

ALBERTA ENERGY AND UTILITIES BOARD

Calgary, Alberta

PANCANADIAN RESOURCES, HEAVY OIL BUSINESS UNIT APPLICATION FOR A STEAM-ASSISTED GRAVITY DRAINAGE (SAGD) RECOVERY SCHEME CHRISTINA LAKE THERMAL PROJECT

**Decision 2000-7
Application No. 1023589**

1 APPLICATION

On April 15, 1998, PanCanadian Resources, Heavy Oil Business Unit (PanCanadian), pursuant to Section 10 of the Oil Sands Conservation Act, submitted Application No. 1023589 to the Alberta Energy and Utilities Board (the Board/EUB) to construct and operate a steam-assisted gravity drainage (SAGD) recovery scheme from the McMurray Formation in the Athabasca Oil Sands Deposit. Under a coordinated application process adopted by Alberta Environmental Protection (AENV) and the EUB, PanCanadian filed a joint application and environmental impact assessment (EIA). PanCanadian also filed for specific approvals under the Alberta Environmental Protection and Enhancement Act (AEPEA).

The proposed Christina Lake thermal project would be located on 8.4 sections of land in the Regional Municipality of Wood Buffalo approximately 170 kilometres (km) south of Fort McMurray, Alberta, in Township 76, Range 6, West of the 4th Meridian (Figure 1). The application requested approval for the following plans:

- Each of project's three phases would have its own central plant facility consisting of raw water treating and softening, steam generation, production separation, heat recovery, water deoiling, and water disposal and oil facilities. Plant sites for Phases 1, 2, and 3 would be in sections 16, 24, and 11 respectively of Township 76-6W4M.
- PanCanadian would drill horizontal well pairs and use SAGD as the recovery process. A total of 700 horizontal wells could be drilled during the development of the three phases.
- The project would incorporate produced water reuse facilities in Phases 2 and 3.

2 DECISION

After carefully considering all of the evidence, the Board has determined that Application No. 1023589 is in the public interest and is prepared, subject to the authorization of the Lieutenant Governor in Council, to approve the application. The Board believes that there are minimal operational and environmental risks associated with this development, that these risks are manageable, and that the project can proceed in an acceptable manner. The approval is subject to the requirements and conditions as specified in Section 12 of this decision.

3 HEARING

The application was considered at a public hearing in Fort McMurray, Alberta, from November 2, 1999, to November 5, 1999, before Presiding Board Member T. McGee and Acting Board Members R. N. Houlihan, Ph.D., P.Eng., and C. A. Langlo, P.Geol.

Those who appeared at the hearing and abbreviations used in the report are listed in the following table.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)

Witnesses

PanCanadian Resources, Heavy Oil Business
Unit (PanCanadian)
B. K. O’Ferrall
A. C. Reid

K. Dryden, P.Land
J. O’Donnell
B. Stevens, P.Eng.
R. Ameli, P.Eng.
J. Suggett, P.Eng.
J. Gulley, P.Biol.,
of Golder Associates Ltd.
D. Kerr, P.Ag.,
of Golder Associates Ltd.
E. Gillmor, P.Geol.,
of CH2M Gore & Storrie Limited
C. Downe-Cicoria,
of Lornel Consultants

Wood Buffalo First Nation (WBFN)
A. C. Rice

J. Malcolm
T. Harpe
E. Adby

Nakewin Traditional Aboriginal Authority
(NTAA)

W. Alook
M. McCallum

Chipewyan Prairie Dene First Nation (CPDFN)
K. E. Buss

W. Janvier, Chief
H. Morrice
V. Janvier
J. Cardinal
A. Janvier
T. Janvier
R. Kent

THOSE WHO APPEARED AT THE HEARING (continued)

Principals and Representatives (Abbreviations Used in Report)

Witnesses

Oil Sands Environmental Coalition (OSEC)
K. E. Buss

D. Smith
M. Kitagawa
G. MacCrimmon

Government of Alberta
G. P. Van Nes
H. L. Veale

Chard Dene Community Association (CDCA)

R. Nakohoo, President
P. Mercredi
S. Hayne

Conklin residents

D. Pruden

Alberta Energy and Utilities Board staff (EUB)
W. Y. Kennedy, Board Counsel
Z. Buss, P.Eng.
P. Hunt
B. Austin, P.Geol.

AENV and the Alberta Department of Health and Wellness submitted an intervention stating that they did not object to the proposed project provided matters raised by the Crown were properly addressed and the EUB found the project to be in the public interest.

Other Abbreviations

Alberta Ambient Air Quality Guidelines—AAAQG
Alberta Environmental Protection—AENV
Alberta Environmental Protection and Enhancement Act—AEPEA
Alberta-Pacific Forest Industries Inc.—AL-PAC
Athabasca Tribal Council—ATC
Boreal Woodland Caribou Committee—BWCC
Conklin Community Association—CCA
Cumulative Environmental Effects Monitoring Program—CEEMP
Environmental impact assessment—EIA
Historical resources impact assessment—HRIA
NO_x/SO₂ Emissions Management Working Group—NO_x/SO₂ EMWG
Regional Infrastructure Working Group—RIWG

Regional Sustainable Development Strategy—RSDS
Steam-assisted gravity drainage—SAGD
Terrestrial Environmental Effects Monitoring—TEEM
Wood Buffalo Environmental Association—WBEA

4 ISSUES

The Board believes the issues relating to the application to be

- need for the project
- public consultation
- socioeconomic issues
- bitumen recovery process
- land use
- environmental issues
- cumulative effects of oil sands developments

5 NEED FOR THE PROJECT

5.1 Views of the Applicant

PanCanadian stated that the Christina Lake thermal project was needed to recover the bitumen resources underlying its lease and that it would result in a positive contribution to the efficient development of Alberta's oil sands resources. The planned commercial bitumen project wells and bitumen processing plants are designed for up to 11 000 cubic metres per day (m³/d) (70 000 barrels per day [bbl/d]) of bitumen when all three phases are operational. The project would begin steaming in fall 2001 and provide economic benefit to the community, area residents, and the province of Alberta.

PanCanadian gave several reasons for proceeding with its development at this time, including the fact that drilling programs confirmed that the Christina Lake lease has significant bitumen resources.

5.2 Views of the Interveners

None of the interveners questioned the need for the project.

5.3 Views of the Board

The Board accepts that a thermal project is required in order to recover the resources from the Christina Lake area. The Board believes that the project represents an orderly and efficient use of the province's energy resources.

6 PUBLIC CONSULTATION

6.1 Views of the Applicant

PanCanadian stated that its consultation process was carried out over a period of two years and involved hundreds of contacts with parties in the area. It conducted the consultations prior to submission of the project application in order to hear the views of affected parties, incorporate their input into the application, and minimize environmental impacts. PanCanadian submitted that it had provided opportunities for stakeholder input to its project by means of newspaper advertising, newsletters, meetings, and open houses in the communities of Lac La Biche, Janvier, and Conklin. It believed that it had adequately fulfilled its obligations to consult.

