburden would be required between the end pit lake and Pond 8 to ensure the integrity of both ponds. Suncor stated that the volume of recoverable bitumen contained in this plug was approximately 420 000 m³ (25 million bbls).

Suncor stated that the external tailings pond was located in an area that contained 10 744 000 m³ (68 million bbls) of recoverable bitumen. Suncor further stated that by 2027 all fluids stored in the external pond would be withdrawn and that a portion of the remaining sand and overburden would be rehandled into the interior of the pond to expose the ore below. Suncor estimated that the volume of tailings sand and overburden to be rehandled for this purpose was 12.5 million m³ but noted that the predicted volumes of ore and rehandle material involved in this scenario were estimated based on a number of assumptions regarding slopes and offsets. Suncor believed that, based on the chosen design parameters, it could successfully recover the affected resource. It also stated that, if the assumptions were found to increase resource recovery cost, it would be prepared to examine other alternatives, including the substitution of an otherwise uneconomic mining area to replace the resource lost.

Suncor stated that, in the event an expansion of the external tailings pond became necessary, with a resulting increase in the amount of mineable oil sands beneath the pond, it would remain committed to rehandle any additional tailings and overburden material required to recover bitumen from beneath the pond. Suncor further stated that, if the cost of the rehandle scenario were significantly higher than predicted, it would examine other alternatives, including substitution of an otherwise uneconomic mining area to replace the resource lost.

4.3.2 Views of the Interveners

The interveners did not comment on resource conservation matters.

4.3.3 Views of the Board

The Board accepts that an in situ plug of ore and overburden is required to accommodate Suncor's proposed mining and in-pit tailings disposal plan. However, the Board believes that there should be opportunities to reduce the size of the plug required so that bitumen losses are minimized. The Board also believes that evaluation of these opportunities is not warranted until further information regarding behaviour of consolidated tailings (CT) deposits is obtained and the final designs of Ponds 8 and 8a are completed. Therefore, the Board will require that Suncor complete a study of ways to minimize the size of the in situ plug and submit the study to the

Board for consideration and approval at least two years prior to commencement of CT placement in Pond 8.

The Board believes that there is a significant probability that Suncor will need to expand the external tailings pond as design and operational complexities of the tailings management plan become evident, with a resulting increase in temporarily sterilized oil sands. However, the Board accepts Suncor's commitment to rehandle any additional pond material required to recover the underlying mineable oil sands affected by the construction of the pond.

As an alternative to recovery of the oil sands underlying the external pond, the Board would be willing to consider proposals by Suncor to recover an equivalent value of resource through substitution of alternative uneconomic mining areas. However, the Board believes that, apart from the oil sands sterilization issues, there are significant environmental benefits associated with the rehandle scenario through the creation of a more desirable final landform for the external pond structure. This consideration, along with uncertainties associated with accurately defining an equivalent oil sands resource underlying the pond, would cause the Board to strongly favour the rehandle of the pond and recovery of the underlying oil sands over any other proposal.

Furthermore, while the resource beneath the pond has been drilled sufficiently to allow the lateral extent of the mineable oil sands to be defined, the Board does not believe that the drilling is sufficient to allow accurate calculation of the quantity of oil sands contained beneath the pond. Therefore, in the event that Suncor proposed to replace the reserves under the pond with an alternative supply of oil sands, the Board will require Suncor to drill the pond area further in order to allow more accurate assessment of recoverable bitumen.

5 TAILINGS MANAGEMENT

Tailings management entails a variety of technical, economic, and environmental issues. Among the more important of those issues for the Board is the avoidance of resource sterilization and the minimization of the environmental impact through implementation of tailings technologies, leading to a dry landscape suitable for the desired end land uses.

5.1 Views of the Applicant

Suncor stated that Millennium extraction plant tailings would temporarily be deposited as conventional tailings, beaching the sand and storing the mature fine tailings (MFT) in an external tailings pond (Pond 8a) approximately 5 km south of the Millennium extraction plant. Suncor indicated that insufficient storage capacity would be available in existing ponds to accommodate the tailings material produced by the new extraction plant. Since there was no MFT inventory on the east side of the Athabasca River, CT could not be produced from start-up of the Millennium plant. Suncor acknowledged that an inventory of MFT, available on the west side of the Athabasca River, could be used to create CT but contended that transfer of this material to east-side operations was not feasible due to high cost and complex logistics. Therefore, Suncor contended that an out-of-pit conventional tailings pond was required both to store tailings and to create an inventory of MFT to allow later production of CT.

Suncor stated that it would continue to reclaim tailings using CT technology. While Suncor believed that this approach has been commercially demonstrated and promises a means to reclaim tailings, it stated that further development was required on the release water quality and on techniques to stabilize CT storage areas to a trafficable surface. While it has constructed trafficable surface using techniques tested on a field pilot scale, it has not conducted an integrated demonstration of stabilization of a large CT deposit. Suncor said that development work is planned. Suncor committed to investigate enhancements and alternatives to its CT technology but concluded that CT was the best solid tailings management method technically and economically viable at this time.

Suncor indicated that numerous alternatives to the proposed tailings pond were considered, including alternative locations farther to the south, alternative construction methods including all overburden containment, and alternative tailings technology. Suncor noted that other tailings technologies using clarifiers or thickeners show promise; however, they are not sufficiently developed. Suncor recognized the proposed benefits of alternative technologies and would continue to participate in further research and development initiatives through the Canadian Oil Sands Network for Research and Development (CONRAD) on some of the alternative tailings technologies in order to continue to improve its economic, environmental, and reclamation performance. Suncor concluded that the most affordable and achievable design with the least environmental disturbance was the establishment of a conventional tailings pond just south of the Millennium extraction plant.

Suncor submitted that it would construct the containment dykes for the external pond primarily of tailings sand, with an initial starter dyke constructed of overburden material. Tailings sand would be placed on top of the starter dyke using upstream and downstream construction techniques to achieve the desired slope angles. Suncor also indicated that, while the design for Pond 8a was conceptual, the geotechnical criteria used as a basis for design provided sufficient certainty for the current phase of planning. It also noted that it did not believe that detailed design work would indicate that a larger pond footprint would be required to provide the same storage capacity.

Suncor stated that it used a semi-empirical model to forecast the accumulation of fine tailings and that the model had been calibrated for Suncor's extraction chemistry environment when applied to typical ores contained on the existing leases. Suncor stated that this model assumed that fine tails deposited in the external pond would settle to 30 per cent solids, the minimum MFT density, within one year. Suncor acknowledged that the fine tailings production volume was the most difficult component of the tailings streams to predict. It noted that some contingency storage space would be available in Pond 7 if the fine tailings settled slower than predicted, resulting in increased storage requirements.

Suncor proposed to use in-pit tailings containment dykes constructed almost entirely of waste overburden and interburden. Suncor noted that it, together with its consultants, had over 30 years of oil sands experience in design and maintenance of earth structures associated with mine activities and indicated that it would continue to ensure that its earth structures would meet or exceed applicable Canadian standards for geotechnical security. Suncor also stated that detailed designs for each earth structure would be submitted for approval through the AENV dam safety procedures.

Suncor stated that it would use the observational approach for dyke design. Using this approach, Suncor recognized that uncertainty regarding the characteristics of geological material would always exist and it had made assumptions regarding the behaviour of the geological material in the design of the dykes. Suncor also recognized that it was possible that the materials would behave differently than assumed and that it would implement monitoring programs to identify different behaviours. In the event that monitoring programs showed unanticipated behaviour, Suncor indicated that it would take remedial actions, such as construction of berms or changes to slopes.

Suncor stated that it would construct two in-pit dykes to replace the Athabasca River escarpment and to provide containment for in-pit tailings, dyke 10 in Pit 1, and dyke 11 in Pit 2. It would construct other in-pit dykes in Pit 2 to allow in-pit tailings deposition in mined-out areas as the pit development proceeded. Suncor indicated that dyke 10 was presently in the detailed site investigation and design phase, while dyke 11 was in the feasibility design stage. Suncor acknowledged that dyke 11 would be higher than any other dyke in the oil sands industry but noted that tailings structures of similar dimensions exist in mine operations outside Alberta. Suncor also noted that the consultants and expert review panel employed by Suncor had experience with structures as high as dyke 11 and higher. Suncor indicated that, according to the current development schedule, it would need a conceptual design for dyke 11 in about 2001 and a detailed design ready for regulatory approval in about 2002.

5.2 Views of the Interveners

The interveners did not provide comments regarding the tailings pond location. The Friends of the Athabasca (FOTA) noted that Project Millennium would increase the total amount of tailings by 2.5 times the current amount, increase the number of tailings ponds, require long-term (ten- to twenty-year) stabilization programs, and increase consumptive use of water. FOTA believed that the Bitmin process provided some advantages over Suncor's tailings management scheme.

FOTA suggested that the Bitmin process could be applied now, in whole or in part, along with the Suncor process to produce solid tailings and that its commercial application should not be delayed. FOTA recommended that the Board support the use of CT until Suncor converts to a solid tailings process, in order to reduce the need for ponds.

AENV stated that its objective of reclamation was to return disturbed land to an equivalent land capability. CT was a promising new tailings management scheme designed to reclaim fine tails deposits to a dry landscape. In its submission, AENV stated that this appeared to be the best available option to reclaim tailings as dry land. AENV stated that CT technology required further investigation and research to demonstrate it as a successful reclamation technique, but it was optimistic that further research could resolve any remaining issues.

5.3 Views of the Board

The Board shares some responsibility with AENV for reclamation planning and, in particular, the consideration of available reclamation options. In doing so, the Board and AENV jointly assess CT technology, review ongoing demonstrations and performance, and evaluate reclamation practices.

The Board notes FOTA's position on the use of the Bitmin process to produce a solid tailings but believes that further development and testing at a larger scale are required before commercial application can be adopted with any level of confidence. The Board supports solid tailings management technology developments such as Bitmin and others that would potentially eliminate the need for conventional tailings ponds or technologies that would mitigate the impact of existing tailings ponds.

The Board accepts that at this time CT offers the most promise of a dry landscape for tailings and accepts Suncor's continued use of CT as its tailings management strategy. However, the Board expects Suncor to monitor alternative tailings technologies for the reclamation of fine tails to a solid tailings without the need for conventional tailings ponds. The Board notes that technology, while promising, is still being developed. The current information suggests that, while a trafficable landscape may be achievable using CT technology, various parameters need to be better understood to refine the process. The Board will require Suncor to submit annual progress reports on CT developments until it is satisfied a trafficable landscape is achieved.

Although the Board considers CT to be viable, it questions whether CT is the best tailings management option for a new lease development, such as Suncor's, where another conventional tailings pond is required. Such an approach still requires a large out-of-pit tailings area to produce MFT and to store sand. A number of other solid tailings management techniques under development appear to offer smaller disturbed areas, faster and progressive reclamation, reduced energy consumption (due to immediate water recycling), and reduced water requirements and water release.

The Board recognizes Suncor's efforts in working together with other oil sands operators to solve tailings management issues and expects research and testing to continue on alternative tailings technologies that further reduce or eliminate the need for a conventional tailings pond. The Board will require Suncor to test alternative tailings technologies, such as the use of thickeners and clarifiers, including its extension to paste technology. Suncor will be expected to re-evaluate its tailings scheme if testing demonstrates the feasibility of an alternative tailings management scheme. The Board will require Suncor to submit progress reports on alternative tailings schemes on an annual basis until a trafficable tailings scheme has been developed.

The Board accepts that the external tailings pond is required if the Millennium project is to proceed according to the schedule proposed and that the location and conceptual design proposed by Suncor are appropriate.

The Board also finds the overall tailings management plan proposed by Suncor to be acceptable based on currently available information. However, the Board is concerned that a number of Suncor's assumptions regarding tailings volume prediction, dyke design parameters, and dyke construction schedules appear to be overly optimistic.

In particular, the Board believes that more detailed information regarding the designs of the tailings containment structures along the Athabasca River valley, including dyke 10, dyke 11, and the external tailings pond (Pond 8a), may indicate that significant alterations to the designs are required to assure the necessary environmental protection. In order to prevent alterations that would lead to increased sterilization of mineable oil sands or unacceptable environmental impacts, the Board will require Suncor to complete and submit for approval the detailed designs

of dykes 10 and 11 and the external tailings pond at least six months prior to containment of any water or deposition of tailings sand in the external pond. The Board recognizes that this may cause Suncor to undertake site investigations and design work earlier than planned, particularly with regards to dyke 11, but believes that the extra effort is justified due to the scale of the potential changes and the proximity of the dykes to the Athabasca River.

6 BITUMEN EXTRACTION TECHNOLOGY

6.1 Primary Extraction

6.1.1 Views of the Applicant

Suncor stated that it would condition approximately one-half of Steepbank mine ore at the Steepbank ore preparation facility and hydrotransport it to the base extraction plant for subsequent processing at the existing facility until the year 2012. Suncor would process the other half of the ore through the Millennium ore preparation plant and the Millennium extraction plant located on the east side of the Athabasca River in the Steepbank mine area. It would pipeline froth product from this facility to the base froth treatment plant for froth cleanup. In approximately 2012, it would construct an additional primary extraction plant on the east side of the Athabasca River in the Steepbank mine area, since the base extraction plant would be too distant for economical transport of the ore and disposal of the tailings.

