Decision **2001-111**

EPCOR GENERATION INC. AND EPCOR POWER DEVELOPMENT CORPORATION

490 - MW Genesee Power Plant Expansion
Application No. 2001173

December 2001

Alberta Energy and Utilities Board

ALBERTA ENERGY AND UTILITIES BOARD
Decision 2001-111: EPCOR Generation Inc. and
EPCOR Power Development Corporation
490 - MW Coal - Fired Power Plant
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ALBERTA ENERGY AND UTILITIES BOARD

Calgary, Alberta

EPCOR GENERATION INC. &
EPCOR POWER DEVELOPMENT CORPORATION
EXPANSION OF GENESEE POWER PLANT

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1 THE APPLICATION AND HEARING

1.1 The Application

EPCOR Generation Inc. and EPCOR Power Development Corporation (EPCOR) have applied to the Alberta Energy and Utilities Board (EUB) and Alberta Environment (AENV) for approval to construct and operate a 490-megawatt (MW) expansion (GP3) at its existing coal-fired Genesee power plant, which is located some 80 km west of Edmonton, in Section 25, Township 50, Range 3, West of the 5th Meridian, in Leduc County, as shown in Figure 1.

EPCOR prepared and submitted Application No. 2001173 to the EUB under section 9 of the *Hydro and Electric Energy Act* (HEE Act) to construct and operate the proposed expansion.

1.2 The Hearing and the Participants

The Board issued a Notice of Prehearing Meeting and Hearing for EPCOR's application to construct GP3 on July 9, 2001. In response to the Notice a number of interveners registered submissions to the application. A list of parties who appeared at the hearing is shown in Appendix A**.**

The Board held a prehearing meeting in Edmonton on August 10, 2001, before M. N. McCrank, Q.C., (Presiding Member), R. G. Lock, P. Eng., (Board Member) and G. J. Miller (Board Member). A number of matters were reviewed including the issues to be determined at the hearing, the nature of transmission evidence to be received, the identification of local interveners, and the request from interveners for an adjournment of the commencement of the hearing. The Board's Memorandum of Decision, issued on August 17, 2001, is attached to this report as Appendix B.

The EUB considered the application at a public hearing held from September 18 to September 25, 2001. The application was heard by the same Panel Members.

Final argument and reply was heard on September 25, 2001. The Board considers that the evidentiary portion of the application was concluded on that date.