PanCanadian recognized that outstanding stakeholder concerns were the basis for the present EUB hearing and welcomed the hearing as an opportunity to further address these issues. PanCanadian acknowledged the concerns of representatives of the Chard Dene Community Association (CDCA) that some residents of Chard had not been adequately consulted. PanCanadian noted that as soon as the concern was identified, it immediately scheduled meetings and provided information to the Chard community to begin the necessary consultation. PanCanadian also noted that 169 contacts with the Chipewyan Prairie Dene First Nation (CPDFN) had been made since December 2, 1997, and that 20 meetings had taken place.

PanCanadian's consultation approach for communities closest to its project area was to adopt memoranda of understanding (MOUs) or community development accords. PanCanadian noted that such accords enabled parties to establish an ongoing process for the identification and resolution of community concerns. PanCanadian stated that a formal community development accord had been signed with the CPDFN, which called for funds to be provided to the CPDFN for services provided in 1998, including review of the EUB and AEPEA applications. PanCanadian stated that it had made a commitment to sign an accord with the community of Conklin. At the time of the hearing, PanCanadian had also agreed to continue discussions with the Wood Buffalo First Nation (WBFN) but had not committed to an accord.

PanCanadian stated that it would continue its consultation with stakeholders to address their outstanding issues. PanCanadian noted that should the project be approved by the EUB, it was also committed to continue to work with affected communities on an ongoing basis.

6.2 Views of Conklin Residents

Ms. Pruden, on behalf of some of the Conklin residents, stated that there was support for the project and the consultation methods used by PanCanadian. Ms. Pruden noted that she did not represent Conklin Metis Local #193, although she was a member. She also stated that members of the Conklin Metis Local #193 did not belong to WBFN. Ms. Pruden noted that the Conklin Community Association (CCA) had withdrawn its interventions to the application prior to the hearing. She stated that the CCA believed that community concerns related to education, training, long-term employment, and business opportunities would be addressed with PanCanadian in a forthcoming MOU or consultation agreement.

Mr. Adby and Mr. Alook, also residents of Conklin, submitted statements of concern related to potential effects of the project and impacts on water supply, bush medicine, air quality, noise levels, land, and animals.

6.3 Views of the Chard Dene Community Association

The CDCA maintained that PanCanadian had not adequately consulted its 200 members from the Hamlet of Chard. The CDCA noted that it had not received the results of PanCanadian's EIA or socioeconomic studies. Mr. Nakohoo stated that PanCanadian had not approached the community of Chard for its input or concerns related to the project. The CDCA identified its members as Bill C-31 nonstatus aboriginal and Metis people from the Chard community.

The CDCA also stated that the First Nation residents of Janvier were distinct from residents of Chard and that the two subcommunities did not interact. As a result, the CDCA believed it had been overlooked during consultations with the community of Janvier, as PanCanadian had focused those discussions on issues of the CPDFN. The CDCA requested that PanCanadian communicate all relevant project information to its representatives for review. It also suggested that an accord similar to that which PanCanadian entered into with the CPDFN to address issues of education, training, and employment should have been established with the CDCA.

6.4 Views of the Chipewyan Prairie Dene First Nation

Chief Janvier, on behalf of the CPDFN, submitted that PanCanadian had not adequately consulted with the CPDFN about specific traditional uses of lands within the project area and had not adequately sought input from CPDFN members on cabins, gravesites, trails, and hunting.

The CPDFN noted that the community development accord signed with PanCanadian was inadequate as a consultation process for identification and resolution of concerns and that difficulties arising from the accord led to a breakdown of communications between the parties. The CPDFN also stated that it had recently entered a capacity-building agreement with the Athabasca Tribal Council (ATC) to provide a community liaison person for consultations with Janvier residents about regional environmental issues. Funding of the position was established through oil sands and forest developers in the region.

The CPDFN had believed that after signing the accord, PanCanadian would provide sufficient resources to undertake third-party review of its application and EIA. Through such expert review of the application, the CPDFN believed that it could have negotiated with PanCanadian to address outstanding community concerns.

The CPDFN cited environmental concerns, such as impacts on wildlife, waste disposal, sand production, and air monitoring. The CPDFN believed that these concerns had not been adequately addressed by means of the consultation process due to the limited funds available. It also noted that even after community consultations, Janvier residents still had a weak understanding of the project's potential impacts. The CPDFN also noted that PanCanadian's summary of public consultation contacts overstated the actual number of meetings held with Chief Janvier and CPDFN members.

The CPDFN believed that for public consultation to be effective, there must be adequate understanding between the parties. In its view, this understanding had been weakened by PanCanadian's reluctance to acknowledge the CPDFN's traditional use of lands within the project study area. The CPDFN also noted that it had expected PanCanadian's consultation process to involve the negotiation of some community benefits. Despite the accord, the CPDFN did not believe that PanCanadian had made solid commitments to address primary community issues, such as education funding, training, and job opportunities. It believed that aboriginal communities in the area had common interests that should be addressed by PanCanadian.

The CPDFN believed that there was more to be gained from a cooperative approach by aboriginal communities in dealing with PanCanadian about regional issues and stated that it would consider third-party mediation as a means to continue the consultation process with PanCanadian. The CPDFN believed that the Board should defer further consideration of PanCanadian's application until completion of the consultation process. The CPDFN stated that it did not object to PanCanadian's project proceeding but desired the Board to impose conditions upon any approval that it might issue for PanCanadian to address community needs for consultation and to provide a mechanism to negotiate benefits, such as training, education, and economic development opportunities.

6.5 Views of Wood Buffalo First Nation

WBFN stated that as an established aboriginal organization directly affected by the project, it should have been able to obtain a formal consultation agreement with PanCanadian. WBFN pointed out that it had members living in Anzac, Conklin, Janvier, and the Fort McMurray area and believed that it represented the Conklin Metis Local #193. WBFN also said it incorporated the Nakewin Traditional Aboriginal Authority (NTAA), an information-gathering organization that also provides advice to WBFN elders on cultural and resource matters. WBFN noted that it was not affiliated with the community associations PanCanadian had consulted with in the Conklin area and believed that it should have been contacted directly by PanCanadian.

WBFN did not object to PanCanadian's project proceeding but requested that the Board impose conditions upon any approval that it might issue to address community needs for consultation, compensation, economic development opportunities, land reclamation, and environmental monitoring. WBFN expressed interest in continued negotiations with PanCanadian to address its concerns.