Suncor stated that the technology proposed to extract bitumen from mined oil sands would be similar to that for the Steepbank mine, except that the thermal energy consumption would be 20 per cent lower. The Millennium extraction process would take advantage of recent developments that have the potential to further improve the extraction performance. Developments under active assessment and considered part of the current design for Millennium include

- oil sands conditioning using rotary breakers and agitation tanks, and
- a tertiary recovery scheme.

Other technology under active assessment with the potential for inclusion in the Millennium design include:

- a low-temperature raw bitumen pipeline, and
- thickeners and clarifiers.

Suncor believed that it has selected the most appropriate extraction technology for the Millennium project and that the impacts of the selected technology have been assessed in the EIA. Suncor stated that extraction technology selection for the Millennium project was based on choices made for the Steepbank mine. Generally, alternative technologies to the current processes are not commercially proven or not able to compete with the advantages of existing infrastructure or experience. Suncor stated that the direction it took to technology selection was to modify the current technologies with the objectives of increasing resource recovery, increasing energy efficiency, and maintaining an acceptable environmental impact.

It noted that the Bitmin process, as well as other alternative extraction technologies, was not commercially proven or competitive considering Suncor's existing infrastructure or experience. Suncor believed that the alternative extraction technologies, including the Bitmin process, had increased technological risks and capital requirements compared to the process it has chosen.

Suncor committed to achieve an average overall bitumen extraction recovery of 92.5 per cent from oil sands feed and stated that it would be prepared to accept this recovery as an approval condition. Suncor also committed to sustain a program of recovery improvement initiatives consistent with those in the Steepbank mine application.

6.1.2 Views of the Interveners

FOTA believed that Suncor's EIA was incomplete given that it did not assess alternative technologies in adequate detail to ensure that the best available technology would be implemented. FOTA noted that Suncor did not fully explore alternatives such as the Bitmin process, nor did it provide advantages and disadvantages of alternative processes to Suncor's proposed technology. FOTA noted that some of the merits of the Bitmin process, based on a 20-t/h pilot test were

- no need for a tailings pond,
- less thermal energy,
- less power consumption,
- immediate tailings reclamation,
- disturbed land only open for five years,
- less capital and operating costs for mining and extraction, and
- possibility of treating existing tailing pond water for use.

FOTA referenced statements from federal and provincial ministers of the environment that expected developers would use "best available technologies," technologies more efficient in energy use and less harmful to the environment.

6.1.3 Views of the Board

The Board recognizes FOTA's position on alternative extraction technologies. The Board notes that the Bitmen process is not commercially proven and would require a large-scale pilot to confirm process performance. The Board accepts Suncor's approach of modifying its current extraction technology with the objectives of increasing resource recovery, increasing energy efficiency, and achieving an acceptable environmental impact.

The Board accepts that Suncor's proposed modifications to its extraction process would improve the performance of the extraction plant and would allow Suncor to achieve an average overall bitumen recovery of 92.5 per cent.

6.2 EXTRACTION FROTH TREATMENT

6.2.1 Views of the Applicant

Suncor stated that it would process all froth production at the base froth treatment. Developments under active assessment and considered part of the current design include inclined plate settlers and two-stage classifying hydrocyclones.

Suncor said that it was actively assessing an additional recovery step for froth treatment tailings with the potential for inclusion in the Millennium design.

Suncor believed that it had selected the most appropriate extraction froth treatment technology for the Millennium Project and that it had assessed the impacts in the EIA.

6.2.2 Views of the Interveners

The interveners did not question the extraction froth treatment technology.

6.2.3 Views of the Board

The Board is satisfied with Suncor's proposed modifications to the extraction froth treatment process and its commitment to recover an average of 92.5 per cent of the bitumen from the Millennium Project.

6.3 DILUENT RECOVERY AND LOSSES

6.3.1 Views of the Applicant

Suncor stated that it would use a reformulated "heart cut" diluent in its froth treatment process. The heart cut diluent quality would have a narrower boiling range (200 - 400°C) with less light and heavy ends and benzene as compared to the current diluent quality (175 - 450°C). The reformulated diluent would reduce benzene emissions from the tailings pond by approximately 80 per cent, reduce volatile organic compound (VOC) and total reduced sulphur (TRS) compound emissions, and improve diluent recovery in the naphtha recovery unit (NRU) by 5-8 per cent.

Suncor stated that, with the change in its diluent quality and an increase in overall service factor to 98.6 per cent for its new and existing NRUs, it would achieve an overall diluent recovery of 99.3 per cent. This would result in a decrease of 10 per cent in volume of diluent lost per volume of bitumen produced relative to current practices. Suncor committed to an overall diluent recovery of 99.3 per cent, including provision for upsets and down times, on an annual average basis, with a stewardship target of 99.5 per cent. Suncor was not prepared to commit to an overall diluent recovery of 99.5 per cent recovery, even though it is consistent with its current operations. Suncor stated that it did not see the merit in continuously raising the prescribed recovery level at which enforcement actions might apply.

Suncor believed that, based on its experience and improvements in the operation of the NRU, it would be able to prevent potential odour incidents from occurring. Suncor stated that it has

substantially reduced odour incidents with plant improvements and would continue to evaluate the most effective measures to control diluent losses and to mitigate their potential impact on the environment.

Suncor acknowledged that a hydrotreated diluent had the potential to reduce emissions of sulphurous compounds from the tailings pond. However, Suncor concluded that there was insufficient justification to support investment to hydrotreat the diluent or to add redundancy to prevent untreated tailings being discharged to the tailings pond. Suncor committed to evaluate all options in the event of an odour incident, including reducing production rates and acting diligently, consistent with its business and environment practices to address the issue.

6.3.2 Views of the Interveners

AENV and Alberta Health believed that there is still uncertainty regarding the predicted amount of VOC and TRS emissions from the tailings ponds and their impacts. Further efforts by Suncor were needed to better understand and minimize emissions from the ponds. AENV stated that it might recommend to its approvals director that Suncor be required to provide further backup capabilities in the NRU or implement further operational procedures to prevent VOC and TRS emissions from the tailings ponds during all operating conditions.

6.3.3 Views of the Board

The Board recognizes Suncor's efforts to improve its diluent quality and plant operations. The Board notes Suncor's commitment to a minimum diluent recovery of 99.3 per cent, which would result in a reduction in the volume of diluent lost to the tailings ponds from the current annual average of 6.2 volumes per 1000 volumes of bitumen produced to 5.3 volumes. The Board also notes Suncor's commitment to an internal stewardship target of 99.5 per cent diluent recovery.

However, notwithstanding Suncor's improvements, the total volume of diluent lost to the tailings ponds will increase. The Board believes that a higher diluent recovery is achievable based on current plant performance and available technology. Therefore, the Board will require Suncor to achieve a diluent recovery of not less than 99.5 per cent to reduce diluent losses to a maximum of 4.5 volumes of diluent per 1000 volumes of bitumen produced.

The Board is not convinced that Suncor would be able to prevent off-site odours and other impacts resulting from the volatilization of solvent and other hydrocarbons contained within its tailings ponds if untreated froth treatment tails and upgrading waste water were discharged to the tailings pond. This would likely occur during an NRU outage or upset condition, when, under Suncor's proposed design, significant volumes of froth treatment tailings and upgrading waste water could be discharged to the pond without solvent recovery.

Given the risk of off-site impacts, the Board does not believe that discharge of untreated froth treatment tailings and upgrading waste water and associated diluent directly to the pond is acceptable and will condition the approval accordingly. The Board expects Suncor to identify alternative methods, such as implementing further operational improvements or the installation of redundancy in the NRU, in order to achieve essentially no discharge of untreated tailings and to reduce the risk of off-site impacts from diluent losses to the pond.

7 AIR EMISSIONS ISSUES

Air emissions, like other environmental impacts, are subject to strict provincial standards. In reviewing the air impact, the Board's responsibility is to evaluate whether those impacts meet or exceed those standards and ultimately support sustainable development in the area.

The Board notes the concerns raised by a variety of parties about the potential effect of emissions in the region due to the Millennium project directly and the prospective growth in the industry in general. None of the parties presented any guidelines on the possible threshold levels that were acceptable. Although it was generally acknowledged that current emissions are presenting no adverse impacts, in general the parties concluded that emissions thresholds should be developed for the area, they should be scientifically based, and a multistakeholder process should be adopted to develop them. The parties also noted various initiatives in progress in the area that individually or collectively focused on monitoring or addressing all relevant emissions issues.

The Board has no material evidence that existing or foreseen emissions as a result of Project Millennium will cause any serious effects on human or animal health or effects on vegetation. Notwithstanding that fact, the Board agrees with others that the prospect for industrial expansion in the area demands some caution and requires a system for monitoring and early detection of the potential impacts.

The Board also shares the view that, as a long-term precaution, environmental management objectives for regional air emissions should be set up based on the environmental capacity of the region. The Board is satisfied that the Regional Sustainable Development Strategy (RSDS), sponsored by AENV, and Cumulative Environmental Effect Management (CEEM) initiatives can be used to address these concerns. The Board also notes that Suncor is committed to those processes and agrees to abide by the results that may flow from them. Although the Board is unable to identify specific impacts from Project Millennium that could result in unacceptable effects, it believes an aggressive monitoring system should be able to detect them to implement mitigation measures. The Board will condition the project to assure Suncor will comply with the findings of RSDS.

7.1 Views of the Applicant

Suncor stated that it had developed a "We Care" environmental policy that involves continuous improvement and adaptive management to eliminate, minimize, or mitigate the impacts associated with its operations. It noted that since 1994 it had spent some \$220 million to improve sulphur plant recovery, install a vent collection and treatment system, and install a flue gas desulphurization unit (FGD).

Suncor planned to take a major proactive step in reducing sulphur emissions with this project. It noted that, while production would more than double at its site, there would be a minimal increase in sulphur dioxide (SO₂) emissions. Suncor said that the new sulphur recovery facility, to be installed as part of the Project Millennium Upgrader, would have a recovery of 99.5 per cent. The new sulphur recovery unit (SRU) would be designed with two trains, each with the capacity to handle all the acid gas from the Millennium Upgrader. Integration of the new SRU with existing facilities would provide for the processing of about 50 per cent of the feed to the

existing sulphur recovery units in the new SRU. Suncor noted that interconnection of the two existing and two new SRUs would increase overall recovery and would minimize the need for flaring as a result of upsets. Suncor noted that the service factor on its existing sulphur recovery facility would be greater than 99.9 per cent and that it did not expect many upsets, given the redundancy of the proposed facilities.

Suncor noted the Board's sulphur recovery guidelines, *Informational Letter (IL) 88-13*), and said that it would maximize the sulphur recovery to the capabilities of the facilities. It stated that, on a calendar-day basis and considering worst-case flaring, it expected to achieve 98.5 per cent or better sulphur recovery, consistent with IL 88-13.

Suncor stated that it will commission its Flare Gas Recovery Project in 1999. It said that a proposed natural gas liquids (NGL) recovery project with Novagas Canada Limited Partnership (Nova Gas) will reduce SO₂ emissions from existing and Project Millennium upgrading facilities. The NGL project would eliminate use of sour fuel during normal operations and reduce predicted emissions by about 5 tonnes per year. These reductions in low-elevation SO₂ sources would have the effect of eliminating predicted hourly Alberta ambient air quality guideline exceedances; however, isolated daily and annual exceedances are still predicted close to the development area. The exceedances were attributed by Suncor to sulphur in the diesel fuel used in the mine.

Suncor stated that, based on its experience operating the FGD since 1996, it would have an uptime of 95 per cent. It said that maintenance would be planned during periods of reduced coke firing and reduced energy demand. Suncor stated that unplanned outages of the FGD have been in the order of one to two days in duration. It said that five per cent FGD downtime had been factored into its emissions estimates and that it had completed an analysis of exceedances when the FGD is down. Suncor said that it predicted that the Alberta ambient air quality guideline for SO₂ would be exceeded for two hours per year using the likelihood of an upset.

Suncor stated that Project Millennium would double nitrogen oxides (NO_x) emissions relative to 1997 values from its current operations. The majority of the increase was attributed to the expanded mine fleet. Suncor noted, however, that air dispersion modelling did not predict any exceedances of Alberta ambient air quality guidelines for nitrogen dioxide (NO₂) in Fort MacKay, Fort McMurray, or Fort Chipewyan.

Suncor said that it was committed to expanding its NO_x emission control program with Project Millennium. It stated that new equipment would use low NO_x burners, that natural gas would be used for incremental power generation, and that low-emissions mine fleet engine technology would be introduced as the equipment becomes available. Suncor said that it was committed to using the low-emissions engine technology even if the equipment is not required by Canadian regulations. Suncor noted that it anticipated delivery of a truck later in 1999 that will have improved engine technology. It said that the technology would be implemented as it retires the 240-ton mine trucks and that NO_x and particulate matter (PM) emissions reductions of 30-40 per cent could result from the improved technology.