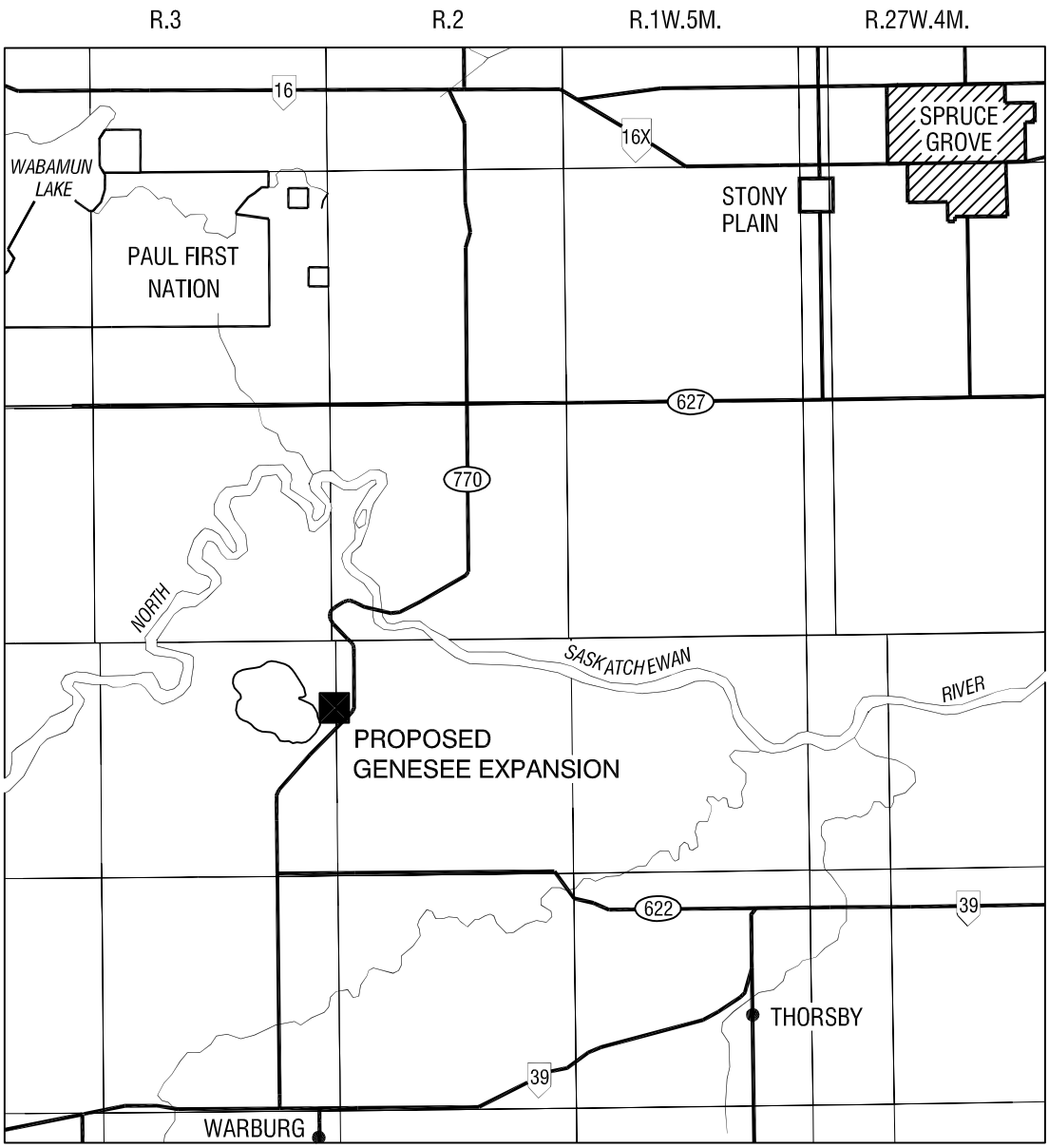

Figure 1 Genesee Area

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EPCOR POWER DEVELOPMENT
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EUB

1.3 Existing Plant

The existing Genesee power plant consists of two coal-fired thermal electric generating units, ancillary support facilities and a cooling pond. The plant was first approved by the Energy Resources Conservation Board in March 1981. The first unit began commercial operation in October 1989 and the second came on stream in October 1994; the delay was a result of lower than anticipated demand for additional generating capacity.

Both units use a single stack that is 121 metres (m) high. Each unit is equipped with a multi-stage steam turbine, a pulverized coal fired sub-critical pressure boiler, and an electrical generator with a rated output of 410 MW gross at a voltage of 20.5 kV transformed to 240 kV. Each boiler weighs more than 4,000 tonnes and stands 65 m. The Genesee units feed their output into the existing Keephills-Genesee-Ellerslie transmission loop that is designed and built to 500-kV standards, but currently operated at 240-kV. The power plant annually produces about 6300 GWh.

The cooling pond, which provides for steam condenser cooling, covers 735 hectares, and contains 34 million m^3 of water. The cooling pond is sized to provide cooling water for up to four 400 MW units. The artificial cooling pond was created by constructing a dyke across Genesee Creek and adjacent low lands, and then flooding the entire area. The water level is maintained primarily by pumping water from the NSR and supplemented with local runoff. The cooling water is pumped from the pond, through the condensers, and returned to the pond in an open loop cycle.

The power plant uses about 3.6 million tonnes of coal annually, which is supplied from the adjacent Genesee Mine that is a joint venture of EPCOR and Fording Coal Limited (Fording). The surface mine is operated using a heavy equipment fleet including draglines, loaders, trucks, and bulldozers. Coal seams are exposed by two draglines utilizing 50.5 m^3 and 81 m^3 buckets.

Coal leases of strategic significance in the Genesee Mine permit area are owned by EPCOR and Fording. EPCOR owns all the surface rights within the current ten year mine licence boundary and almost all the surface rights within the mine permit area.

Lands that have not already been purchased by EPCOR are either under negotiation to be purchased or will be purchased as the mining operations progress toward the properties. Rights are purchased in accordance with the land acquisition policies that have been in place since 1978.

1.4 Project Summary

The GP3 project would generate 450 MW (net) of base load power into the Alberta Interconnected Electric System (AIES). GP3 would use supercritical pulverized coal combustion technology. The supercritical boiler would result in GP3 being greater than 10 % more efficient than the existing Genesee units, and other coal combustion power plants in Alberta. The higher efficiency supercritical cycle offers one of the viable options to reducing carbon dioxide (CO_2) emissions in pulverized coal combustion power plants on a unit of production basis. The supercritical boiler burns less coal to produce each kilowatt of electricity. Burning less coal translates to lower air emissions such as CO_2, sulphur dioxide (SO_2), nitrogen oxides (NO_x), and trace metal pollutants such as mercury.