6.6 Views of the Oil Sands Environmental Coalition

OSEC believed that public consultation with PanCanadian had been limited and ineffective. Although it had identified several issues, not all of these were addressed prior to the hearing, nor had an MOU been negotiated with PanCanadian, as OSEC had requested. OSEC stated that aboriginal groups in the area, including the CPDFN, residents of Conklin, and WBFN, had contacted it to assist them with technical review of the PanCanadian application and to help overcome difficulties they were experiencing with the PanCanadian consultation process.

6.7 Views of the Board

The Board views public consultation between proponents and parties that may potentially be affected by proposed energy developments as an essential part of the project development process. The Board also believes that successful consultation requires participation and commitment from all parties to identify issues and work towards resolutions. While the Board finds that PanCanadian met the minimum requirements for consultation, it believes that more determined consultation must continue in order to facilitate the project's implementation.

The Board believes that in areas where regional environmental concerns or multiple land uses exist, public consultation requires involvement of communities located significant distances from a proposed project. The Board notes that although a considerable effort was directed at consultation prior to the hearing, PanCanadian was unable to reach consensus with all interveners in the nearby communities. The Board believes that all interested and potentially affected parties have a role in seeing that a consultation process is productive and that greater effort on the part of the interveners to identify concerns early in the process would have improved the outcomes.

The Board notes the issues raised by members of the communities of Chard, Janvier, and Conklin regarding environmental and socioeconomic effects and will require PanCanadian to do additional consultation in these communities. The Board is aware that the complex and emerging issues relating to the aboriginal people of the area, including traditional land use, contributed to PanCanadian's consultation difficulties. Noting the release by the Alberta government in July 1999 of a Draft Aboriginal Policy Framework, the Board also recognizes that the role of government and others in the area of consultation with aboriginal communities may change as new policies are developed. This is particularly true for discussions involving resource development and land management decisions.

The Board notes the common interests of the aboriginal communities and their commitment to work together to support a cooperative approach to consultation. Such an approach would also be advantageous to all resource developers in the region. The Board believes that the initiative among resource developers in the Fort McMurray area and the ATC provides an effective model to improve the consultation process. The Board believes that the interveners were generally supportive of the project proceeding if preproject consultation could be concluded and comprehensive agreements reached on outstanding issues of environmental impact, training, education, and economic development opportunities.

The Board will require PanCanadian to initiate and facilitate the establishment of an advisory group with community leaders from the nearby communities of Conklin, Janvier, and Chard. The Board recommends that the advisory group consider establishing industrial relations contacts for each community to address outstanding consultation issues, including opportunities for training, education, economic development, and identification of project environmental effects and mitigation. The Board encourages PanCanadian to evaluate the use of alternative presentation and visualization methods in follow-up consultations to enhance understanding of the technical aspects of its project. The Board also encourages the use of a third-party facilitator acceptable to all parties as part of the process. The Board will continue to monitor this process.

With regard to WBFN and in particular the residents of Anzac, the Board believes that the distance from the proposed project is such that the issues raised are better dealt with in a regional context. The Board would encourage these residents to pursue their issues through existing regional initiatives of the oil sands industry and Wood Buffalo Regional Municipality.

The Board recognizes the efforts of OSEC and PanCanadian to consult on project issues. The Board is satisfied that PanCanadian made reasonable efforts to provide information in responding to OSEC's requests. The Board notes the difficulties encountered and believes that the issues raised by OSEC, including emissions and habitat management, are regional in nature and can be effectively dealt with through the participation of PanCanadian in existing regional initiatives, such as the Cumulative Environmental Effects Monitoring Program (CEEMP).

7 SOCIOECONOMIC ISSUES

7.1 Views of the Applicant

PanCanadian estimated that the proposed project would increase the provincial gross domestic product by approximately \$317 million and contribute the equivalent of 4931 person years of employment within Alberta. Construction expenditures would be \$370 million over 30 years; some \$48 million would be spent within the region, and \$12 million would accrue to the local area. During Phases 1, 2, and 3, there would be 22, 38, and 20 full-time employees respectively.

PanCanadian cited its excellent record of providing job training and local employment opportunities to aboriginal communities. It committed to employ local residents who met the necessary training and safety standards. PanCanadian stated that it had provided scholarships and local needs assessment programs in other areas of its operations to promote training and education. It also pointed out that additional educational opportunities had resulted from its contribution to the Southern Alberta Institute of Technology environmental program and student scholarships. PanCanadian stated that it was not its policy to make decisions affecting education funding without the involvement or approval of government agencies responsible for such services. However, it said that it was reviewing the CPDFN's request for funding assistance to the Janvier community high school.

PanCanadian also stated that it would involve local residents to assist with further site assessments for its project facilities. This would contribute to improved knowledge and mitigative measures respecting potential sacred sites, medicinal plant species, and other aboriginal land uses. PanCanadian stated that although it was committed to local and aboriginal employment, it was not prepared to make commitments prior to project approval.

PanCanadian stated that through the accord with the CPDFN it had established a process for future negotiations on community issues of training, education, employment, and economic development. It anticipated that it would reach similar accords after negotiations with other affected communities.

In response to questions about appropriate levels of community medical services, PanCanadian noted that it had provided financial assistance to a Conklin resident in order to upgrade nursing qualifications.

PanCanadian submitted that project-related traffic on Highway 881 would have minimal impacts on the communities of Anzac and Conklin in terms of increased traffic on the highway. It committed to participate in the Regional Infrastructure Working Group (RIWG) and to further evaluate the cumulative effects of new roads and traffic on communities. PanCanadian agreed to work with the communities on issues of public safety and noted that by transporting the oil by pipeline, truck traffic to the plant site could be limited to one truck per day.

7.2 Views of the Interveners

Chief Janvier and elders from the CPDFN conveyed their frustration and disappointment over past unfulfilled commitments of oil and gas companies to the community. The people of the CPDFN and the community of Janvier had not realized promised social and economic benefits from industrial development in the area. Chief Janvier stated that an unemployment rate of 80 per cent for communities like Janvier and Conklin was not acceptable. To overcome the failure of companies such as PanCanadian to share economic benefits with local aboriginal communities, Chief Janvier requested that the Board address the community issues of education, employment, and economic development in its decision and condition any approval it might issue to ensure firm commitments in these areas.

The CPDFN believed that PanCanadian's EIA had not adequately addressed its members' traditional resources and land uses. It suggested that employment of CPDFN band members who were knowledgeable about the area could assist in providing the required site assessments.

WBFN expressed concern about increased truck traffic through the communities of Conklin and Anzac using existing road infrastructure. It questioned how PanCanadian would respond to the need for road upgrading, improved signage, reduced speed limits, or other traffic restrictions during peak traffic periods that might create a community safety issue.

The CDCA asked that PanCanadian give its members the same consideration for access to jobs, training, and education as other aboriginal groups in the area receive. It did not want its members to miss employment and contract opportunities due to lack of training.