Suncor noted that NO_x emission reductions have been measured at 40 per cent as a result of its boiler rebuild project, much greater than the design commitment of a 20 per cent reduction. It said that EIA evaluations were based on this design commitment.

Suncor said that VOC sources included fugitive emissions from process areas, tank farms, and tailings ponds. It noted that the tailings ponds are a significant source and that VOC emissions originate from unrecovered diluent in the froth treatment tailings.

Suncor stated that it had been monitoring tailings pond emissions since 1992 and that 1997 surveys indicated higher emissions than previous or subsequent 1998 results. As a conservative approach, Suncor said that the EIA evaluations assumed that all diluent entering the ponds was lost to the atmosphere. On that basis, ambient air quality modelling indicated that VOC concentrations in Fort MacKay, Fort McMurray, and Fort Chipewyan were acceptable from a human health risk perspective. It stated, however, that based on work carried out by Syncrude and work done subsequent to the application, only 10-15 per cent of the diluent lost to the ponds actually results in VOC emissions. Suncor stated that it would continue its pond surveys to understand related emission mechanisms so that it could reduce future emissions.

Suncor said that TRS compounds are components of fugitive emissions that result in odour concerns. It noted that recent improvements, such as the south tank farm VRU, have reduced odour complaints from 295 in 1993 to 20 in 1998. With the installation of the new NRU and the existing unit as backup, Suncor expected to increase the overall reliability of the diluent recovery system and minimize TRS losses.

Suncor stated that no exceedances of the hourly Alberta ambient air quality guidelines for ozone had been observed in the past five years of monitoring in either Fort MacKay or Fort McMurray. It noted that an ozone working group has been established through the Wood Buffalo Environmental Association (WBEA) to monitor results on an ongoing basis. When ozone was modeled for the Millennium project, the model indicated that a 20 per cent increase in peak hourly ozone concentrations could be expected. The model predicted possible hourly exceedances in Fort MacKay for two days a year. Suncor said that it did not expect any adverse ozone effects as a result of Millennium project and that it was committed to continuing to examine the issue and look for solutions acceptable to stakeholders.

Suncor acknowledged the concerns about effects of acid deposition resulting from SO₂ and NO_x emissions on sensitive soils and water bodies. Suncor stated that acid deposition models indicate potential acid input (PAI) in the oil sands region could exceed the Alberta Interim Critical Load for sensitive soils; in particular, 1.4 million hectares in the regional study area (RSA) are predicted to receive PAI in excess of the interim critical load for sensitive soils based on cumulative effects case emissions.

Suncor said that it is working to better understand the acid deposition issue through active participation in the Terrestrial Environmental Effects Monitoring program (TEEM) with other regional stakeholders. It noted that parameters assessed in AENV studies conducted between 1984 and 1988, as well as in follow-up assessments in 1989 and 1993, did not indicate that soil acidification was taking place.

Suncor stated that, as part of the CEEM initiative, it has worked with industry, OSEC, and other stakeholders to establish a memorandum of understanding (MOU) that will initiate the NO_x and SO₂ Management Working Group. Suncor confirmed its commitment to working with the participants to a successful resolution. It also said that it would continue its active participation in the WBEA.

Suncor noted that it had also assessed the emission of fine particulate matter (PM) in its EIA because of health concerns. Although there are no Alberta or Canadian standards for PM finer than 10 microns (10^{-6} m) (PM_{10}) or for particular matter finer than 2.5 microns ($PM_{2.5}$), it had used U.S. Environmental Protection Agency (U.S. EPA) primary standards for comparison. With the exception of PM_{10} concentrations in Fort McMurray, predicted concentrations of PM_{10} and $PM_{2.5}$ in Fort MacKay, Fort Chipewyan, and Fort McMurray were less than the U.S. EPA standards. Suncor noted that its modelled predictions were in good agreement with WBEA $PM_{2.5}$ monitoring data for Fort McMurray.

Suncor observed that 85 per cent of the PM_{10} predictions for Fort McMurray were attributable to non-oil-sands activities, including vehicle emissions and residential wood burning. It noted that the maximum measured PM levels in early September did not correspond with predicted results, but pointed out that there was intense forest fire activity in the area at that time. Suncor stated that both predicted and measured PM concentrations were below the most stringent of proposed Canadian guidelines more than 95 per cent of the time.

In response to questions from OSEC, Suncor stated that it was not scientifically defensible to quantify health risks from predicted PM_{10} or $PM_{2.5}$ levels. It said that it was committed to monitoring the federal approach to PM and would comply with future federal PM guidelines or standards.

Suncor stated that it takes the climate change issue seriously and that it was striving to manage its net greenhouse gas contributions to its own 1990 emission levels. It said that its first priority was to understand and manage its own emissions and that creative energy conservation and optimization had reduced predicted Millennium project greenhouse gas emissions by 30 per cent. Suncor said that it would be impossible to double production without absolute increases in greenhouse gas emissions; therefore, it planned to rely on flexibility mechanisms in the proposed program to claim domestic and international offsets.

7.2 Views of the Interveners

7.2.1 Views of OSEC

OSEC claimed that there are deficiencies in the impact assessment carried out by Suncor. To illustrate, it stated that the (RSA) used by Suncor was too small and did not account for long-range transport of air emissions. It said that it thought that there is a need to look at immediate downwind areas in Saskatchewan.

OSEC noted that Suncor, as well as other operators, have compared predicted project and cumulative impacts relative to a baseline based on current conditions. OSEC stated that this fails to consider accumulated environmental stresses and residual impacts that have occurred from past emission loadings.

OSEC argued that large-scale projects cannot be adequately assessed on a project-by-project basis by considering the incremental impacts of each project. Rather, it said that the first step should be to determine the environmental capacity of the region and to evaluate historic and existing use of that capacity. Then it would be possible to determine whether there is room for incremental loadings and to determine what portion should be allocated. It stated that at this time

there is uncertainty with respect to environmental capacities, current exceedances of those capacities, and what capacity remains to be allocated. OSEC said that the Board needs to be mindful of the uncertainties and urged it to consider the need and urgency of determining environmental capacities in the region.

OSEC said that NO_x emissions in the region have been increasing and are predicted to continue to trend upwards. OSEC noted that SO₂ emissions in the region had been increasing from 1965 to 1995. While there has been a downward trend in SO₂ emissions since 1995, OSEC expected an upward trend will resume after five or six years.

OSEC stated that addressing NO_x and SO₂ emissions issues are high priorities for the region. It said that the purpose of the NO_x and SO₂ Management Working Group discussed in the MOU between OSEC, Suncor, and other oil sand operators would be to determine NO_x and SO₂ environmental capacities, define related management objectives, and establish an emissions management plan. OSEC stated that there is a commitment to reach a conclusion by the end of 2000. However, it said that a regulatory driver is needed to ensure the work is completed on a timely and useful basis. It was OSEC's view that there must be no net increases in environmental emissions until there is a cumulative effect management framework in place to determine if the region has the capacity to absorb increased emissions.

OSEC noted that VOC emissions in the region have been increasing and are predicted to continue to trend upwards.

OSEC said that, while Suncor provided a preliminary assessment of the effects of its Millennium project on ground level ozone concentrations, it did not address the related potential impacts on receptors. It noted that ozone monitoring in the region has indicated that the 24-hour guideline is exceeded about 35 per cent of the time and that, prior to 1993, the one-hour guideline was exceeded numerous times.

OSEC noted that Suncor's EIA had predicted that PAI over a large area would exceed the interim critical load for sensitive soils. OSEC stated that the Suncor EIA was deficient in that the assessment of predicted PAI loadings on receptors in the RSA was not adequate.

OSEC also noted results of epidemiological research that indicated that there is a robust and statistically significant relationship between PM and human mortality effects, as well as a linear relationship between increasing PM concentrations and human health impacts. OSEC said that the National Ambient Air Quality Objectives for Particulate Matter recommended reference levels for PM₁₀ and PM_{2.5} of 25 µg/m³ and 15 µg/m³ respectively as 24-hour averages. It noted that reference levels are science-based levels at which effects on human health and the environment can be reliably demonstrated. Related guidelines are currently being negotiated under the Canadian Council of Ministers of the Environment (CCME) Harmonization Accord. OSEC noted that at this time only British Columbia has a fine PM standard, which is 50 µg/m³ PM₁₀ on a 24-hour basis. It stated that the information requires a precautionary position and noted that in the OSEC-Suncor bilateral agreement Suncor had committed to prevent increases in PM concentrations in Fort MacKay and Fort McMurray as a result of Project Millennium. It requested the Board to include the bilateral agreement as a condition of regulatory approval.

OSEC said that it had significant concerns about the growth of greenhouse gas emissions that are proposed by the oil sands industry. It noted Canada's commitment to lowering its greenhouse gas emissions to six per cent below 1990 levels by 2008-2012. OSEC stated that in rendering decisions on projects such as the Millennium project, the Board is de facto deciding to allocate vested rights to a portion of Canada's overall greenhouse gas emissions. It said that it was OSEC's preference that the Board incorporate this reality into its decision. OSEC noted Suncor's target of managing net greenhouse gas emissions to 1990 levels, but stated that it did not meet the objective of 1990 minus six per cent. OSEC was reasonably confident that bilateral negotiations will result in a beneficial response, based on previous successes with Suncor and its innovative greenhouse gas reduction initiatives.

7.2.2 Views of the FOTA

FOTA stated that, while Suncor seems to be more efficient in terms of carbon dioxide (CO₂) produced per unit of production, the proposed expansion will increase greenhouse gas emissions. It said that the increase in greenhouse gas emissions should not be accepted by the Board and that emissions trading and other offsets are not substitutes for absolute reductions.

7.2.3 Views of Anzac

Anzac stated that it was concerned about air quality issues, including ground level ozone formation and stack emissions, such as heavy metals, that are not monitored in the area.

7.2.4 Views of Environment Canada

Environment Canada presented a submission outlining a number of concerns. It stated that it was concerned that some environmental quality guidelines may be exceeded and that no timelines have been set for completion of work to refine models and implement additional monitoring. However, Environment Canada stated that it was satisfied that the CEEM initiative and the RSDS will address issues related to environmental effects of long-range emissions transport and environmental limits for the region.

Environment Canada concluded that the Millennium project would contribute to regional NO_x emissions that could potentially affect ground level ozone and acid deposition. It stated that Suncor should consider mitigative measures to reduce NO_x emissions. Given the regional concern about ozone, Environment Canada stated that it supports and will participate in the WBEA Ozone Working Group, which has been formed to address ozone modelling and monitoring in the region.

Environment Canada stated that it was concerned about acid deposition in the region. It noted that, as expansions and new projects in the oil sands region occur, it may result in exceedances of critical loads for soils and reduced protection for lakes.

Environment Canada stated that PM issues are uncertain and that secondary PM formed as a result of the interaction of SO₂, NO_x, and VOC emissions has not been adequately addressed. It stated that PM will require careful future evaluation and that there is potential that mitigation may be required in the form of reductions in SO₂, NO_x, and VOC emissions.

Environment Canada acknowledged Suncor's commitment to the Voluntary Challenge Registry program set up to monitor and limit greenhouse gas emissions to 1990 levels by 2005. It noted that Suncor was the only company in the area to make such a commitment. Environment Canada noted, however, that production capacity is doubling in the area and that there would be an overall increase in emissions even with net per unit of production greenhouse gas reductions. It stated that Canada must meet its commitments under the Kyoto accord.

7.2.5 Views of AENV

AENV stated that it did not believe that current emissions rates in the region were adversely affecting the area. AENV concluded that the regional study area was reasonably appropriate for Suncor's EIA and that the Clean Air Strategic Alliance (CASA), which includes the involvement of Environment Canada and Saskatchewan, would be the appropriate forum in which to address issues related to emissions impacts outside the regional study area.

AENV stated that further modelling and monitoring would be helpful to establish the effects of air emissions on acid deposition, ground level ozone, and NO₂ concentrations. It said that the work may occur through the WBEA or may be recommended as an EPEA approval condition. AENV stated that the NO_x and SO₂ Management Working Group was critical to issues to be addressed through the RSDS. It noted that AENV had committed technical staff and resources to the NO_x and SO₂ Management Working Group.

AENV stated that the potential for exceedances of the Alberta ambient air quality guidelines for SO₂ was a significant air issue. It said that AENV had not decided if it would accept the increase in SO₂ emissions requested by Suncor. It recommended that Suncor either commit to treating fuel gas to remove sulphur compounds or take other measures to eliminate predicted SO₂ exceedances. AENV noted that the proposed Novagas NGL project would address this recommendation. AENV also noted that Suncor predicted limited SO₂ exceedances occurring largely within the lease development area. It was AENV's desire that Suncor continue to work to eliminate the predicted exceedances.