Other main features of the GP3 project are:

- a dry flue gas desulphurization (FGD) unit for removing SO_2 from flue gas;
- low NO_x burners and combustion techniques;
- a high-efficiency dust-collection system, using fabric filter baghouse to reduce particulate and associated mercury emissions;
- a 121-metre stack for flue gas exhaust;
- condensing and cooling water equipment designed to minimize back pressure; and
- a generator transformer.

There are sufficient mineable coal reserves in the current approved mine permit development area to supply both the existing two units and GP3 for the economic life of the project. Estimated coal reserves in the Wetaskiwin Coal Field exceed 370 million tonnes. The Genesee Coal Deposit is contained in the Wetaskiwin Coal Field. Currently, coal is mined at a rate of 3.4 to 3.6 million tonnes per year. GP3 would require approximately 1.8 million tonnes annually. The mine plan would be adjusted to reflect the increased rate of coal removal. The existing large-scale mining equipment and mobile fleet would be supplemented to handle the increased volumes of coal.

The GP3 project is scheduled to begin production of electricity during the 2004/2005 winter peak period. The project, if approved, would create approximately 750 person years of employment during the construction period.

1.5 Review and Participation by Federal Government Agencies

Environment Canada, the Department of Fisheries and Oceans, and the Canadian Environmental Assessment Agency (the Federal Agencies) participated in the review of the regulatory applications for the GP3 project.

The form of the review included participation with the Provincial regulatory review teams in identifying and requesting supplementary information requirements. The Federal Agencies also participated at the EUB hearings by filing submissions with the EUB, conducting cross-examination of other hearing participants, sitting a Panel of experts at the hearing who gave expert testimony on issues directly related to the matters under consideration by the EUB, and by making recommendations on certain issues of concern to the Federal Agencies for the Board's consideration.

2 ROLE AND AUTHORITY OF THE BOARD REGARDING APPLICATIONS FOR ELECTRIC GENERATION PLANTS

With the enactment of the *Electric Utilities Act*[1] and amendments to the HEE Act, the Legislature expressed its clear intention that electric generation in Alberta is to be developed through the mechanism of a competitive, deregulated electric generation market and not through the former regulatory regime which required the Board to determine the need and cost of such

[1] SA 1995, Chap. E. -5.5, with amendments thereto

facilities as well as the price of electricity. The responsibility of the Board under section 9 and 2.1 of the HEE Act and section 2.1 of the *Energy Resources Conservation Act*[2] is to consider whether the construction and operation of a proposed power plant is in the public interest, taking into account a number of factors including the social, environmental and economic impacts of the project, the economic, orderly, and efficient development of electric generation, and the creation of an electric generation sector guided by market forces.

The issue of public health and safety is a fundamental component of the public interest when reviewing power plant applications. An applicant must satisfy the Board that the construction and operation of its electric generation plant will not jeopardize public health and safety or the Board will not approve its project.

The determination of whether a project is in the public interest requires the Board to assess and balance the negative and beneficial impacts of the specific project before it. Benefits to the public as well as negative impacts on the public must be acknowledged in this analysis. The existence of regulatory standards and guidelines and a proponent's adherence to these standards are important elements in deciding whether potential adverse impacts are acceptable. Where such thresholds do not exist, the Board must be satisfied that reasonable mitigative measures are in place to address the impacts. In many cases, the Board may also approve an application subject to specific conditions that are designed to enhance the effectiveness of mitigative plans. The conditions become an essential part of the approval, and breach of them may result in suspension or rescission of the approval.

In the Board's view, the public interest will be largely met if applications are shown to be in compliance with existing provincial health, environmental, and other regulatory standards in addition to the public benefits outweighing negative impacts.

Parties in the present proceeding have argued that the Board must consider whether the proposed GP3 power plant is needed by the province. They contend that the electric energy produced by GP3 will not be required by the citizens of Alberta when it comes on stream and that the electricity is intended for export markets. Such a scenario, they submit, cannot be in the public interest because other jurisdictions will enjoy the power but Albertans will be left with the unacceptable impacts of the construction and operation of the plant.

It is the Board's view that this matter is essentially one of need and that it is not a factor to be considered in an application under section 9 of the HEE Act, although, the impacts on public health, safety and the environment created by an export plant would, of course, be of central relevance. The legislative changes referred to above, replaced the Board's authority to determine future demand for electricity with the mechanism of a competitive electric generation market. The Board's position on the relevance of the need for a power plant is further explained in Decision 2001-33 (EPCOR Rossdale) and Decision 2001- 101 (AES).