WBFN inquired about PanCanadian's ability to meet commitments to employ local residents given that many aboriginal people do not possess the necessary educational qualifications to enter technical training institutions.

7.3 Views of the Board

The Board believes that new in situ oil sands developments, such as the one proposed by PanCanadian, will provide considerable socioeconomic opportunities for people in the region and for the province as a whole. The Board also acknowledges the efforts of leaders within the aboriginal communities to pursue opportunities for development within their own communities.

The Board is required to address socioeconomic impacts as part of its review of project proposals, although the lead roles for ensuring that such benefits are realized fall to other areas of government. The Board is satisfied that PanCanadian has policies and programs in place to address socioeconomic issues.

The Board accepts PanCanadian's intention to take reasonable steps to implement community development accords with Conklin, Janvier, and Chard. The Board recognizes the importance of funding assistance for training and education to facilitate employment opportunities and encourages PanCanadian to consider options to provide such assistance. The Board also encourages PanCanadian to review its occupational health and safety needs for local medical services and wherever possible to integrate them with the needs of local communities, such as Conklin.

The Board expects PanCanadian to work with local government to implement suitable measures, such as signage and reduced speed limits, to address local traffic concerns. Where transportation issues are regional, the RIWG could be used as a mechanism for identifying issues to industry and local or provincial governments.

Given the potential for growth of industrial development in the Wood Buffalo area and the number of operators and communities involved, the Board believes that cooperative efforts are necessary to contribute solutions to regional socioeconomic issues. As previously noted, the Capacity Building Agreement negotiated between the ATC and industry, which enables First Nations in the oil sands region to consult with developers and identify and resolve community issues. It also enables First Nations to work with local, provincial, and federal governments and developers regarding long-term socioeconomic benefits and the establishment of training, education, employment programs, and necessary infrastructure.

The Board believes it is in the interest of all parties to work cooperatively with the Regional Municipality of Wood Buffalo and regional developers through existing working groups, such as the Regional Oil Sands Working Group, the Regional Standing Committee on Oil Sands Development, and the ATC/Industry Working Group. The Board urges PanCanadian, as well as other industrial operators entering the region, to support and participate in such initiatives.

8 BITUMEN RECOVERY PROCESS

8.1 Views of the Applicant

PanCanadian stated that its project would recover bitumen from the McMurray Formation, which, it said, is a high-quality resource with greater than 20 m of net bitumen pay thickness in the high-grade portion of the project area.

PanCanadian pointed out that it currently was operating a SAGD thermal recovery project at Senlac, Saskatchewan, and was confident that application of SAGD technology at Christina Lake would recover up to 65 per cent of the bitumen in place with minimal surface disturbance, low emissions, and minimal impact on the surface and groundwater.

The SAGD technology would be operated below the McMurray Formation fracture pressure using steam injection wells of 500 m horizontal length or longer. A horizontal production well would be placed approximately 5 m below the injection well and be used to produce the bitumen and water to surface, where it would be separated. The wells would be drilled from pads located to optimize reservoir recovery. PanCanadian indicated that it needed to substantiate the reservoir production capabilities in Phase 1 prior to proceeding with Phase 2.

PanCanadian maintained that the extraction of 111 million m³ (700 million bbl) of bitumen over the life of the project is in the public interest. It stated that it would expect all three phases of the project to be operational in 2009.

8.2 Views of the Board

The Board is satisfied that the SAGD process has potential to achieve high bitumen recovery levels from higher-grade oil sands in the project area. This project is the first commercial application of the SAGD process in the Athabasca area and it is noted that actual recoveries may be lower, particularly where oil sands bitumen content or seam thickness is low. The Board expects PanCanadian to recover the practical maximum amount of bitumen from the total bitumen in place in the project area using SAGD or other follow-up recovery processes. The Board will require PanCanadian to show, prior to project abandonment, that recovery is maximized. The Board will monitor the recovery performance through periodic review of the project.

9 LAND USE

9.1 Wildlife

9.1.1 Views of the Applicant

PanCanadian stated that the technology proposed for its project minimized impacts on wildlife and that the mitigative measures proposed in its EIA would further minimize impacts that might occur. On this basis, PanCanadian concluded that the environmental impacts, including those on wildlife, were acceptable.

PanCanadian outlined several advantages of using the proposed technology, which included multiwell pads with long horizontal segments to reduce overall surface disturbances to wildlife habitat and ongoing reclamation to reduce the duration of the disturbance. Total disturbance over the 30-year life of the project would involve 704 hectares, or approximately 2 per cent of the study area as defined in PanCanadian's application. The project plan would also provide some flexibility to avoid environmentally sensitive sites when establishing drilling locations and production facilities.

PanCanadian committed to wildlife monitoring as a means of managing site impacts and evaluating the success of reclamation in re-establishing habitat. PanCanadian stated that it would establish details of wildlife monitoring in consultation with AENV and local communities. It noted that it had completed wildlife baseline studies to assess impacts to ungulates in the regional and project study areas. Other follow-up work remained to be completed, including survey work on the distribution of species at risk, such as amphibians.

PanCanadian's EIA set out mitigative measures for woodland caribou, such as the use of an access management plan and site assessments for the location of surface facilities away from prime habitat. It stated that it has been an active member of the Boreal Woodland Caribou Committee (BWCC), participating in ongoing research into mitigative measures to reduce

impacts on caribou. PanCanadian believed that it would be able to integrate several caribou management practices of the BWCC into its project plan, which would be developed with local communities, regulators, and company representatives. In response to a question regarding the timing of construction activity, PanCanadian stated that details of its construction schedule were not available this early in the project.

PanCanadian noted that its project area was outside of the most recent caribou management area as defined by AENV. It believed that future development activities of the proposed project would not encroach upon the Key Caribou Zone established north of Christina Lake. It did acknowledge, however, that boundaries of the caribou management areas were subject to periodic review by AENV and the BWCC and stated that it would monitor such changes to ensure that impacts were minimized. PanCanadian also outlined its commitment to support regional environmental initiatives such as the Wood Buffalo Environmental Association (WBEA), CEEMP, and Regional Sustainable Development Strategy (RSDS).

PanCanadian noted that Environment Canada had completed an environmental screening of the project and that no concerns were identified and no federal government approvals were required at this time.

9.1.2 Views of the Interveners

Residents of Conklin who filed statements of concern about PanCanadian's application identified several concerns, including the possible loss of wildlife, impacts to water quality and fish, and uncertainties about potential impacts the project might have on human health from consumption of traditional foods. Other residents of Conklin represented by Ms. Pruden supported the project and believed that wildlife were adaptable to developments and frequently returned to local areas after being disturbed and absent.