AENV said that predicted levels of NO₂ at the mine rim may require further study and monitoring. It stated that the NO₂ issue was not as significant as the SO₂ issue because the area involved was confined to the mine rim.

AENV also questioned the predicted tailings ponds emissions, a key air issue. It recommended to Suncor that Suncor further reduce diluent losses to the tailings ponds. AENV also recommended to Suncor that it develop an action plan to minimize VOC and TRS emissions and to conduct source monitoring and study of the tailings pond emissions.

AENV stated that there is some possibility that the region may be approaching environmental thresholds with respect to ground level ozone. It said, however, that there was considerable uncertainty because of the complexity and the number of factors involved in determining such levels. It noted that the WBEA Ozone Working Group had been established to look at modelling and to narrow the uncertainty gap. In its view, monitoring over the longer term would help determine any trend between increased precursor emissions and increased ground level ozone. AENV noted that the precautionary measures it had in mind with respect to ozone precursor emissions included application of CCME standards for minimization of emissions from boilers,

heaters, and turbines. It said that Suncor should investigate lower emission engines for its mobile mine fleet and that AENV expected Suncor to select available low-emissions engines in its equipment replacement program.

AENV stated that the evaluation tools used by Suncor for its assessment of PAI were appropriate. It said that AENV was not aware of observed environmental effects related to acid deposition from oil sands operations. AENV noted, however, that additional monitoring of aquatic receptors in the region would be an improvement on present monitoring.

AENV noted that there are no Canadian and Alberta standards for PM₁₀ or PM_{2.5}. However, it said that in the EIA Suncor had compared predicted PM levels with standards applied in other jurisdictions. It stated that the predicted PM levels would be generally acceptable.

AENV stated that it does not limit greenhouse gas emissions within its approvals, although it has required reporting in some instances, and it relies on the Voluntary Challenge Registry program as the appropriate current forum for addressing greenhouse gas emissions. AENV does, however, require that operators describe greenhouse gas management plans in project EIAs.

7.3 Views of the Board

The Board notes that determination of acceptable long-term environmental capacities for NO_x and SO₂ emissions is needed in the region. The Board expects that the NO_x and SO₂ Management Working Group will define science-based environmental capacities for NO_x and SO₂ emissions in the region affected by the oil sands industry and that it would recommend related environmental management objectives. The environmental objectives are expected to take into account science-based environmental capacities and adopt the precautionary principle with respect to remaining uncertainties and economic impacts on industry and other stakeholders. The Board also expects that the NO_x and SO₂ Management Working Group will recommend processes to implement the environmental management objectives, including timelines, emissions allocation mechanisms, and stakeholder responsibilities. In this regard, the Board expects that Suncor will fulfill its commitment to support and participate in the NO_x and SO₂ Management Working Group.

The Board acknowledges the submissions of Environment Canada and OSEC with respect to evaluation of long-range emissions transport issues. The Board notes that Environment Canada and SERM will be included in the regional initiatives, especially the NO_x and SO₂ Management Working Group. The Board views Environment Canada and Saskatchewan as key participants and contributors to the multistakeholder initiatives.

The Board believes that the best available science-based information would form the basis of timely conclusions and recommendations for emission management objectives for the region. However, the Board recognizes the uncertainty that may exist for sometime with respect to environmental capacities in the region. The Board believes that it would be inappropriate to put off dealing with NO_x and SO₂ emission management issues pending perfect understanding.

Therefore, the Board looks to the NO_x and SO₂ Management Working Group to assess environmental capacities and recommend regional management objectives by the end of the year 2000.

The Board acknowledges Suncor's commitments to address sulphur emissions from its operations and to design its sulphur recovery facilities to meet IL 88-13 on a calendar-day basis and with worst-case flaring. The Board notes Suncor's commitment to providing a high level of redundancy in its proposed sulphur recovery facilities that would minimize the impacts of upsets on sulphur emissions.

While the Board recognizes the complexity of controlling sulphur emissions from oil sands facilities relative to sour gas plants, it expects that a measure of continuous improvement in technology should be adopted as the oil sands industry expands. In the Board's view, it is a reasonable precautionary pollution prevention approach to expect sulphur recovery from sour gas and acid gas streams generated in oil sands facilities to meet the IL 88-13 guidelines. Consistent with the projected sulphur contained in sour and acid gas streams for the Millennium project, the Board will condition the approval by requiring Suncor to achieve a 98.5 per cent sulphur recovery from these streams on a quarterly average basis. The Board expects Suncor will operate its sulphur recovery units consistent with IL 88-13 requirements. The Board will consider a suitable period following start-up before imposing the annual 98.8 per cent recovery requirement based on sulphur content in the acid gas production in the project approval.

The Board notes that the Millennium project would double NO_x emissions from Suncor's operations relative to 1997 emissions and that increasing NO_x emissions are significant PAI, PM, and ground level ozone precursors. It acknowledges Suncor's commitment to use low NO_x burners and to use natural gas for incremental power production. The Board also acknowledges Suncor's commitment to use low NO_x engine technology as it becomes available for replacing its mine fleet. The Board expects that Suncor will meet its commitments to use low NO_x emissions technology to the extent possible for the Millennium project equipment and in its mobile mine fleet replacement program. The Board will require Suncor to report every two years on the progress made in reconfiguring its fleet.

The Board notes that Suncor's current and predicted VOC emissions are significant in the region. The Board shares AENV's concern with VOC emissions from tailings ponds. As set out in Section 6.3.3, the Board expects Suncor to make the necessary process design changes to minimize the effects.

The Board notes that Project Millennium will involve significant increases in regional ozone precursor emissions and that uncertainty exists with respect to effects of oil sands projects on ground level ozone. The Board expects that Suncor will continue to support the efforts of the WBEA Ozone Working Group to create better understanding of the issue and to reduce uncertainty.

The Board is concerned that Suncor's and other project EIAs for the region predict large areas that will be subject to increasing PAI above the interim critical load for sensitive soils. The Board understands that PAI effects are long term and accepts Alberta Environment's testimony that it was not aware of observed regional effects due to acid deposition. The Board notes that more complete evaluation of receptor sensitivity to acid deposition in the region, along with

monitoring to assess actual deposition rates, is required to reduce uncertainty associated with acidifying emissions issues. The Board expects that the WBEA and TEEM, with the support of Suncor and other oil sands operators, will work to improve the understanding of receptor sensitivity and acid deposition in the region.

The Board recognizes that acidification is a long-term issue and that it may take decades before PAI above the critical load will cause observable effects. The Board notes that its approvals in the near term need to be consistent with acidifying emissions rates that will not result in unacceptable long-term environmental effects. Therefore, the Board expects that acid deposition issues will be addressed by the NO_x and SO₂ Management Working Group over the next two years and that management objectives, based on the best information available at the time, will be developed.

The Board recognizes that ongoing monitoring and research will likely improve the understanding of environmental capacities and result in changes to recommended environmental objectives. The Board believes this issue can be addressed by processes that accommodate new information but does not accept that remaining uncertainty should preclude development and implementation of measures to protect the environment from adverse effects of acidifying emissions in the near term.

The Board notes that PM levels are related to primary emissions and secondary PM formation from interaction of air emissions including NO_x, SO₂, and VOCs and that related emissions originate with industrial and non-industrial sources in the region. The Board believes that all of these sources need to be considered in the further evaluation of PM. The Board expects that PM issues will be incorporated into regional initiatives and monitoring programs.

The Board notes that emerging mobile mine fleet engine technology has the potential to significantly reduce PM and secondary PM precursor emissions and that Suncor has committed to using this technology as it becomes available.

The Board acknowledges Suncor's proactive approach to managing its greenhouse gas emissions and its participation in the Voluntary Challenge Registry of Natural Resources Canada. The Board views its role in ensuring appropriate energy resource conservation as complementary with emerging climate change programs and policies of other federal and provincial agencies.

The Board notes Suncor's initiative to voluntarily reduce emissions in a variety of areas in its operation and applauds the leadership shown by the company in this area. The Board expects these undertakings by the company to be implemented as a matter of public trust and sees no need to condition the permit to that effect.

8 HEALTH

In considering whether a project is in the public interest, the Board must be convinced that there are no adverse health effects to humans or animals.

8.1 Views of the Applicant

Suncor maintained that its project would not present any adverse health risks to the public. Suncor said that it had taken a conservative approach in assessing health risk implications by assuming all diluent entering the tailings ponds would be lost to the atmosphere and completed a quantitative and conservative human health risk assessment. Suncor said that its assessment indicated that human health risks were at acceptable levels for all scenarios included in the EIA. It said that, although the assessment indicated acceptable health risk, Suncor was committed to further reducing the risk by reducing diluent losses.

8.2 Views of the Interveners

Anzac noted that there have been no health studies that considered the accumulated risks to its members or aboriginal people in the region. It stated that no consideration has been given in the health studies to mental health aspects. Anzac believes that the issues can be addressed based on its agreement with Suncor.

Alberta Health, based on its review of the EIA, believed that the Millennium project is unlikely to have an adverse impact on human health. It advised that an existing personal exposure monitoring program, supported and funded by a multistakeholder group that included Suncor, had been concluded in Fort McMurray. It said that preliminary results of the program were being tabulated and reviewed and ongoing collection of personal exposure information should be part of a long-term monitoring strategy for the region. Alberta Health believed that additional regional work is required to improve understanding of air quality and health relationships, improve future assessments, and provide for evidence-based decisions. Specifically, Alberta Health stated that the personal exposure monitoring should be continued. Alberta Health said that it was satisfied that Suncor had adequately addressed both the acute and chronic health impacts of emissions from upset conditions.

AENV said that there is considerable uncertainty with respect to VOC and TRS emissions predictions. It noted that Suncor's evaluation did not indicate health difficulties would be expected based on predicted VOC emissions. AENV said, however, that if VOC and TRS emissions are high, then related odours would be a concern.

AENV recommended that further monitoring activities are needed to improve understanding of the links between air quality and human health and to address cumulative effects issues, should they arise. It noted the work that has been done that associates PM with health outcomes and said that there is not a causality relationship between PM and ozone. The community exposure and health effects assessment program collected data on PM₁₀ and PM_{2.5} exposure and the composition of the PM. It acknowledged the contributions of Suncor to regional air quality management initiatives and stated that it expected Suncor to continue to support these initiatives.

8.3 Views of the Board

The Board notes the testimony of Suncor, Alberta Health, and AENV that the Millennium project is not expected to result in unacceptable public health risks based on conservative assumptions, especially with respect to VOC emissions. The Board expects the development of Canadian or Alberta ambient air quality guidelines for VOCs and PM will provide clear

benchmarks on acceptable ambient air concentrations against which emissions management programs can be defined. The Board expects existing projects to comply with such guidelines.

The Board believes that the existing health study in the area should provide some insights on the health effects on the community. The Board supports Alberta Health's view that further exposure monitoring should be carried out to improve understanding of air quality and human health relationships in the region and to monitor the impacts of increasing industrial activity on public exposure. The Board expects Suncor and other oil sands operators to show ongoing leadership in supporting these health effects monitoring programs.

9 AQUATIC RESOURCES

9.1 Water Quantity and Quality

9.1.1 Views of the Applicant

Suncor stated that the Millennium project has been designed such that it will not need to increase the existing licensed allocation of Athabasca River water. Suncor committed to maximize water reuse and minimize water releases, but expected some increase in its present use of river water. Suncor estimated total consumptive water use with the Millennium project to be less than 0.2 per cent of the lowest flow in the Athabasca River. Suncor stated that the effect of increased consumptive water use on downstream users of the Athabasca River would be negligible.

The End Pit Lake (EPL) proposed by Suncor was designed to contain volumes of fine tailings and CT seepage waters. Suncor predicted naphthenic acids, present in oil sands tailings water, to be in the EPL. Suncor's water quality modelling of EPL discharge found that water released from the lake would be non-toxic to aquatic life. Suncor's current research suggested that naphthenic acids may not be genotoxic to mammals, thereby reducing the uncertainty surrounding the toxicity of naphthenic acids and their risk to human and wildlife receptors. Suncor stated that further toxicity tests would be conducted to ensure that discharge is not toxic to aquatic life before such discharges are made.

Suncor recognized the uncertainties associated with the EPL, but believed that future research and monitoring would allow it to design and create a viable, productive, and self-sustaining ecosystem. Suncor stated that a regional approach would be used to continuously improve design and operational parameters and to ensure the overall feasibility of the end pit lake concept as a viable component of reclamation. Suncor committed to participate in regional efforts, such as the EPL Working Group.

Suncor maintained that the Millennium project discharges would have a negligible impact on water quality of the Athabasca and Steepbank rivers, Shipyard Lake, and Wood, Leggett and McLean creeks. Suncor committed to continue water quality monitoring in the Athabasca River, Shipyard Lake, and other local watercourses through the Regional Aquatics Monitoring Program (RAMP) and other monitoring activities. Suncor's research and monitoring commitments also included, but were not limited to, the potential acidification of sensitive water bodies in the region, fish tainting, and receptor sensitivity to CT water.