The Board received submissions from participants concerning the necessity of reviewing provincial transmission system cost impacts as part of the section 9 HEE Act application. Parties maintained that in order to ensure the economic, orderly, and efficient development and

[2] RSA 1980, Chap. E-ll, with amendments thereto

operation of the generation and transmission of electric energy under section 2(a) of the HEE Act, the Board must take account of evidence regarding potential impacts such as congestion management and system wide costs on the AIES as an integral part of the power plant proceeding. These interveners argued that the Board must be able to appreciate the economic impacts to the AIES that may be triggered by the approval of a new plant in order to make a decision that meets the public interest.

The Board acknowledges the importance of the potential economic impacts on the AIES that may be triggered by the approval of a power plant. However, the Board does not accept that this issue must be considered as part of an application to approve the construction and operation of a power plant. Approval of a power plant does not automatically result in an approval to connect the plant to the transmission system. A separate application under section 17 of the HEE Act is required. All interested stakeholders will be afforded an opportunity to advance their positions on the principles which should govern the terms of access to the AIES when transmission congestion is triggered as a result of new plants being commissioned. This will take place in a Board proceeding presently scheduled for the spring of 2002. The outcome of this review, including the framework for the potential allocation of costs resulting from the impact of a new plant's load on the AIES, may or may not be commercially acceptable to a successful approval holder. This is a risk borne by the approval holder.

3 ISSUES

The Board views the issues related to this application to be:

- Human Health
- Environmental Effects of the Proposed Power Plant:
  - Air Quality
  - Surface Water
  - Fish and Other Aquatic Biota
  - Ground Water
  - Terrain, Soils and Reclamation
  - Terrestrial and Wetland Vegetation
  - Wildlife
  - Noise
  - Traditional Land Use
- Socio Economic Issues, including Public Consultation and Local and Landowner Issues
- Technology Selection and Environmental Performance of the Proposed Power Plant
- Impact on Area Transmission System and Upgrades

4 HUMAN HEALTH

4.1 Views of the Applicant

EPCOR fulfilled the terms of reference agreed upon by commissioning a detailed human health risk assessment (HHRA). Individuals exposed to chemicals of potential concern (COPC), within defined local and regional study areas (i.e. 13 x 18 km area surrounding the Genesee power plant), were included in the study. EPCOR believed that the HHRA conducted was detailed,

comprehensive, conservative and complete. EPCOR supported this view by stating that the study:

- involved both acute and chronic exposure scenarios and employed assessment concepts and protocols that are current, proven, and accepted by federal and provincial regulatory jurisdictions;
- evaluated 21 COPCs , SO_2, NO_x, Particulate Matter (PM), and 18 additional chemical compounds (metal oxides, volatile organics, CO, HCl). The COPC list was established by systematically applying a screening protocol to the suite of chemicals identified in existing power plant stack and fugitive emissions;
- considered three separate categories of potential receptors exposed through inhalation, ingestion, consumption, and dermal contact;
- examined three emission scenarios arising from development: Genesee (existing) alone, all existing regional power generation facilities, and all future regional power generation facilities;
- employed site-specific input data to the HHRA that were current (i.e. results from commissioned soil sampling and analyses, dug-out water sampling and analyses), historical measurements available from soil and groundwater monitoring, and predictive results of the emission dispersion modelling found in the air quality section of the Environmental Impact Assessment (EIA); and
- embodied a high degree of conservatism in risk assessment results. In addition to the conventional use of uncertainty factors, conservatism was further enhanced in this HHRA through the use of "worst case scenario" emission data used in the modelling and analyses.

From the HHRA, EPCOR concluded that except for SO_2, Mercury (Hg) and Arsenic (As), all other chemicals of concern were below the critical concentration ratio (CR) or exposure ratio (ER), determined by comparing estimated exposure doses to recognized health-based exposure limits. According to the protocol followed by EPCOR, CR's or ER's less than 1.0 indicated that no health risks were predicted, and further analysis of exposure or risk was not required. Where CR's or ER's exceeded 1.0, analyses for possible health risks were necessary. Slight exceedance of 1.0 was not necessarily indicative of health effects due to the conservative nature of the risk assessment process.