The CDCA supported the PanCanadian application but noted that it had not received environmental information on the project. The CDCA was concerned about local impacts from the industrial use of water, effects on water supply, and possible effects of contaminants on wildlife.

The CPDFN was concerned about potential impacts of the project on migratory game and wildlife, including moose and caribou. CPDFN also raised concerns about direct and indirect impacts of the PanCanadian project in combination with the cumulative impacts of existing and future oil sands operations.

WBFN identified several wildlife concerns related to the proposed project, including that

- there had been inadequate study of the cumulative effects of wildlife displacement;
- wildlife data from field studies had not been provided to local residents;
- there was insufficient information respecting fish resources and the spring inventory of fish species and not even this information was provided to local residents;
- PanCanadian's EIA did not address the Migratory Bird Convention and Environment Canada's participation;
- potential impacts of the project on birds and other wildlife (e.g., woodland caribou) were not adequately addressed.

WBFN and the CPDFN identified specific concerns regarding woodland caribou and the project's proximity to known caribou habitat. The CPDFN believed that conflicting information from different caribou management maps suggested that the project study area might include key caribou habitat. This would require implementation of special caribou management guidelines by PanCanadian. WBFN questioned the adequacy of PanCanadian's plan for restricting nonessential construction activity between March 1 and June 15 (under AENV's Caribou Policy, no activity is permitted during that time in the caribou range).

OSEC requested that PanCanadian elaborate on its monitoring and mitigative plans for wildlife management. OSEC believed that the applicant had not adequately assessed the effects of habitat fragmentation upon wildlife biodiversity at the species and at the community levels. It also believed that PanCanadian provided insufficient information to calculate the likely reduction in wildlife populations that might occur as a result of project.

AENV stated that effects of the Christina Lake thermal project would be managed without impacts to fish populations. Respecting wildlife, AENV submitted that any project approvals it might issue would address wildlife management goals. AENV concluded that the RSDS would provide a suitable framework in which to deal with resources and environmental issues of the oil sands region.

9.1.3 Views of the Board

The Board believes that the impact of the PanCanadian project on wildlife in the Christina Lake area will be relatively small and that mitigative measures as proposed by PanCanadian will be successful in managing such impacts. The Board accepts PanCanadian's commitments to continue site-assessment work, complete wildlife surveys, and monitor the ongoing impacts of its project under the direction of AENV. AENV will also deal with species at risk, including woodland caribou.

The Board believes that careful management of regional wildlife populations is necessary in the face of increasing industrial presence. The Board is confident that research, monitoring, and management practices can be applied to sustain wildlife populations. The Board recognizes this as a priority issue within RSDS and places high importance on PanCanadian's commitment to support CEEMP and RSDS. The Board believes that regional issues, including wildlife displacement and habitat fragmentation, will be managed in the context of multistakeholder initiatives such as CEEMP. The Board also encourages the ongoing participation of community members and other interested parties through these cooperative regional initiatives, which include the participation of aboriginal communities, regulators, industry, and public interest groups.

9.3 Aboriginal Land Use

9.3.1 Views of the Applicant

PanCanadian accepted that it has a duty to consult aboriginal stakeholders regarding activities that involve use of unoccupied Crown lands. Consequently, it initiated thorough community consultations, principally in Conklin and Janvier, to identify the concerns of local residents and

involve them in the planning for the project. During preparation of its land-use study and open house consultations, PanCanadian stated that it had not been informed that aboriginal land use was a community issue.

PanCanadian advised the Board that the legal responsibility for establishing aboriginal rights and traditional lands rested with the federal and provincial governments and was not a company matter.

As part of its EIA, PanCanadian provided a land-use report that included the identification of aboriginal traditional land uses in the region surrounding the project area. The land uses identified included hunting, trapping, fishing, cultural use, and food collection. The report also documented historic harvest records of traplines that might be affected by the development. In completing a rare plant survey of the area, PanCanadian received input and assistance from local aboriginals. PanCanadian concluded that no significant impacts to aboriginal land uses would occur due to the Christina Lake project or from regional cumulative effects. PanCanadian stated that it had negotiated agreements with trappers in the project area and would continue to do so.

PanCanadian noted that a historical resources impact assessment (HRIA) approved by Alberta Community Development addressed potential disturbance to sites of known archaeological significance. The HRIA concluded that no historical/archaeological resources had been identified in the project area. PanCanadian stated that site specific assessments, including appropriate mitigative measures, would be completed prior to development of surface facilities in all phases of the project.

9.3.2 Views of the Interveners

The CPDFN introduced evidence from a map of CPDFN Special Interest Lands, a consultant's land-use report prepared for the CPDFN, and oral accounts from a number of elders and members of the CPDFN relating to the geographic extent of past and present traditional resources and land uses. Several Dene traditional names were cited for geographic features of the region and accounts given of their historic occupation. Chief Janvier was concerned that PanCanadian had refused to acknowledge traditional use of project area lands by his people and said that this had been detrimental to subsequent consultations and communications with the CPDFN. The CPDFN noted that its community had been relatively isolated from developments of this type and that it had only been about ten years since an all-weather road to the community was built.

The CPDFN questioned PanCanadian about the methods used to assess impacts to traditional land use. The CPDFN asserted that in the absence of effective community consultation with its members about specific land uses, such as hunting and trapping harvests, sacred sites and gravesites, and collection of medicinal plants and traditional foods, the applicant was unable to determine the full extent of its impacts.

Chief Janvier stated that traplines in PanCanadian's study area were registered mainly to Metis and nonaboriginal people. Prior to the sale of traplines by the Alberta government, his people had trapped south of Christina Lake within the CPDFN's land base, including the area of PanCanadian's application.

The CPDFN stated that the distance between Conklin and the Christina Lake thermal project was nearly equal to the distance between the Winefred Lake North Bay Reserve and the project. The CPDFN noted that PanCanadian was unaware of the existence of several cabins at the Winefred Lake Reserve that would be directly affected by PanCanadian's project and, as a result, had failed to include the affected residents in its public consultation.

WBFN noted that members who resided in Conklin, Chard, Janvier, Anzac, and the Fort McMurray area made use of the WBFN's trapping region. WBFN stated that it had filed an aboriginal land claim with the Government of Canada, which included traditional lands in an area south of Christina Lake, inclusive of the PanCanadian the project area.

WBFN and the CPDFN advised the Board that there was knowledge of burial sites within close proximity to the shoreline of Christina Lake. They were concerned that these and other sites (e.g., sacred sites and those used for medicinal plants or trails) used by their members would be disturbed by PanCanadian's project, as they had not been identified in the HRIA or EIA.