9.1.2 Views of the Interveners

OSEC raised concerns surrounding Suncor's commitments to regional aquatic monitoring programs, specifically with respect to research to reduce anthropogenic sources of water pollution. OSEC requested that Suncor take steps towards the prevention of the release of wastewater during upset and maintenance conditions.

In its written submission, FOTA expressed a number of general concerns with respect to

- the water consumption involved in the extraction of tailing process,
- water toxicity of tailing ponds, and
- the potential developmental effects of minute doses of toxicants on wildlife.

Anzac raised general concerns about the water quality in the Athabasca River as it related to fish and wildlife health. Specific concerns identified included chemicals for which there are no restricted guidelines, namely, magnesium, naphthenic acids, strontium, sulphate, and PAHs. Anzac also raised concerns about the potential chronic cumulative effects of aluminum, mercury, and iron concentrations in the rivers and the potential effects of these chemicals on aquatic life. Anzac stated that it had serious concerns about fish tainting in the Athabasca River and that, due to these concerns, many of its members no longer ate fish from this river.

Environment Canada identified the toxicity of CT waters, the potential discharge of tailings water into receiving aquatic ecosystems, and the viability of an aquatic ecosystem in the EPL as priority issues to be considered in the Board's review of the application.

AENV recognized the uncertainty regarding the water quality in the EPL due to its potential depth and the constituent water quality and residual tailings it may contain. However, AENV was prepared to conceptually accept the EPL as part of the reclamation plan provided that it did not negatively impact downstream water bodies, the water discharge would be non-toxic to aquatic life, and it met the regulatory objective of equivalent capability. AENV also recognized that further research might be required to verify the EPL's capability of supporting a healthy, viable, self-sustaining ecosystem. AENV stated that, in the event that discharge from the EPL was not acceptable, it may require Suncor to develop other options to ensure that water of unsuitable quality is not released off site.

9.1.3 Views of the Board

The Board notes Suncor's efforts to maximize water reuse and minimize water releases. The Board recognizes the concerns raised by the interveners regarding water release during and after operation of the mine and plant. With regards to water discharge during the operation of the mine and plant, the Board does not believe any significant impacts on local or regional surface water will result directly from the Suncor operations. The Board expects that Suncor will complete surface water quality monitoring of mine discharge and receiving watercourses in accordance with detailed requirements established by AENV. The Board notes Anzac's concerns regarding the quality of water in the Athabasca River, and it expects Suncor to fulfill all commitments it has made to stakeholders and regulatory agencies respecting research on local and regional aquatic impacts, including participating in a regional fish health and tainting study.

The Board also expects that Suncor, along with other oil sands operators, will pursue further research on issues surrounding the end pit lake. The Board expects that the proposed EPL Working Group will direct the necessary research in a constructive, progressive manner that will address the uncertainties raised in this and previous applications.

9.2 Fisheries and Fish Habitat

9.2.1 Views of the Applicant

Suncor stated that the upper reaches of Leggett Creek and the lower reaches of Wood Creek would be displaced due to the mining activities. The total area lost will be 1.2 hectares. McLean Creek will not be directly affected by mining activities. However, the diversion of flows from the upper catchment of Wood Creek into McLean Creek is under consideration. Therefore, the potential impacts associated with a change in the flow regime may affect the fish habitat in McLean Creek.

Suncor stated that, due to its proposed mitigation and compensation measures, the Millennium project would result in no net loss of fish habitat and will have no impact on fish health or fish abundance. Suncor committed to reduce wastewater discharge to the Athabasca River and to continue to monitor fish health on a regular basis. Suncor stated that it is participating in a regional fish health and tainting study.

Suncor agreed to continue its active consultation with the DFO and with AENV regarding their goals of no net loss of fish habitat. It has applied to DFO for approval to proceed with alteration of fish habitat as required under the *Federal Fisheries Act*. Suncor committed to the concept of no net loss of fish habitat and will use proven techniques for fish habitat creation and enhancement on site and off site, in advance of any authorization to proceed.

Suncor stated that the Millennium project has been designed to preserve Shipyard Lake. Suncor committed to ensuring that water levels and water quality are maintained in Shipyard Lake throughout the development and closure phases of Project Millennium. Suncor committed to habitat enhancement and habitat compensation if these were deemed to be necessary due to fish habitat loss.

9.2.2 Views of the Interveners

OSEC requested that Suncor maintain the ecological integrity of Shipyard Lake throughout the construction, operation, and reclamation phases of the Millennium project.

Anzac indicated that its members had concerns with the regional health of fish and fish tainting, specifically in the Athabasca River.

DFO considered both local and regional effects of the Millennium project on fish and fish habitat. It determined that, with the application of appropriate mitigation measures, followup, and monitoring programs and the provision of adequate compensation for habitat losses, the Millennium project would not result in a net loss of productive capacity of fish habitats. DFO stated that it was satisfied with Suncor's proposed mitigation measures and compensation to address these project-specific issues.

DFO's assessment of the potential impacts of the Millennium project on Shipyard Lake and Creek wetland hydrology concluded that it was not certain if the mitigation measures alone would succeed in maintaining current water levels. Further study and development of a long-term operation plan for Shipyard Lake would be required to address this issue. DFO stated that water quality issues related to Shipyard Lake would be adequately addressed through Suncor's monitoring programs.

DFO expressed concern related to the ability of McLean Creek to accommodate increased flow due to the Millennium project and to reestablish a stable channel regime under modified hydraulic conditions. It stated that if mitigation were not a viable option for McLean Creek, then habitat compensation off site would be required prior to issuance of a Fisheries Act Authorization. The role of McLean Creek as a target for fish habitat compensation was still under examination by DFO at the time of the hearing.

AENV concluded that the Millennium project would not impact fish populations. A fish conservation strategy for Alberta has been developed to guide the management of fish resources in a manner consistent with the federal *Fisheries Act* and the Fish and Wildlife Policy for Alberta. AENV accepted and endorsed the federal policy of no net loss of productive fish habitat. AENV stated that, subject to detailed analysis, Suncor may be required to mitigate for loss of fisheries habitat either on or off site in their development plans in order to meet the no-net-loss policy.

The establishment and maintenance of fish populations in the EPL are the responsibility of Suncor. If a naturally reproducing sport fishery cannot be developed in the EPL, Suncor will be required to maintain fisheries on a sustainable basis.

9.2.3 Views of the Board

The Board accepts AENV's and DFO's statements that, with the application of appropriate mitigation measures and monitoring programs and the provision of adequate compensation for habitat loss, the Millennium project will result in no net loss of fish habitat or productive capacity. The Board notes OSEC's and DFO's concerns regarding the ecological integrity of Shipyard Lake but notes Suncor's commitment to ensuring water levels and water quality are maintained in the lake.

The Board expects Suncor will honour its commitment to RAMP and other regional and project-specific monitoring programs. The Board trusts that the respective government agencies responsible for fish and fish habitat will ensure that all aquatic issues as they relate to fish and fish habitat will be adequately addressed either through regional initiatives or project-specific monitoring, research, and follow-up programs.

10 SOCIO-ECONOMIC

Socio-economic impacts from a project can produce both positive and negative effects. The Board typically reviews both the cost and benefit to society, as well as any adverse social impacts.

10.1 Views of Applicant

Suncor stated that the Millennium project would create approximately 800 new permanent jobs and 1200 indirect jobs, and would engage a potential construction labour force of 2500-3000. Suncor committed to work with employment centres and educational institutions to ensure hiring of qualified local residents. Suncor also committed to work with a number of local aboriginal councils to identify potential candidates for training programs. It stated it is striving to ensure that any adverse socio-economic impacts would be minimal and shortlived and that collaboration among developers, government institutions, and the local communities would mitigate potential social impacts from the cumulative effects of a number of announced oil sands projects.

Suncor committed to attempt to increase the aboriginal workforce from the current 4.5 per cent to 12 per cent by 2002 and to contract with aboriginal firms. Suncor set a target for aboriginal businesses of a minimum of \$25 million per year by 2002. Suncor stated that it makes no distinction in its hiring of aboriginal employees with respect to treaty status.

Suncor stated that it had been in consultation with Anzac to discuss socio-economic issues and that those discussions were leading to a formal agreement between the two parties. Suncor stated that they had recently received a proposal from Anzac that outlined a process for a community needs assessment and a process for long-term consultation with the community. At the hearing Suncor reaffirmed its commitment to ongoing discussions and negotiations with Anzac to address its concerns on employment, training, and business opportunities.

Suncor stated that it purchased the trapping rights in the vicinity of Project Millennium and therefore no trapper is directly and adversely affected by the project.

10.2 Views of the Interveners

Anzac raised a number of socio-economic concerns it had with respect to regional industrial development. Issues included, but were not limited to, unemployment among its membership, education, training, and employment opportunities, accommodation needs, and social family problems.

Anzac stated that its members have a long history of hunting, fishing, trapping, and traditional land use in the region. These lands include the Project Millennium lease and surrounding areas. Anzac believes that increased industrial activities in the region are responsible for the decline in the wildlife populations and, in turn, have adversely affected its trapping and hunting yields. Anzac stated that development has displaced its members from their traditional harvesting areas and that increased recreational and industrial use restricts the availability of traditional fish and hunting areas. Anzac believed that Project Millennium would further restrict its ability to continue its traditional lifestyle in this area.

10.3 Views of the Board

The Board recognizes the efforts of Suncor to create employment opportunities for the local community through a number of initiatives, and it is encouraged by Suncor's efforts and progress to resolve socio-economic issues with local aboriginal groups. The Board recognizes the agreements Suncor reached with both the Fort MacKay First Nation and the Athabasca Chipewyan First Nation, which demonstrate the company's commitment to work with local communities to address their concerns.

The Board recognizes the concerns of the Anzac community with respect to its socio-economic issues but believes that the direct discussions and negotiations between the community and Suncor are the most appropriate means of resolutions of these issues. The Board believes any outstanding concerns should be directed to provincial agencies charged with addressing socio-economic issues. The Board will direct the comments and concerns raised at the hearing to the Regional Infrastructure Working Group (RIWG) and the appropriate provincial ministry, which may be in a position to assist in these matters.

11 CUMULATIVE IMPACTS

The Board recognizes that the environmental effects of any single large project development such as Suncor's Project Millennium should not be viewed solely in isolation of the effects of other developments in an area. Impacts should be related to cumulative environmental consequences, as well as regional socio-economic effects. While the Board subscribes to a review in that context, it also recognizes that many aspects of cumulative impact assessment are subject to varying degrees of uncertainty. In the Board's view, cumulative impact assessment should include events that are reasonably certain to occur. Actions can then be adopted that will respond to unforeseen events or establish mitigative programs to forestall unacceptable outcomes.

In preceding sections of this decision report, the Board states its views on a number of environmental parameters that were discussed at the hearing. In the following section, the Board discusses in a more general manner the topic of cumulative effects and the manner in which those aspects of a proposed development are factored into a determination of the public interest. In addition, certain specific initiatives designed to address cumulative environmental effects are reviewed.

11.1 Views of the Applicant

Suncor noted that, in recent years, the announcements for development of a number of projects in the Fort McMurray area led to the conclusion that a more systematic regional approach to environmental management was required.

Suncor stated that it was required to complete a cumulative effects assessment as part of its EIA. Suncor was also required to apply for authorization from the DFO for the harmful alteration, disruption, or destruction of fish habitat under Section 35(2) of the *Fisheries Act*. Therefore, under the *Canadian Environmental Assessment Act*, Section 5(1)(d), the DFO was required to complete a comprehensive study report (CSR) for Project Millennium. This study report included an assessment of cumulative effects.

Suncor stated that the EIA cumulatively assessed the impacts associated with the development, operation, and closure of the Millennium project in association with existing, approved, and planned regional developments. Suncor stated that human health assessment is incorporated into the cumulative effects assessment process. The cumulative effects assessment considered mitigation and monitoring based on programs currently conducted by operators, as well as on those programs proposed for the Millennium project.

Suncor noted that its cumulative effects assessments were based on modelling to provide predictions of further outcomes. Suncor indicated that it is important to followup with monitoring to verify impact predictions. It said that modelling is an iterative process where mitigation measures and/or design changes are applied and reapplied until the analysis indicates that the residual impacts are acceptable.

Suncor stated that it had designed the Millennium project so that it would be compatible and consistent with the provincial integrated resource plan. In terms of riparian habitat, Suncor stated that Shipyard Lake would be preserved and there would be a minimum of a 100 m buffer along the river valleys in order to maintain wildlife corridors. Suncor stated that the cumulative effects of site clearing for all projects in the region on wildlife habitat would be relatively small and that progressive reclamation would mitigate the cumulative effects of habitat loss.

Suncor stated that, along with Shell, Mobil, Syncrude, and AENV, it has committed to work on a research program that will attempt to understand biodiversity and wildlife in the oil sands region. This research would be conducted through a regional biodiversity working group and would be tied to the regional reclamation research in that it would attempt to achieve reclamation of the landscape to an acceptable, biologically-diverse, self-sustaining ecosystem.