Acute 1 hour and 24 hour CR's for SO_2 based on maximum 1 hour and 24 hour predicted air concentrations associated with development scenarios 2 (cumulative baseline) were estimated to be 1.42 and 1.93 respectively. From data reported by their consultant on the maximum SO_2 concentrations attributable to the existing Genesee power plant, EPCOR concluded that the existing plant was contributing negligibly to the maximum regional SO_2 concentrations. Furthermore, EPCOR reasoned that maximum concentrations are only expected to occur one hour in every 5 years, and much lower concentrations would be expected the majority of the time. EPCOR therefore concluded that no acute health risks were associated with SO_2 concentrations attributable to existing Genesee emissions.

Acute 1 hour and 24 hour CR's for SO_2, based on maximum 1 hour and 24 hour air concentrations associated with development scenario 4 (future cumulative baseline), were predicted to be 1.42 and 1.93 respectively also. Based on the data regarding maximum SO_2

attributable to future Genesee emissions with cumulative effects, EPCOR stated that the Genesee facility would contribute negligibly to the maximum regional SO_2 concentrations. EPCOR conducted further analysis related to the predicted CR exceedance, examining data predicted on the maximum hourly and daily SO_2 concentrations at several "sensitive receptor" locations (e.g. existing residences, recreational areas, communities in the study region). All acute CRs based on the maximum 1 hour and 24 hour air concentrations at sensitive receptor locations were below the critical CR value of 1.0.

EPCOR reported baseline carcinogenic Arsenic ER values for all four development scenarios considered ranging from 97 to 100. The primary exposure pathways contributing to these estimated risks were through consumption of local dairy milk (32%) and fish (60%). EPCOR concluded that power plants contributed very little to this baseline risk (i.e., ER=1.4, scenario 4).

Following a similar analysis for predicted baseline non-carcinogenic Arsenic ER values, EPCOR concluded that the power plants contributed very little to the baseline risk predicted. For development scenarios 1, 2, 3 and 4, the baseline Arsenic ER values ranged from 6.3 to 7.6. Consumption of local dairy milk (33%) and fish (59%) accounted for the majority of the risk. EPCOR estimated that a maximum ER of 0.3 for scenario 4 was directly attributed to power plants.

EPCOR reported that the baseline methyl mercury ER value for development scenarios 1-4 of 6.7 exceeded the critical ER value of 1.0. The latter results were 100% attributable to chemical exposure from eating fish. EPCOR stated neither existing nor future mercury deposition from power plant emissions into the Genesee cooling pond and the North Saskatchewan River (NSR), contribute to baseline methyl mercury concentrations in the fish. Consequently, EPCOR concluded that the contribution of power plants alone to the baseline ER value for methyl mercury was essentially zero. Elevated background or baseline ER values for methyl mercury were not considered surprising since advisories are in effect for both the NSR and the Genesee cooling pond.

With regard to potential mercury deposition in the regional study area, EPCOR reported the predicted hourly and annual average ground level concentrations of mercury that might occur as a result of cumulative emissions from generating stations in the Wabamun Lake – Genesee area, were two to three orders of magnitude less than effects screening levels established by the Texas National Resources Conservation Commission (TNRCC). The TNRCC screening levels are based on data concerning health effects, odour nuisance potential, phytotoxic effects and corrosion effects. EPCOR also tabled a study commissioned to assess the impact and deposition of mercury at locations surrounding the area of the existing Genesee plant. Based on data obtained employing moss traps, the Goodarzi Study (1996) concluded deposition and impact were very low in comparison to average concentrations in area soil. EPCOR cited commitments to monitor mercury emissions, assess mercury deposition, and measure sediment background mercury levels as further evidence of specific efforts to address human health concerns regarding mercury releases to the environment.

In considering the results of the HHRA and supplementary work completed, EPCOR stated, with confidence, that neither short-term nor long-term health risks were predicted with the construction and operation of GP3.

4.2 Views of the Interveners

Clean Energy Coalition and Capital Health Authority
In assessing potential impact of power plant emissions to human health, the Clean Energy Coalition (CEC) believed the modelling undertaken in the EIA failed to consider a sufficiently large study area. EPCOR's air dispersion expert, under cross-examination, testified that 80% of the mass of emissions from the plant would be deposited outside of the study area. CEC stated that neither the air dispersion modelling nor HHRA incorporated important secondary pollutants such as PM_{10} (a toxic compound under the *Canadian Environmental Protection Act* [CEPA]), and ground-level ozone (a chemical currently under evaluation under the Canada Wide Standards process). The CEC expert witness on atmospheric chemistry stated these chemicals are created largely outside the defined EIA regional study area. Ozone and $PM_{2.5}$ (i.e. subset of PM_{10}) are reported in the scientific literature as having demonstrable deleterious health effects. Both the Government of Canada and the Capital Health Authority (CHA) concurred with CEC regarding the need to increase the size of regional study area. Both the CEC and CHA provided justification, for an expansion of the study region to include neighboring populated centres and areas (e.g. County of Leduc, Stony Plain, Spruce Grove, Edmonton). CEC stated that the "highest impact" with regard to emissions should consider not only the ground level concentrations of chemicals, but the number of potentially affected individuals or receptors as well.