9.3.3 Views of the Board

The Board heard evidence from all aboriginal interveners that traditional land uses have been and continue to be practised within the vicinity of PanCanadian's application. Intervenors also indicated at the hearing that the proponent had not adequately assessed traditional uses. Based on current regulatory requirements and practices of AENV and Alberta Community Development for applications requiring an EIA and HRIA, the Board accepts that PanCanadian followed reasonable steps in assessing the nature of aboriginal land use and evaluating possible effects of its proposed project. The Board is also aware, as previously noted, that the requirements for consultation with aboriginal people are changing.

Concerns raised by members of aboriginal communities in the Christina Lake area about undisclosed heritage resources, medicinal plants, and sacred sites influence the Board to believe that additional consultation is required to mitigate potential effects on traditional land uses. The Board notes that to incorporate sensitive information pertaining to traditional land uses within project planning may require the direct involvement of community elders and confidentiality agreements.

The Board notes that PanCanadian has stated that there was some flexibility in locating surface facilities and committed to ongoing environmental site assessments with the involvement of aboriginal people. The incorporation of traditional knowledge can only occur through mutual cooperation, which places a burden of responsibility upon the participating aboriginal communities as well as PanCanadian.

The Board's legislative mandate precludes it from decisions directing compensation for land-use impacts. The Board looks to federal and provincial governments with legal responsibility for such matters to take appropriate actions. Nor does the Board make decisions regarding the allocation of aboriginal rights and entitlements that may arise through constitutional law. Given that WBFN currently does not hold status as a First Nation, the Board encourages members of WBFN to participate with local communities and associations and through regional initiatives to identify and resolve issues.

10 ENVIRONMENTAL ISSUES

10.1 Sulphur Emissions and Sulphur Recovery

10.1.1 Views of the Applicant

PanCanadian noted that gas produced with bitumen from the reservoir would be separated, collected, and used in steam generators. PanCanadian stated that this use of produced gas is preferable to flaring. Sulphur dioxide (SO₂) emissions from combustion of produced gas from all three phases of the project are estimated at 5.7 tonnes per day (t/d). SO₂ emissions from the first phase of the project are estimated at 0.24 t/d (0.12 t/d sulphur). PanCanadian used dispersion models to show that maximum ground-level concentrations of SO₂, would be less than 39 per cent of the Alberta Ambient Air Quality Guideline (AAAQG).

PanCanadian stated that its estimates of SO₂ emissions were the highest expected and it committed to sulphur recovery should production data show that sulphur emissions were at levels where the EUB guidelines required it.

10.1.2 Views of the Interveners

AENV's submission noted that the AAAQG would be met and recommended that PanCanadian be required to follow the outcome of the EUB's review of the sulphur recovery guidelines. AENV stated the importance of pollution control for regional sulphur emissions.

OSEC expressed concerns with SO₂ dispersion model predictions and the lack of sulphur recovery facilities. It questioned PanCanadian's assessment of sulphur emissions in the context of local and regional impacts to the environment

10.1.3 Views of the Board

The Board notes that produced gas is collected and combusted in steam generators and that the sulphur emission estimate for Phase 1 is less than 1 t/d. The Board is satisfied that the AAAQG would be met and does not believe sulphur recovery is warranted for Phase 1 of the proposed project. Prior to the start of construction, the Board will require PanCanadian to submit a report that provides an analysis of actual sulphur emissions data, a projection of Phase 2 and 3 emissions, and a discussion of the applicability of sulphur recovery guidelines in effect at that time. The Board notes PanCanadian's commitment to comply with future sulphur recovery guidelines and will require PanCanadian to add sulphur recovery facilities if warranted by project emission rates and applicable sulphur recovery requirements.

10.2 Water Issues

10.2.1 Views of the Applicant

PanCanadian stated that it selected groundwater as its preferred source of boiler feedwater for its operation because it did not believe water from Christina Lake was a reliable source. PanCanadian noted that it might be necessary to restrict withdrawal from the lake in the winter months to avoid impacts on the aquatic life in the Jackfish River that could be caused by reduced

outflow from the lake. It concluded that it was not reasonable to use lake water, as this would require the development of a backup water source. It also noted that a 5 km pipeline would be required to move water to the project area.

PanCanadian stated that initially groundwater would be extracted from one or two 150 m deep wells drilled into an aquifer at the base of the Quaternary. It said it had drilled a potential water source well in Section 9-17-76-6W4M (9-17) to test the quality and quantity of the aquifer water. PanCanadian indicated that extracting water from this zone would not affect overlying aquifers or surface water, as the basal aquifer at the 9-17 location was isolated from overlying sediments. This assessment was based on the results of a pump test and water-level response in a nearby observation well.

PanCanadian said it would require up to 3000 m³/d of water for Phase 1 of the project. Total freshwater requirements for the addition of Phases 2 and 3 would be 2700 m³/d and 5000 m³/d respectively. Water requirements would decrease in Phase 2 due to the implementation of a water-recycling program. PanCanadian pointed out that it was not feasible to construct the water-recycling component of the project until Phase 2 because no produced water quality information was available from the site and the lack of data created a significant risk in the design of treatment facilities. It maintained that building and operating a smaller water treatment facility for Phase 1 and a new facility for Phase 2 was more expensive than building and operating one large plant.

PanCanadian indicated that produced water reuse would not eliminate the need for a source water supply during start-up and that 20 per cent of the total project water requirement would come from fresh water during normal operation. It stated that a first phase as large as proposed was required to determine overall process performance. The scale of the project created the large freshwater requirement in Phase 1, but PanCanadian noted that the lack of water recycling capability would be temporary.

PanCanadian indicated that it would contain surface runoff water from its operational areas for use in its process and would apply to AENV for a diversion permit for this purpose.

PanCanadian indicated that it would dispose of all produced water during Phase 1 and excess produced water during Phases 2 and 3 into the water leg of the McMurray Formation underlying the producing zone. It indicated that returning the water to the McMurray Formation would not impact the resource recovery due to the thickness of the bottom water zone. PanCanadian conducted a short-term disposal test in the basal aquifer at the 4-16-76-6W4M well and did not encounter any major permeability or wellbore damage. PanCanadian concluded that it was likely that the McMurray Formation would be a suitable disposal zone. It said it would require up to four water disposal wells throughout the life of the project.

PanCanadian indicated that it would be taking a number of precautions with respect to management of drilling and production waste due to the sandy soil conditions in its project area, including

- using a remote sump located in Section 8-76-6W4M;

- using freshwater/bentonite mud as the drilling fluid for the surface hole—the fluid would be disposed of using the pump-off method, as per *Guide 50: Drilling Waste Management*; and
- properly containing, storing, and transporting production wastes off site to approved waste facilities—sludge ponds or landfill cells would not be constructed on site.

10.2.2 Views of the Interveners

Several of the interveners expressed concern that PanCanadian's project could impact groundwater and surface water. They expressed concern that PanCanadian had not adequately explained these aspects of the project to the area residents.