Suncor indicated that a number of groups or initiatives have been implemented to address the outstanding environmental issues within the oil sands area (see Appendix 3). One of the initiatives is AENV's recently-announced RSDS. Consistent with this strategy, Suncor expected the CEEM initiative to play a leadership role in providing necessary information, coordinating activities, and making recommendations to AENV. It believed that this strategy would ultimately provide the regulation to industry in a more holistic and regional context.

The CEEM initiative includes a regional board representing various stakeholders with a number of technical issue groups reporting to it. The first such group has already been formed to address SO₂ and NO_x emissions. Representation on this group includes the federal and provincial governments, industry, environmental groups, and aboriginal communities. Suncor described the CEEM initiative model as a continuous improvement or adaptive management model involving goal setting, evaluation of management options, implementation of plans, and evaluation of plan performance against objectives. The management process is being designed to be iterative between components and through the entire cycle of the process. The intent is that in time all cumulative effect issues, including those of terrestrial and aquatic nature, will be included within this process.

The first output of CEEM's work, according to Suncor, will be a review of the environmental limits and an assessment of the need for and the adequacy of these limits. Suncor said that the setting of management objectives around those environmental limits would be next, leading to a plan for implementation. Suncor believed that a monitoring program was important.

Suncor noted that the RIWG was established in response to the potential cumulative effects of oil sands development on infrastructure and services. This group, which includes Suncor, other industry members, and representatives from provincial and municipal governments, was formed in 1997. Its mandate is to identify, prioritize, and scope issues related to human and physical infrastructure and economic development, as well as provide necessary information for planning purposes. Additionally, the Athabasca Oil Sands Development Facilitation Committee was created to ensure that RIWG outputs or other issues were directed to the appropriate authorities for expedient resolution.

Suncor committed to continue its active participation in all the regional initiatives, including the WBEA, the CEEM initiative, and the NO_x and SO₂ Management Working Group to identify concerns and develop acceptable solutions.

11.2 Views of the Interveners

OSEC agreed that Suncor and many of the other oil sands developers have made an effort to produce comprehensive environmental assessments. Notwithstanding, it believed that there were issues that Suncor had not adequately addressed in the EIA and the cumulative assessment it included.

OSEC noted that the Suncor documents presented information on the total cumulative stress and loading in the oil sands region, but it also noted some concerns it had raised and discussed with Suncor. OSEC was concerned that the cumulative effects assessment did not go far enough and questioned whether it was sufficient in describing the cumulative impacts on receptors and the environment.

OSEC also said that there were specific deficiencies in Suncor's EIA and the cumulative effects analysis in the area of acid deposition. In OSEC's view, Suncor had not conducted an adequate assessment of the impacts on receptors of the anticipated loadings of acid deposition.

OSEC noted that Suncor was able to give a preliminary assessment of the impact of its project and other projects on concentrations of ozone within the region but that there were a number of uncertainties in the predictions on ground level ozone. It said that Suncor was not able to assess and did not provide information on what the impacts of predicted ozone levels might be on human, vegetation, and wildlife receptors.

OSEC also believed that there were deficiencies in the definition of the regional study area versus the total area where the impact may occur. It believed that the area where effects would be felt was larger than the region selected for assessment. An example it noted was related to the long-range transport of air emissions. The assessment region was confined to an area around Fort McMurray and to a distance approximately 150 km from that location. OSEC considered this approach to be deficient in that the effects actually extend into Saskatchewan.

AENV stated that it is committed to lead the development of the RSDS. AENV further stated that the strategy would not duplicate or impede the existing initiatives or projects in the region. AENV believed that "a key component of the strategy would be to improve communication, cooperation, and coordination of ongoing activities in the Athabasca region, and to define gaps in knowledge and activities, and initiate work to fill these gaps."

AENV noted that the cumulative impacts on wildlife populations as a consequence of habitat removal was uncertain. AENV also noted that the habitat suitability models used in the assessment of such impacts required improvement to fully understand the implications of the regional development scenario on wildlife populations. AENV stated that it might require Suncor to provide validation of predicted impacts to wildlife and verification of habitat suitability models used in the assessment of impacts to wildlife.

Environment Canada stated its concerns about the possible cumulative effects in the oil sands region due to the numerous oil sands developments forecast. In regards to air issues, Environment Canada said it was important that the focus be shifted from a parameter-by-parameter analysis of emissions from a single facility to a regional assessment of concentrations and effects. Environment Canada also encouraged all oil sands developers within the region to consider those effects collectively and in a coordinated manner.

In the CSR with respect to wildlife, Environment Canada stated that “an overall identification and evaluation of appropriate corridors should be undertaken for the Regional Study Area (RSA). Mitigation plans should consider establishing continuous corridors through the RSA and protecting habitat for isolated species and populations. Long-term monitoring of the health of river and creek corridors such as the Muskeg and Steepbank Rivers will be essential.” At the hearing Environment Canada stated that this work could be accomplished through the regional oil sands reclamation advisory committee.

The CSR noted that the maximum level of habitat disturbance within the RSA that could still sustain healthy resident and migratory bird populations into the longer term was currently unknown. The CSR also stated that the cumulative effects of oil sands development on regional wildlife population, wildlife habitat, and biodiversity needed to be established immediately. Environment Canada stated that the effects of regional oil sands development on wildlife populations and wildlife movement required more studies, but that this work could be adequately addressed by the various working groups, such as the RSDS and the CEEM initiative.

Environment Canada committed to participate in the various regional working groups to lend its expertise to these groups and to ensure that its opinions and concerns were adequately addressed.

11.3 Views of the Board

The Board considers cumulative effects in determining the public interest in terms of the economic, social, and environmental effects of proposed projects. In regions where cumulative development may result in unacceptable environmental or social effects, consideration of the public interest needs to address acceptable levels of activity and emissions, as well as the most appropriate allocation of development and emissions approvals. The Board acknowledges the difficulties in predicting environmental effects of projects that are planned but not approved and, therefore, recognizes the degree of uncertainty associated with such predictions. The Board also notes that it is reasonable to expect that some of the projects considered in the cumulative effects assessment may not proceed in the same time frame, if at all. Associated impacts would tend to reduce the effects shown in the EIA.

The Board also notes that some of the concerns raised are related to total carrying capacity of the region with respect to a variety of compounds, some of which require new guidelines or national standards. The Board endorses the need for such thresholds and notes that the objective of RSDS is to establish such limits and a mechanism to manage them.

The Board notes that Suncor's EIA, as well as those of other oil sands operators, have focused on project and cumulative inputs. That is, project and cumulative emissions and other changes have been identified and, through numerical modelling, potential changes in ambient air quality, water quality, and deposition have been forecast. These resulting findings have been compared to available environmental criteria, such as the Alberta Ambient Air Quality Guidelines.

The Board notes that, although the project-specific impacts from the Millennium project are manageable, some uncertainty remains with respect to environmental capacities for emissions and land use impacts of cumulative development in the region. For example, the Board believes that the carrying capacities or environmental limits for the oil sands region need to be studied further, and understood better, with respect to air, particularly acidifying emissions and ground level ozone precursors. The Board accepts OSEC's concern that Suncor was unable to provide information on the impact of ground level ozone. The Board recognizes that there are uncertainties with respect to ozone modelling and formation, but it notes there is ongoing work in the WBEA Ozone Working Group to resolve these issues. The Board notes Suncor's commitment to continue active participation in this group and to take appropriate action if necessary.

The Board also notes AENV's testimony that effects due to acid deposition have not been observed in the region and its statements that, while there is a possibility that the region may be approaching the thresholds with regards to ground level ozone, there is considerable uncertainty whether that will happen or not.

The Board believes that predicted cumulative emissions and results of related air quality modelling indicate that reasonable precautionary measures should be undertaken by individual projects. For that reason, the Board indicates in other sections of this report specific measures it expects Suncor to undertake with respect to sulphur recovery efficiency, use of low NO_x equipment, and diluent recovery for tailings.

The Board believes that time lines associated with project design and construction, as well as the time frame over which effects such as acidification occur (i.e., decades), afford the opportunity for regional initiatives, including the RSDS, CEEM, and the NO_x-SO₂ Management Working Group, to address emissions issues. The Board expects that Suncor will meet its commitments to the initiatives and that the initiatives will better define environmental capacities and recommend related management objectives on a timely basis. The Board's expectations for Project Millennium sulphur recovery, NO_x emissions minimization, and diluent recovery stated elsewhere in this report represent its current position. The Board notes, however, that if further evaluation determines that regional emissions must be controlled due to limitations on environmental capacities in the region, Suncor will be expected to proportionately participate in meeting appropriate reductions.

The Board believes that regional issues should be reviewed in a regional context and that the combination of CEEM and RSDS provides a means to address regional issues. It is satisfied that

all the uncertainties associated with the cumulative impact predictions, including size of study area and the need for wildlife corridors, can be managed through processes such as the RSDS.

The Board believes that both the RSDS and CEEM initiatives are acceptable and effective processes through which regional cumulative effects issues can be addressed. The Board also believes that RSDS, although in its initial stages, will complement the existing CEEM initiative and provide the necessary regulatory support to assure that all necessary actions are implemented. The Board notes that both AENV and Environment Canada accept that the various regional multistakeholder initiatives are appropriate means of resolving outstanding environmental issues. The Board is confident that AENV will ensure that the appropriate steps are taken to revise approvals if it becomes evident that there are some serious environmental problems. In any event, the Board has the ability and will modify its approvals if serious problems are identified through the multistakeholder process.

The Board recognizes that for these two initiatives to be successful in light of the rapid industrial development in this region, time, resources, and commitment will be required by all stakeholders involved. Resolution of cumulative effects issues requires a cooperative and collective effort by all stakeholders. Therefore, the Board expects that all energy industry developers in this region will contribute their expertise and resources to this concerted effort. The Board also expects the relevant regulatory agencies and the public to participate in these efforts. The Board has participated in the CEEM initiative and RSDS and will continue to do so in the future.

OSEC raised the issue of the need to determine the region's capacity to cope with cumulative environmental effects of current and planned oil sands developments. OSEC suggested to the Board that a mechanism of establishing such a framework could be accomplished under Section 22 of the *Energy Resources Conservation Act*. The Board does not believe that this is warranted at this time in light of the regional efforts currently in place and those being developed. The Board is satisfied that these regional efforts could successfully address the cumulative environmental effects in the oil sands region. The Board will monitor the progress and effectiveness of the various initiatives designed to address cumulative effects.

12 CONCLUSIONS

1. The Board is satisfied that market opportunities exist and Suncor is positioned to take advantage of these opportunities if the project proceeds. Subject to resolution of other concerns, the Board believes there is need for the project.
2. The Board accepts Suncor's overall mining plan as being appropriate, including the use of a cutoff grade of seven per cent, a 3 m mining selectivity, and a mining limit of \$62.9/m³ (\$10/bbl). However, the Board believes that there is value in using a TV/BIP ratio equal to 15 to measure ongoing performance with regards to determination of appropriate pit limits and will condition the approval appropriately.
3. The Board will require Suncor to submit a final evaluation of the oil sands resources that includes the determination of final mining limit, in the areas of the north and northeast dumps one year prior to commencement of construction of these dumps. The Board will

require Suncor to submit for approval detailed geotechnical designs for the north and northeast dumps at least six months prior to field preparation in the dump areas.

4. The Board accepts the proposed Millennium extraction plant location. When Suncor decides to relocate the Millennium extraction plant, the Board will require Suncor to submit an assessment of the resulting impacts on resource recovery, environmental, and mine and extraction operations two years prior to the construction of the new facilities.
5. The Board will require that Suncor complete a study of ways to minimize the size of the in situ plug and submit the study to the Board for consideration and approval at least two years prior to commencement of CT placement in pond 8.
6. The Board accepts that the external tailings pond is required if the project is to proceed on schedule, and it believes that location and conceptual design are appropriate. The Board will require Suncor to complete and submit for approval the detailed designs of dykes 10 and 11 and the external tailings pond prior to containment of any water or deposition of tailings sand in the external pond.
7. The Board accepts that the use of CT currently represents Suncor's preferred tailings management strategy and is prepared to accept that approach at this time. The Board also believes, however, that better tailings management options are likely to become economic in the future and will require that Suncor and other oil sands operators continue to test alternative tailings management technologies and reevaluate their tailing management programs. The Board will require Suncor to submit annual progress reports on its tailings research until a trafficable tailings has been established.
8. The Board accepts Suncor's proposed extraction process and its commitment to an eventual 92.5 per cent overall bitumen recovery.
9. The Board believes that a higher diluent recovery than that proposed by Suncor is achievable and therefore will require Suncor to achieve an annual diluent recovery of not less than 99.5 per cent. The Board is not prepared to accept the release of untreated froth treatment tailings and upgrader wastewater into the tailings pond and will condition the approval accordingly.
10. The Board is unable to identify specific impacts from the Millennium project emissions that could result in unacceptable effects. It still believes that an aggressive monitoring system should be in place to detect possible impacts and implement mitigation measures. The Board will condition the project to ensure Suncor will comply with the findings of RSDS.