CEC expressed concern regarding the quality of input data used for predictive modeling. CEC noted that in the EIA, air quality modelling information was passed on to other consultant teams to be used in their work. CEC believed the inability to access and employ current and actual site-specific data resulted in a very weak cumulative effects assessment with limited ability to assess the potential impact of expanded operations in the region. The CHA expressed similar concerns, noting that conclusions and outcomes of the HHRA were highly dependent on the quality of the input data.

The CHA recommended to the Board that EPCOR, in conjunction with other air emission generators, continuously monitor $PM_{2.5}$ and PM_{10} and other relevant air toxics in the area, and that the data be made available to all parties upon request.

Mewassin
The Mewassin Community Action Council (Mewassin) expressed a significant concern about the level of ill health in their community. Mewassin provided a detailed anecdotal report of health concerns including malignancies, respiratory conditions (asthma, allergies), neurological disorders (multiple sclerosis), and cardiovascular diseases. Mewassin stated that it had discussed its health concerns with government and university health experts. Mewassin also referred to health statistics presented in the Westview Regional Health Authority (WRHA) 2000-2001 annual report as additional evidence supporting their community health concerns. Under cross-examination, Alberta Health and Wellness (AHW) reviewed the statistical conclusions presented

in this report. The WRHA reported a significantly higher mortality rate for all cancers than the provincial average for males, and for both males and females combined. Mortality rates for all cancers in females in WRHA relative to the province were essentially the same. In comparing similar mortality rates in Regional Health Authorities (RHAs) surrounding WRHA, the WRHA and Aspen Health Authority had the same rate. Crossroads and Capital City RHAs had similar rates but different from WRHA and Aspen RHA. Mewassin noted that the EIA conducted a baseline study on the health of fish, but failed to consider local people in this regard. Mewassin stated that no one of authority asked whether there was a local health problem. Mewassin advocated assessments that included consideration of air quality, pollution levels, animal, and human health.

Mewassin questioned the concept of toxicity thresholds and believed current environmental standards (e.g. ambient air quality, water quality criteria) failed to reflect impact on human health from a continuum of exposures. Mewassin believed a health assessment should encompass psychological, social and physical perspectives. Mewassin questioned EPCOR's view that strict compliance to existing air emission criteria fully protected human health.

The Paul First Nation

The Paul First Nation (PFN) expressed a long-standing and deep concern for power plant impacts on their health and on their natural environment. The PFN reported that no comprehensive health assessment by any level of government had ever been conducted for those reserve members living in proximity to the power plants during over 20 years of operation. The PFN believed the EIA was fundamentally flawed, failing to incorporate the PFN perspective, and traditional values such as use of medicinal plants. Furthermore, the HHRA failed to employ any site-specific data relevant to the PFN. Dietary patterns, consumption preferences for fish and game, general health status, soil, water and air quality, and quality of fruits and berries were not examined as a prerequisite to the HHRA modelling conducted. The highest average 24-hour acute exposures and the annual chronic exposures occurred within the Lake Wabamun area just west of the PFN reserve or at Keephills on the south edge of the PFN reserve. The PFN (Chief and Council) requested that the Board deny or defer EPCOR's GP3 application, until a health study could be conducted on the PFN members, and a traditional land use study could be completed.

The Government of Canada

The Government of Canada expressed particular concern for potential adverse impacts on human health and ecological receptors related to power plant emissions (e.g. mercury) and the formation of secondary pollutants (such as $PM_{2.5}$ and ozone). It stated that for $PM_{2.5}$ and ozone, a threshold concentration which adversely affects human health is not recognized. The Government of Canada also stated the area in Alberta most likely to have a regional mercury problem is the Wabamun Lake - Genesee - Edmonton area. It noted that a significant fraction of the reactive gaseous mercury emitted in the province would be deposited within the province, providing direct input to the local ecosystem. The Government of Canada estimated that in Alberta, nearly 80% of the total provincial mercury emissions are from coal-fired power plants. The Government of Canada advocated preventative planning measures to reduce mercury emissions.

Government of Alberta
AHW noted an exceedance of the critical exposure consumption quidelines. AHW reported that Environment Canada had conducted a health assessment for mercury, resulting in the fish consumption advisory for the NSR. AHW expressed uncertainty as to the source or sources of the Mercury.