10.2.3 Views of the Board

The Board is concerned that Pan Canadian's interpretation of the impact of groundwater withdrawal on overlying aquifers and surface water may not be adequate. The Board notes that PanCanadian's assessment was based on limited information that indicated that the Quaternary stratigraphy underlying the project area is laterally variable.

The Board notes that while the 48-hour pump test provided valuable information on water yield and chemistry of the aquifer, the short duration was inadequate to determine impacts on surface water and overlying aquifers. The Board will require PanCanadian to reassess the impacts of its proposed water withdrawal scheme using additional information as required. The Board notes that AENV will apply monitoring conditions in its permit to divert groundwater and may also place restrictions on groundwater withdrawal should unacceptable reductions in water levels be observed in the overlying strata.

EUB *Informational Letter (IL) 89-5: Water Recycle Guidelines and Water Use Information* requires produced water to be recycled where water volumes exceed 500 000 m³/yr. Produced water recycling is necessary to conserve freshwater resources, increase project energy efficiency, and minimize waste water disposal.

The Board notes that the lack of water-recycling capability is temporary and that PanCanadian requires information gathered during Phase 1 to design its water recycling facility. Therefore, the Board will allow the commencement of Phase 1 without water recycling. Specifically, the Board is prepared to approve the operation without water recycling for a period of two years after the commencement of steam injection. The Board expects that operations during this period would provide the recovery process performance and produced water information necessary to design and implement water recycling. The Board will require PanCanadian to submit a report outlining its plans for implementation of water recycling no later than January 2, 2003.

The Board also believes that freshwater requirements may be reduced by utilizing brackish water and expects PanCanadian to investigate this option further and report its findings to the Board no later than January 2, 2003.

The Board notes PanCanadian's proposal to dispose of produced water in the base of the McMurray Formation and recognizes that this is not ideal, as it is the same formation that bitumen is recovered from. However, the Board accepts that no alternative disposal zone is

available in the area. Furthermore, given the thickness of the basal water zone, the Board would not expect this to have a negative impact on bitumen recovery and is prepared to approve the disposal as proposed. The Board notes that implementation of water recycling would lessen any potential impacts of water disposal in the McMurray.

The Board accepts PanCanadian's plan to use on-site surface runoff water in its process, subject to approval from AENV. The Board agrees that this is the preferable method of drilling and production waste management, given the sandy nature of the surficial material, and agrees with PanCanadian's decision to avoid the use of on-site waste treatment processes.

11 CUMULATIVE EFFECTS OF OIL SANDS DEVELOPMENTS

11.1 Views of the Applicant

PanCanadian stated that in combination with other existing and approved projects, the Christina Lake thermal project would not contribute significant cumulative environmental effects. It aggregated the existing surface disturbance value of 1.2 per cent with an increase of 0.8 per cent from the project for a cumulative land disturbance of 2 per cent within the regional study area. Since forest companies were not operating in the regional study area, cumulative effects of proposed projects upon forest resources in the area were also considered negligible. PanCanadian also stated that Alberta-Pacific Forest Industries Inc. (AL-PAC), as holder of the Forest Management Agreement, had no current plans that would be affected by the project.

PanCanadian submitted supplemental air quality data at the hearing to address stakeholder issues of cumulative air quality resulting from oil sands operations north of Fort McMurray. Dispersion modelling of SO₂ and nitrogen oxides (NO_x) emission data was used to predict ambient air quality within the regional study area. Results of the analysis showed that even with the emissions contributed from other oil sands operations north of Fort McMurray, SO₂ and NO_x concentrations of the project would comply with provincial air quality guidelines. Compared to existing regional emissions, the project would contribute in each case less than 2 per cent of total SO₂ and NO_x concentrations with negligible and reversible impacts.

In response to OSEC's request for a moratorium of in situ developments in the boreal forest, PanCanadian stated that ample provisions and regulations were in place through the Alberta government to manage competing land uses and cumulative effects. It did not support the proposal for a boreal forest moratorium.

PanCanadian recognized that a cooperative approach was required to fully address regional environmental issues. It committed to participate in RSDS, WBEA, CEEMP, Terrestrial Environmental Effects Monitoring (TEEM), and the NO_x/SO₂ Emissions Management Working Group (NO_x/SO₂ EMWG) to determine needs for ongoing research, monitoring, and mitigations.

11.2 Views of the Interveners

Interveners from the community of Conklin directed written concerns to the EUB about PanCanadian's project and regional effects upon fish, wildlife, vegetation, and consumption of

traditional foods. Interveners from the Chard community stated their concerns about industrial use of surface waters affecting fish and wildlife.

OSEC requested that air emissions such as SO₂ and NO_x from oil sands operations north of Fort McMurray be modelled in the PanCanadian EIA to estimate cumulative effects of those emissions. These had not been provided in the EIA document, and OSEC believed that in combination with PanCanadian emissions they would result in undesirable cumulative effects on local air quality. OSEC believed that the effects of acid deposition and ozone generation were other regional air quality issues not adequately addressed in the PanCanadian EIA.

OSEC also submitted evidence to demonstrate that substantial land disturbances had occurred in Alberta's northern boreal forest. One of the few remaining areas of low disturbance levels in the boreal forest was shown from map information to correspond with the known area of bitumen reserves and future in situ development. Consequently, OSEC requested the Board to implement a moratorium on further in situ development projects until such time as further baseline and assessment studies for cumulative effects within the boreal forest were completed.

In its submission to the EUB, AENV stated that cumulative effects from the PanCanadian project upon forest productivity would be negligible. Cumulative effects upon wildlife habitat would be managed through the mitigative measures that AENV would recommend during the EPEA licensing process. AENV believed that cumulative effects of in situ projects such as PanCanadian's were manageable within the RSDS using partnerships among government, industry, and stakeholders.

It was the position of AENV that the proposed project would not impact fish populations. Sufficient groundwater supplies existed in the project and regional study areas so that surface water withdrawals for the project were not required. Nevertheless, monitoring of groundwater aquifers in advance of project start-up was recommended.

AENV expected PanCanadian to contribute to regional air quality monitoring and management systems. AENV also recommended reductions of NO_x within the regional airshed; since NO_x is a precursor of ozone, these measures would also reduce ozone formation. Use of low NO_x burners in PanCanadian's steam boilers was recommended for pollution control.