11. The Board expects that quarterly sulphur recovery from acid gas and sour gas generated by Suncor's operations will not be less than 98.5 per cent inclusive of sour gas flaring and use as a fuel. The Board expects Suncor will operate its sulphur recovery units consistent with IL 88-13 requirements. The Board will consider a suitable period following start-up before imposing the annual 98.8 per cent recovery requirement based on the sulphur content of the acid gas production.
12. The Board expects that Suncor will meet its commitments to use low NO_x emissions technology, and it will require Suncor to report every two years on the progress made in reconfiguring its fleet.
13. The Board expects the NO_x and SO₂ Management Working Group to assess environmental capacities and recommend regional management objectives by the end of the year 2000.
14. The Board expects that the WBEA and TEEM, with the support of Suncor and other oil sands operators, will work to improve the understanding of receptor sensitivity and acid deposition in the region. The Board expects the PM issues will be incorporated into regional initiatives and monitoring programs.
15. The Board expects Suncor to participate in AENV's RSDS and meet its commitment to participate in the NO_x and SO₂ Management Working Group.
16. The Board concludes that the impacts to air and water quality due to the Suncor Millennium project are acceptable, but believes that ongoing monitoring will be required to ensure that predicted emission levels in particular are met.
17. The Board recognizes the efforts of Suncor to create employment opportunities for the local community through a number of initiatives. The Board recognizes the concerns of the Anzac community and will direct the comments and concerns raised at the hearing to the Regional Infrastructure Working Group and the appropriate provincial ministry, who may be in a position to assist in these matters.

18. The Board supports AENV's RSDS and the industry-led CEEM initiative. The Board expects that all companies in the region that hold Board approvals will continue to address these issues in a timely and effective fashion, including appropriate levels of stakeholder involvement.

DATED at Calgary, Alberta on 23 July 1999.

ALBERTA ENERGY AND UTILITIES BOARD

[Original signed by]

F. J. Mink, P.Eng.
Presiding Member

[Original signed by]

J. D. Dilay, P.Eng.
Board Member

[Original signed by]

T. McGee
Board Member

APPENDIX 1 TO ADDENDUM B OF DECISION 99-7

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

APPLICATION BY SUNCOR ENERGY INC. FOR AMENDMENT OF APPROVAL NO. 8101 FOR THE PROPOSED PROJECT MILLENNIUM DEVELOPMENT

Decision 99-7
Application No. 980197

1 INTRODUCTION

1.1 Application

Suncor Energy Inc. (Suncor) applied pursuant to section 14 of the Oil Sands Conservation Act to amend Approval No. 8101 in respect of its existing oil sands mine and processing facilities in the Fort McMurray area. The Project, referred to as Project Millennium, consists of an expansion to the mining area and the addition of new processing units. The project would be located at the site of the existing Suncor operation approximately 35 kilometres (km) north of Fort McMurray in the Regional Municipality of Wood Buffalo, in Township 92, Range 10, West of the 4th meridian and Townships 90, 91, and 92, Ranges 8 and 9, West of the 4th Meridian. The proposed development would increase the production capacity to a minimum level of 12 185 000 cubic metres per year (210 000 bbl/cd) of crude oil products by 2002, provide for the continuation of Suncor's operations until the year 2033, and include:

- an expansion to the Steepbank Mine based on a 30-year mine plan,
- an oil sands extraction plant on the east side of the Athabasca River,
- modifications to the current oil sands extraction plant on the west side of the Athabasca River,
- addition of a second processing train to upgrade oil sands products,
- utilities and other infrastructure associated with the mine and processing units, and
- an integrated reclamation plan for all of Suncor's mining areas.

Under a coordinated application process adopted by Alberta Environmental Protection (AEP) and the Alberta Energy and Utilities Board (EUB), Suncor filed a joint application and environmental impact assessment report. The application was filed on 21 April 1998.

In support of its proposal, Suncor prepared and submitted the following applications:

- Application No. 980197 to the EUB under the Oil Sands Conservation Act for an amendment to EUB Approval No. 8101 to authorise the proposed plant modifications, the expanded mining area, and associated infrastructure to Suncor's existing oil sands site. Under Section 48 of the Environmental Protection and Enhancement Act (EPEA), Suncor also submitted an environmental impact assessment (EIA) report to the Director of Environmental Assessment, for his review. The EIA report forms part of the application to the EUB.
- Application No. 014-094 to AEP under EPEA for an amendment to Suncor's existing EPEA Approval No. 94-91-00 (as amended) to authorise the proposed development and reclamation.
- Application under the WRA, to amend interim Licence No. 10400 to increase the consumptive use of water from the Athabasca River (at Section 25, Township 92, Range 10, West of the 4th Meridian) to 17200 acre-feet (21 170 000 m³) annually for industrial purposes, and to amend Licence to Divert and Use Water Nos. 27549 and 27551 to increase the diversion to 14 500 acre-feet (17 790 000 m³)

annually from surface and groundwater in Townships 90, 91, and 92, Ranges 8 and 9, West of the 4th Meridian.

The expanded Steepbank mine, scheduled to commence in 2002, would continue to use the existing truck and shovel method. Ore would be prepared at the Millennium Ore Preparation plant and then piped to the Millennium Extraction plant. Both of these plants would be located on the east side of the Athabasca River. These plants would use a warm-water separation-cell technology to produce raw bitumen which will be pipelined across the Athabasca River to the Base Extraction plant for secondary extraction. Additional primary extraction capacity would be installed on the east bank of the river in approximately 2012.

A second upgrader train would be constructed at the existing base plant located on the west side of the Athabasca River. Major components of this train would consist of diluent recovery, the processing of the bitumen (producing petroleum coke as a by-product), the manufacture of hydrogen for use in hydrotreating coker products to remove sulphur and the removal of sulphur from byproduct gases.

Typical products would consist of 100 000 bbl/cd of light sweet crude, 80 000 bbl/cd of light sour crude, and 30 000 bbl/cd of diesel for a total of 210 000 bbl/cd. Other products would be petroleum coke (some of which will be used to generate electricity and steam) and sulphur.

The tailings management scheme for Project Millennium would continue to use a tailings pond for initial tailings storage with conversion to consolidated technology until in-pit storage becomes available.

An end-pit lake would remain following the completion of mining.

1.2 Hearing

The public hearing of the application was held in Fort McMurray, Alberta during 12 to 15 January 1999, and before Board Members F. J. Mink, P.Eng., (Presiding Member), J. D. Dilay, P.Eng., and T. McGee and in Calgary on 2 February 1999.

2 SUNCOR'S POSITION ON TIMELY RELEASE OF THE DECISION

Suncor advised that 1 April 1999 was a critical date with respect to construction activities related to Project Millennium. It stated that a delay could prompt increased cost due to winter construction and may jeopardize the project. Suncor estimated that the lost opportunity cost to the company would be approximately \$1M per day. It noted that a timely decision would also enable Suncor to target the US market in advance of competition from Venezuela.

3 DECISION

The Board notes Suncor's concern regarding the need for an early decision and is prepared to issue a decision with reasons and conditions to follow. It notes that Suncor would accept the risk with respect to any conditions that may be attached to the Board's approval.

Having carefully considered all of the evidence, the Board is prepared to approve Application No. 980197 and will issue the required approval in due course. A final detailed report giving the reasons for the Board's decision and conditions of approval will be issued later.

DATED at Calgary, Alberta on 29 March 1999.

ALBERTA ENERGY AND UTILITIES BOARD

F. J. Mink, P.Eng.
Presiding Member

J. D. Dilay, P.Eng.
Board Member

T. McGee *
Board Member

* Mr. McGee was unavailable for signature but concurs with the contents and with the issuing of this report.

APPENDIX 2 TO ADDENDUM B OF DECISION NO. 99-7

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

APPLICATION BY SUNCOR ENERGY INC. FOR AMENDMENT OF APPROVAL NO. 8101 FOR THE PROPOSED PROJECT MILLENNIUM DEVELOPMENT

**Addendum A to Decision 99-7
Application No. 980197**

1 DECISION

In Decision 99-7, the Alberta Energy and Utilities Board (the Board) approved Suncor Energy Inc.'s (Suncor) application for the Project Millennium Development. The application was the subject of a public hearing held in Fort McMurray, Alberta from 12-15 January 1999, and in Calgary, Alberta on 2 February 1999, heard by Board Members F. J. Mink, P.Eng., (Presiding Member), J. D. Dilay, P.Eng., and T. McGee.

This addendum sets out the Board's reasons for its decision and the conditions associated with the extraction froth treatment plant. An additional addendum will be released later with respect to other issues relating to Decision 99-7.

2 EXTRACTION FROTH TREATMENT

2.1 Views of the Applicant

Suncor stated that the base froth treatment plant would process all froth production. Developments under active assessment and considered part of the current design include inclined plate settlers and two-stage classifying hydrocyclones.

Suncor said that it was actively assessing an additional recovery step for froth treatment tailings with the potential for inclusion in the Millennium design.

Suncor believed that it had selected the most appropriate extraction froth treatment technology for the Millennium Project and that it had assessed the impacts in the Environmental Impact Assessment.

2.2 Views of the Interveners

The interveners did not question the extraction froth treatment technology

2.3 Views of the Board

The Board is satisfied with Suncor's proposed modifications to the extraction froth treatment process and its commitment that bitumen production from the Millennium Project would achieve an average of 92.5 per cent bitumen recovery from the oil sands processed.

3 DILUENT RECOVERY AND LOSSES

3.1 Views of the Applicant

Suncor stated that it would use a reformulated “heart cut” diluent in its froth treatment process. The heart cut diluent quality would have a narrower boiling range (200-400°C) with less light and heavy ends and benzene as compared to the current diluent quality (175-450°C). The reformulated diluent would reduce benzene emissions from the tailings pond by approximately 80 per cent, reduce volatile organic compound (VOC) and total reduced sulphur compound (TRS) emissions, and would improve diluent recovery in the naphtha recovery unit (NRU) by 5 to 8 per cent.

Suncor stated that, with the change in its diluent quality and an increase in overall service factor to 98.6 per cent for its new and existing NRUs, an overall diluent recovery of 99.3 per cent would be achieved. This would result in a decrease of 10 per cent in volume of diluent lost per volume of bitumen produced relative to current practices. Suncor committed to an overall diluent recovery of the 99.3 per cent, including provision for upsets and down times, on an annual average basis with a stewardship target of 99.5 per cent. Suncor was not prepared to commit to an overall diluent recovery of 99.5 per cent recovery even though it is consistent with its current operations. Suncor stated that it did not see the merit in continuously raising the prescribed recovery level at which enforcement actions might apply.

Suncor believed that based on its experience and improvements in the operation of the NRU, it would be able to prevent potential odour incidents from occurring. Suncor stated that it has substantially reduced odour incidents with plant improvements and would continue to evaluate the most effective measures to control diluent losses and to mitigate their potential impact on the environment.

Suncor acknowledged that a hydrotreated diluent had the potential to reduce emissions of sulphurous compounds from the tailings pond. However, Suncor concluded that there was insufficient justification to support investment to hydrotreat the diluent, or to add redundancy to prevent untreated tailings being discharged to the tailings pond. Suncor committed to evaluate all options in the event of an odour incident, including reducing production rates and acting diligently, consistent with its business and environment practices to address the issue.

3.2 Views of the Interveners

Alberta Environmental Protection (AEP) and Alberta Health believed that there is still uncertainty regarding the predicted amount of VOC and TRS emissions from the tailings ponds and their impacts. Further efforts by Suncor were needed to better understand and minimize emissions from the ponds. AEP stated that it might recommend to its approvals director that Suncor be required to provide further back-up capabilities in the NRU or implement further operational procedures to prevent untreated tailings streams from being discharged into the ponds. This would help minimize VOC and TRS emissions from the tailings ponds during all operating conditions.

3.3 Views of the Board

The Board recognizes Suncor's efforts to improve its diluent quality and plant operations. The Board notes Suncor's commitment to a minimum diluent recovery of 99.3 per cent which would result in a reduction in the volume of diluent lost to the tailings ponds from the current annual average of 6.2 volumes per 1000 volumes of bitumen produced to 5.3 volumes. The Board also notes Suncor's commitment to an internal stewardship target of 99.5 per cent diluent recovery.

However, notwithstanding Suncor's improvements, the total volume of diluent lost to the tailings ponds will increase. The Board believes that a higher diluent recovery is achievable based on current plant performance and available technology. Therefore, the Board will require Suncor to achieve a diluent recovery of not less than 99.5 per cent to reduce diluent losses to a maximum of 4.5 volumes of diluent per 1000 volumes of bitumen produced.

The Board is not convinced that Suncor would be able to prevent off-site odours and other impacts resulting from the volatilization of solvent and other hydrocarbons contained within its tailings ponds if untreated froth treatment tails and upgrading waste water were discharged to the tailings pond. This would likely occur during an NRU outage or upset condition when, under Suncor's proposed design, significant volumes of froth treatment tailings could be discharged directly to the pond without solvent recovery under.