AHW committed to table the health concerns presented at the hearing with its own provincial department. Health concerns would be assessed and prioritized by AHW. In any health assessment involving the PFN, AHW said Health Canada would have to extend an invitation to the provincial department to assist them with the assessment planned. AHW suggested the "Alberta Oil Sands Community Exposure and Health Effects Assessment Program" (2000) might serve as an example of how the PFN could take charge of their own health assessment, while participating in a large provincial study.

4.3 Views of the Board

In examining potential human health effects, the Board believes that the comprehensive and detailed HHRA conducted by EPCOR was an appropriate and valid. This approach, based on available toxicological data, exposure information and accepted exposure models, allowed predictions to be developed regarding risk to human health as a result of chemical emissions.

Given the degree of conservatism employed in the HHRA, the Board accepts the results of the HHRA conducted and the conclusion that neither short-term nor long-term health risks are predicted with the construction and operation of GP3.

The Board agrees with CEC and CHA that the results of the HHRA are dependent on quality of data used in predictive modeling. The Board understands that archived soil and groundwater monitoring data and some recent site-specific air, soil and surface water quality measurements were employed in the HHRA. As a result, the Board believes a level of uncertainty exists in the estimated concentrations of COPC in consumed foods (e.g. vegetables and fruits, cereal grains, dairy products, meat from domesticated livestock) and regional drinking water. Analyses of representative samples of consumed foods would help verify HHRA model predictions. Additional direct measurements of COPC levels in representative samples of regional study area soil, forage, as well as surface water and groundwater would improve calculated COPC levels in consumed foods.

The Board believes that in order to improve the confidence and validity of HHRA results, the development of an up-to-date, comprehensive regional baseline database and the implementation of community exposure assessment study is needed.

A regional baseline database containing concentrations of COPC in key media (air, soil, surface water, groundwater and receptors (plants, animals, aquatic organisms) was not available. The Board directs EPCOR as a condition of approval to address this deficiency promptly to the satisfaction of AENV, and singularly or in concert with other regional industrial partners and stakeholders. The Board urges early discussions with industrial partners in this regard and the prompt establishment of an action group within or outside of WCAS to address this work. A

necessary first step is a detailed evaluation, screening and consolidation of existing archived site-specific data appropriate to meet this objective.

Considering the extent of existing and planned regional industrial development in the Wabamun Lake/Genesee area and the submissions by the PFN and local residents groups urging a regional health assessment, the Board agrees that the work requested is warranted. Currently, baseline health assessment data is unavailable, hampering efforts to measure any future incremental health effects. In addressing this issue, the Board acknowledges that primary investigative and decision-making responsibilities reside with the respective health agencies. The Board strongly supports the health agencies and recommends prompt planning, action and leadership by these health bodies to validate the need for and to develop a regional health assessment strategy that will include all valid stakeholders. The Board recommends AHW and Health Canada consider this region as a priority for health assessment. The prompt implementation of a community exposure assessment study to verify the HHRA predictions is an appropriate first step. The Board recommends EPCOR to fully support and participate in a regional health exposure or assessment study should one be implemented by AHW or Health Canada.

The Board notes that both the need and the opportunity exists to lead and to support focused research that will help resolve some of human health issues related to emissions from coal fired power generation stations in the Wabamun Lake/Genesee area. The Board believes EPCOR is uniquely situated in this regard with available resources, historical information, and an insight into priority research needs. From a health and environment perspective, the latter may include topics such as: "exposure and health effects to secondary particulates mixtures," "exposure and health effects to ground level ozone," source(s), and fate (ecological and human health) consequences of mercury and arsenic levels in the Wabamun Lake – Genesee area. The Board recommends that EPCOR act in partnership with its regional industrial partners and assume a leadership role by identifying priority health research needs, by organizing and assembling necessary resources and by implementing, managing and communicating to the public the results of such research.

5 ENVIRONMENTAL EFFECTS OF THE PROPOSED POWER PLANT

5.1 Air Quality

5.1.1 Views of the Applicant

The proposed expansion would consist of a supercritical boiler equipped with low NO_x burners, a flue gas desulphurization (FGD) dry lime scrubber unit to reduce emissions of SO_2, and a fabric filter baghouse to reduce PM.

EPCOR selected study areas which included the regions of maximum predicted impacts related to air emissions, potential acid input (PAI), and fog occurrences associated with the proposed expansion. Although these study areas were intended to capture maximum concentration predictions, EPCOR's dispersion modelling estimated that about 80% of the emissions of criteria pollutants would fall outside the study area.