11.3 Views of the Board

The Board recognizes that PanCanadian was required to prepare an EIA and a cumulative effects assessment as part of its application for the Christina Lake project. PanCanadian compiled a cumulative effects assessment within a defined regional study area largely based on incremental effects of its three-phase project, since there had been no other "reasonably foreseeable" projects disclosed. The Board considers PanCanadian's approach reasonable, given the low level of industrial activity in the region. However, the Board understands that with an increased level of development and emergence of techniques for assessment of cumulative effects, more rigorous analyses of cumulative environmental effects will likely be required of subsequent proponents. The Christina Lake project is located within the regional area mandated by the oil sands RSDS. The focus of RSDS, to balance resource development and environmental protection by means of adaptive management techniques, is an effective and appropriate process for dealing with cumulative effects of in situ oil sands developments. In view of RSDS and other

multistakeholder efforts to manage cumulative effects, the Board does not support OSEC's request for a moratorium of in situ oil sands developments in the boreal forest region of Alberta at this time.

In recent decisions involving surface mineable oil sands and processing facilities the Board has acknowledged some uncertainty regarding the level of regional cumulative effects and has expressed the need to address this uncertainty. This view is also warranted for in situ oil sands development in the boreal forest region. Regional multistakeholder initiatives, such as CEEMP, RSDS, and WBEA, and the implementation of environmental working groups and committees within those organizations have contributed marked progress in dealing with regional issues. By its direct participation and monitoring role in RSDS and CEEMP, the Board endorses the work of these organizations to establish regional guidelines and environmental limits and the mechanisms to manage them.

The Board believes that although the project-specific impacts of the Christina Lake project are manageable, some uncertainty remains concerning environmental capacities (e.g., acidifying emissions, wildlife, land-use impacts) at the regional level, as noted by interveners in the PanCanadian application and preceding oil sands applications. Should it become evident that regional environmental issues are not being addressed effectively, the Board is confident that AENV will ensure that appropriate steps are taken to revise approvals. Similarly, the Board has the ability to review and modify the situation or its own approvals for like reasons.

For CEEMP, RSDS, TEEM, WBEA, and NO_x/SO₂ EMWG to successfully meet their goals within an adequate time frame will require resources and commitment from all involved parties. The Board commends PanCanadian for its commitments to support regional environmental management initiatives. The Board expects PanCanadian to participate fully in these programs and abide by their outcomes.

12 DECISION REQUIREMENTS AND CONDITIONS

After carefully considering all of the evidence, the Board determines that Application No. 1023589 is in the public interest and is prepared, subject to the authorization of the Lieutenant Governor in Council, to approve the application. The Board believes that there are minimal operational and environmental risks associated with this development. These risks are manageable, and the project can proceed in an acceptable manner. The approval is subject to the following requirements and conditions:

- 1) PanCanadian must implement produced water reuse for any expansion plans for this project beyond Phase 1. If Phase 2 or 3 is not implemented, water-recycling capability must be installed for Phase 1. The Board requires PanCanadian to submit a report by January 2, 2003, or such other dates the Board may stipulate, outlining its plans for the implementation of water recycling.
- 2) PanCanadian is required to investigate the use of brackish water as an alternative to fresh water and submit a report on the feasibility of this to the Board by January 2, 2003.

- 3) PanCanadian is required to reassess the impacts of its groundwater withdrawals using available stratigraphic information and report its findings to the Board by January 2, 2003.
- 4) PanCanadian is required to initiate and facilitate an advisory group of community leaders from Conklin, Janvier, and Chard. The Board recommends that the advisory group conduct follow-up consultation necessary to address community issues of training, education, economic development, and environmental effects of the project.
- 5) The Board expects PanCanadian to address regional environmental issues arising from its project through active participation in CEEMP, WBEA, TEEM, RSDS and NO_x/SO₂ EMWG.
- 6) Prior to the construction of Phases 2 and 3 of the proposed project, PanCanadian is required to report to the Board its assessments of sulphur emissions based on operational findings and its plans to comply with EUB guidelines in effect at that time.

DATED at Calgary, Alberta, on February 10, 2000.

(Original signed by)

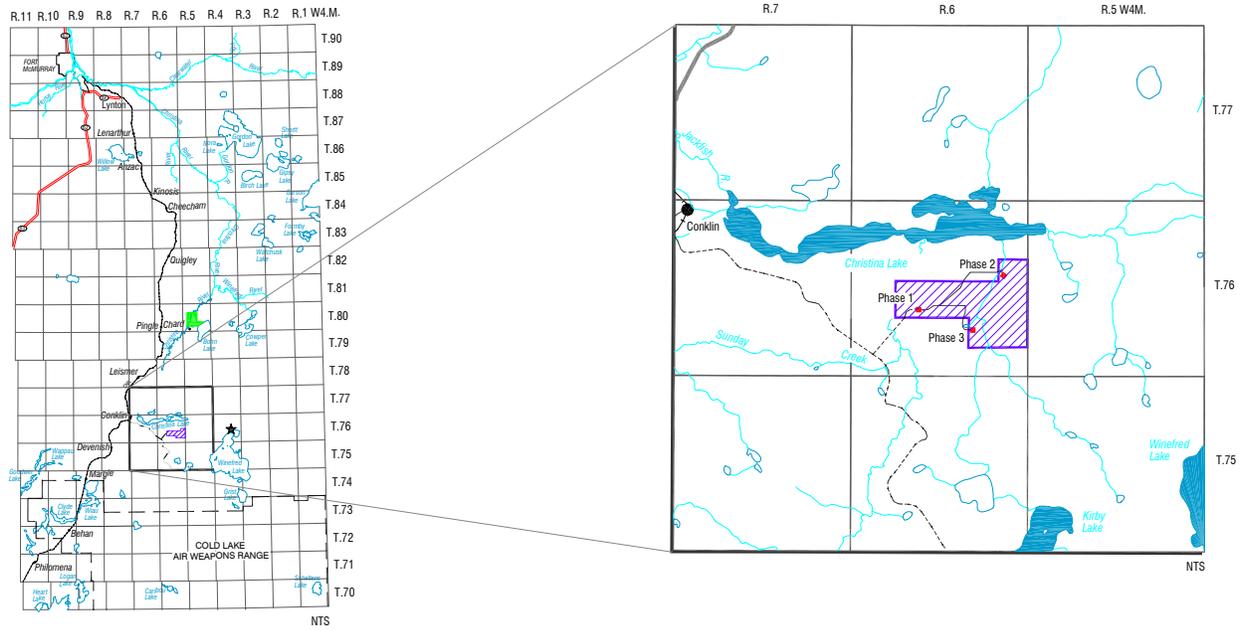
T. McGee
Board Member

(Original signed by)

R. N. Houlihan, Ph.D., P.Eng.
Acting Board Member

(Original signed by)

C. A. Langlo, P.Geol.
Acting Board Member



LEGEND

- Janvier reserve
- Christina Lake project area Phases 1, 2, and 3
- Cold Lake Air Weapons Range boundary
- Existing access road
- Proposed plant locations
- North Bay reserve (Winefred Lake)

Figure 1. Christina Lake Thermal Project
 Application No. 1023589
 PanCanadian Resources

Decision 2000-7