Given the risk of off-site impacts, the Board does not believe that discharge of untreated froth treatment tailings and upgrading waste water and associated diluent directly to the pond is acceptable and will condition the approval appropriately. The Board expects Suncor to identify alternative methods, such as implementing further operational improvements or the installation of redundancy in the NRU in order to achieve essentially no discharge of untreated tailings and to reduce the risk of off-site impacts from diluent losses to the pond.

DATED at Calgary, Alberta on 29 June 1999.

ALBERTA ENERGY AND UTILITIES BOARD

F. J. Mink, P.Eng.
Presiding Member

J. D. Dilay, P.Eng.
Board Member

T. McGee
Board Member

APPENDIX 3 TO ADDENDUM B OF DECISION NO. 99-7

Committees and Organizations in the Athabasca Oil Sands Region Addressing Environmental, Health, and Socio-Economic Issues (as of January 1999)

1. AEP Regional Sustainable Development Strategy (RSDS):

Mandate (Draft)

- Ensure clear direction for sustainable resource and environmental management in the Athabasca Oil Sands area that
 1. ensures a transparent view of Alberta's approach and better linkages of initiatives,
 2. manages regional effects (analyze, minimize, mitigate), and
 3. sets the context to assess and guide resource and environmental management.
- Ensure effective decision-making for resource and environmental management in the region that
 1. ensures better and comprehensive information is available for decision-making,
 2. streamlines and improves decision making, and
 3. makes decisions in an adaptive management.
- The strategy will be used as the context to assess and guide resource and environmental management. Results will be implemented and decisions made in an adaptive management approach, keeping pace with new information and goals. This includes management of facilities after approval.

Members

1. Alberta Energy and Utilities Board
2. Alberta Environment – Northeast Boreal Environmental Resource Committee Members
3. Alberta Resource Development
4. Alberta Economic Development
5. Environment Canada
6. Regional Municipality of Wood Buffalo
7. Saskatchewan Environment

2. Wood Buffalo Environmental Association (WBEA)

Air Quality Monitoring

Terrestrial Environmental Effects Monitoring (TEEM)

Mandate

- Design and operate monitoring programs related to air quality.
- Monitoring regional ambient air quality.
- Monitor regional terrestrial effects of SO₂, NO_x, O₃, and particulates – permanent plots for soil, forest health, and vegetation; colour infrared photographs for vegetation stress; traditional resource use study; trace metal accumulation in plants and animals.
- Monitor spring pulse in water courses.

Members

1. Alberta Environment
2. Alberta Health
3. Athabasca Chipewyan First Nation
4. Fort MacKay First Nation
5. Fort McMurray Environmental Association
6. Mobil Oil Canada Properties
7. Northern Lights Regional Health Authority
8. Nunee Health Authority
9. Pembina Institute
10. Shell Canada Limited/BHP
11. Suncor Energy Inc.
12. Syncrude Canada Ltd.

3. Regional Aquatic Monitoring Program (RAMP) (not yet officially incorporated under WBEA)

Mandate

- Design and operate monitoring projects for
 1. hydrology and related climate features,
 2. water and sediment quality,
 3. aquatic resources (benthic invertebrate communities, fish health and populations, fillet contaminant analysis, and aquatic vegetation),
 4. the Athabasca River, its tributaries and several waterbodies in the area,
 5. fish radio-telemetry study in the Athabasca River, and
 6. fish health parameters.

Members

1. Alberta Environment
2. Alberta Pacific Forest Industries
3. Department of Fisheries and Oceans
4. Environment Canada
5. Mobil Oil Canada Properties

6. Shell Canada Limited/BHP
7. Suncor Energy Inc.
8. Syncrude Canada Ltd.

Invited

1. Fort Chipewyan First Nation
2. Athabasca Chipewyan First Nation

Observers

1. KOCH Industries Canada
2. Mobil Oil Canada Properties
3. Petro-Canada Resources Limited

4. Ozone Working Group

Mandate

- Characterize, through modelling, the scope of the ground-level ozone issue in the Wood Buffalo Region.
- Increase the understanding of the science of regional ground-level ozone with particular reference to this region.
- Decrease the uncertainty with regards to ozone concentrations in the region.

Members

1. Alberta Environment
2. Athabasca Chipewyan First Nation
3. Environment Canada
4. Fort MacKay First Nation
5. Mobil Oil Canada Properties
6. Pembina Institute
7. Shell Canada Limited/BHP
8. Suncor Energy Inc.
9. Syncrude Canada Ltd.

5. Cumulative Environmental Effects Management Initiative (CEEM)

Mandate

- Prepare a common approach for preparing cumulative effects assessments (i.e., the Framework Document, in the Athabasca Oil Sands region).
- Develop an environmental management system to address environmental issues in the Athabasca Oil Sands region

Members (The Management Board of CEEM will have a smaller membership list than that listed below)

1. Alberta Energy and Utilities Board
2. Alberta Environment
3. Alberta Pacific Forest Industries
4. Anzac Metis Local 334
5. Athabasca Chipewyan First Nation
6. Athabasca Tribal Council
7. Canadian Environmental Assessment Agency
8. Chipewyan Prairie Dene Nation
9. Chipewyan Prairie Local 214
10. Conklin Metis Local 193
11. Department of Fisheries and Oceans
12. Environment Canada
13. Fort Chipewyan Metis Association 124
14. Fort MacKay Industry Relations Corporation
15. Fort McMurray #468 First Nation
16. Fort McMurray Environmental Association
17. Fort McMurray Metis Local 1935
18. Fort McMurray Metis Local 20/20
19. Gulf Canada Resources Ltd.
20. Japan Canada Oilsands Ltd.
21. KOCH Industries Canada
22. Mikisew Cree First Nation
23. Mobil Oil Canada Properties
24. Natural Resources Canada
25. Northland Forest Products Ltd.
26. Northstar Energy
27. Pembina Institute
28. Petro-Canada Resources
29. Regional Municipality of Wood Buffalo
30. Shell Canada Limited/BHP
31. Suncor Energy Inc.
32. Syncrude Canada Ltd.
33. Toxics Watch Society

6. NO_x/SO₂ Subcommittee (Memorandum of Understanding)

Mandate

- The purpose of the memorandum of understanding is to voluntarily commit industry, government, and public stakeholders to designing and implementing a management system that establishes environmental capacity guidelines, environmental management objectives, and an action plan to manage and control regional NO_x and SO₂ emissions associated with oil sands development.

Members (will be expanded)

1. Alberta Environment
2. Alberta Energy and Utilities Board
3. Environment Canada
4. Mobil Oil Canada Properties
5. Shell Canada Limited/BHP
6. Suncor Energy Inc.
7. Syncrude Canada Ltd.

7. Reclamation Advisory Committee (formerly the Oil Sands End Land Use [ELU] Committee)

Mandate

- Prepare a manual on end land use options in the oil sands region (mandate of old ELU Committee).
- Review conceptual reclamation plans for boundary issues and end land use (the mandate of this new committee is still being designed).

Members

1. Alberta Environment
2. Alberta Pacific Forest Industries
3. Athabasca Chipewyan First Nations
4. Fort McMurray Environmental Association
5. Fort McMurray Fish and Game Association
6. Metis Nation of Alberta Association
7. Mobil Oil Canada Properties
8. Northland Forest Products Limited
9. Regional Municipality of Wood Buffalo
10. Shell Canada Limited/BHP
11. Suncor Energy Inc.
12. Syncrude Canada Ltd.

8. Wetland Working Group (recommendations submitted to Reclamation Advisory Committee)

Mandate

- Prepare manual on reestablishing wetlands in the reclaimed landscape of oil sands leases.

Members

1. Alberta Environment
2. Athabasca Chipewyan First Nation
3. Can-Ag Enterprises Ltd.
4. Ducks Unlimited
5. Fort MacKay First Nation
6. Golder Associates Ltd.
7. Shell Canada Limited/BHP
8. Suncor Energy Inc.
9. Syncrude Canada Ltd.
10. University of Alberta

9. Oil Sands Vegetation Reclamation Committee (recommendations submitted to Reclamation Advisory Committee)

Mandate

- Prepare a manual on reestablishing vegetation for commercial timber production and for wildlife habitat on terrestrial landscapes of oil sand leases.

Members

1. AGRA Earth & Environmental Ltd.
2. Alberta Environmental Protection
3. Alberta Pacific Forest Industries
4. Can-Ag Enterprises Ltd.
5. Northland Forest Products Ltd.
6. Shell Canada Limited/BHP
7. Suncor Energy Inc.
8. Syncrude Canada Ltd.

10. End Pit Lake Committee (currently being formed):

Mandate

- Define operational standards and address environmental issues related to the establishment of end pit lakes in the oil sands region.

Members

1. Mobil Oil Canada Properties
2. Shell Canada Limited/BHP
3. Suncor Energy Inc.
4. Syncrude Canada Ltd.

11. Athabasca Tribal Council/Industry Working Group (ATC/IWG) Environment Sub-Committee

Mandate

- Develop strategies to ensure the five First Nations and Athabasca Tribal Council have the capacity for effective consultation.
- Participate effectively in the regional environmental management systems

Members

1. Fort MacKay First Nation
2. Gulf Canada Resources Ltd.

Participants

1. Fort McMurray #468 First Nation
2. Mobil Oil Canada Properties
3. Petro-Canada Resources Limited
4. Shell Canada Limited/BHP
5. Suncor Energy Inc.
6. Syncrude Canada Ltd.

12. Alberta Oil Sands Community Exposure and Healthy Assessment (AOSCEHA)

Mandate

- Collect field information on the exposure of residents in Fort McMurray and Fort MacKay to air contaminants and on the health of these individuals.

Members

1. Alberta Health
2. Northern Lights Regional Health Authority
3. Suncor Energy Inc.
4. Syncrude Canada Ltd.

**13. Canadian Oil Sands Network for Research and Development (CONRAD)/Environmental Technical Planning Group
Three Technical Advisory Groups:**

Includes

1. **Aquatic Research (CEATAG)**
2. **Terrestrial Reclamation Research on Challenging Materials (TERRE)**
3. **Air Quality Research (AIRTAG) (currently being formed)**

Overview

- CONRAD currently comprises five technical planning groups (TPGs), including mining, extraction, upgrading, environmental, and in situ recovery. CONRAD began with mining and extraction forming a single TPG. Each TPG develops a project portfolio that may include fundamental research, exploratory research, technology development, or research application.
- CEATAG was formed in 1998 to function as a focus group for the aquatic component of the oil sands environmental research. It is designed to act as a vehicle to get scientifically based aquatic research knowledge to corporate management decision makers in an effective manner.
- TERRE was formed in 1997 to function as a focus group to develop efficient and effective terrestrial reclamation techniques for challenging substrate materials in the oil sands industry and provide an umbrella organization that ensures focus, cooperation and cost-sharing within oil sands terrestrial reclamation research activities.

Members

1. Alberta Energy and Utilities Board
2. Alberta Environment
3. Alberta Research Council
4. Amoco Canada
5. Canadian Association of Petroleum Producers
6. CANMET
7. Environment Canada
8. Golder Associates Ltd.
9. Gulf Canada Resources Ltd.
10. Imperial Oil Resources
11. KOCH Industries Canada
12. Mobil Oil Canada Properties
13. Shell Canada Limited/BHP
14. Suncor Energy Inc.
15. Syncrude Canada Ltd.
16. University of Calgary

14. Regional Infrastructure Working Group

Mandate

- Identify regional impacts of oil sands development and work cooperatively to maximize benefits (e.g., physical and human infrastructure needs) through the following subcommittees.
 - 1) Education and jobs
 - 2) Transportation

- 3) Finance
- 4) Communication

Members

1. Alberta Pacific Forest Industries
2. Gulf Canada Resources Ltd.
3. Japan Canada Oilsands Ltd.
4. KOCH Industries Canada
5. Mobil Oil Canada Properties
6. PanCanadian Petroleum Ltd.
7. Petro-Canada Resources Limited
8. Regional Municipality of Wood Buffalo
9. Shell Canada Limited/BHP
10. Suncor Energy Inc.
11. Syncrude Canada Ltd.

15. Athabasca Tribal Council/Industry Working Group (ATC/IWG)

Mandate

- Assist the Athabasca Tribal Council with the continuing development and implementation of its ATC Resource Development Strategy through the following subcommittees:
 - 1) Environment
 - 2) Education and jobs
 - 3) Human infrastructure
 - 4) Physical infrastructure

Members

1. Executive Director, ATC
2. Regional Coordinator, RIWG
3. Alberta Pacific Forest Industries
4. Gulf Canada Resources Ltd.
5. KOCH Industries Canada
6. Mobil Oil Canada Properties
7. Petro-Canada Resources Limited
8. Shell Canada Limited/BHP
9. Suncor Energy Inc.
10. Syncrude Canada Ltd.