The assessment compared the predicted air quality as a result of industrial and vehicle emissions with the Alberta Ambient Air Quality Guidelines (AAAQG) as stated by AENV. The predicted

air pollutants were grouped into two categories criteria pollutants and toxic pollutants. Criteria pollutants were defined as those that are governed by nation-wide ambient air quality objectives; these include SO_2, NO_x, Total Suspended Particulate (TSP), CO, and ozone. Toxic pollutants included substances such as metallic oxides, volatile organic compounds (VOC), polycylic aromatic hydrocarbons (PAH), and chemical compounds that are not governed by nation-wide objectives.

EPCOR testified that fugitive emissions, such as road dust and fly ash from the ash loading operations, were not included in the assessment. EPCOR believed that if dust sources were controlled, they would not be a concern. If not controlled, then these would need to be modelled.

EPCOR made a voluntary commitment to maintain SO_2 emissions within 78 ng/J over a 720-hour rolling average. This would be equivalent to meeting the standard of the United States Environmental Protection Agency (US EPA), and would surpass the new Alberta requirement of 180 ng/J. EPCOR wished to maintain this as a voluntary commitment rather than a condition of approval. It proposed to report the performance and believed that this would provide as much or more incentive than a regulatory requirement. This reduction would be achieved by plant modification such as a larger FGD unit and by some operating modifications, such as utilizing more lime.

In addition to meeting the US EPA emission standard for SO_2, EPCOR stated various other mitigation and monitoring actions they would be undertaking. These included continuous emissions monitoring from the proposed stack for SO_2, NO_x and ozone, as well as monitoring opacity and flow rate. Stack testing would also be done periodically for total PM, trace metallic elements, mercury and halide air emissions.

When questioned whether Selective Catalytic Reduction (SCR) would be a worthwhile technology for reducing NO_x emissions, EPCOR replied that SCR was a solution to a problem it did not have. Based on the use of low NO_x burners and supercritical boiler technology, plus the results of the dispersion modelling which predicted compliance with the NO_x guidelines, EPCOR did not see a need for SCR.

EPCOR assumed that ozone concentrations would not increase as a result of increased NO_x emissions from the proposed expansion. EPCOR disagreed with Environment Canada that the area was NO_x-limited. Instead, EPCOR believed that the required meteorological conditions for ozone formation were not present. Monitoring data was cited that indicated reduced levels of ozone as NO_x levels increased.

EPCOR testified that the current monitoring station in the Genesee area was not located in the proper place to capture the emissions from the plant. Although EPCOR did not outline what it believed would comprise an acceptable monitoring program, it stated that it had joined the West Central Airshed Society (WCAS). The company believed that this would be the forum for addressing monitoring issues. It indicated that there was not a precise proposal regarding airshed boundaries, but they would be flexible on where those boundaries should be. EPCOR felt that these details could be worked out within WCAS. It was also noted that WCAS was

contemplating a rationalization of the monitoring in the region, and that this might lead to relocation of monitoring trailers.

The assessment also predicted the resulting PAI as a product of emissions of SO_2 and NO_x. PAI values were calculated using the CALPUFF model. EPCOR stated that considering the deposition of the acidic anions without also including the effects of basic cations was an unrealistically conservative approach. Furthermore, EPCOR did not feel that the predictions had status with respect to the evaluation and management of acid deposition. It was agreed, however, that the concept of PAI can be useful for managing deposition of acid forming emissions, as is done through the use of Critical, Target and Monitoring Loads as specified by the Clean Air Strategic Alliance (CASA). EPCOR also noted that it was a signatory to the Target Loading Subgroup methodology. ECPOR proposed to work with WCAS and AENV to manage its emissions such that regional acid deposition would remain within acceptable levels.

The potential for ground-level fog to be created by evaporation of water from the Genesee cooling pond was also evaluated. The proposed expansion would alter temperatures in the cooling pond, thus necessitating a re-evaluation for potential fog creation. EPCOR committed to assess the need for additional road safety measures for Highway 770 in consultation with Leduc County.

EPCOR proposed to voluntarily offset greenhouse gas emissions (GHGs) resulting from the GP3 expansion such that the net emissions would match that of a more efficient natural gas combined cycle plant. This would result in a 53% net reduction of GHGs. A third-party audit process would be developed to verify the offsets.

When questioned on the need to upgrade the existing Genesee units 1 and 2 to meet the new standards issued by AENV, EPCOR testified that the replacement of existing capital stock would be considered during capital stock turnover. The company did not anticipate any upgrades for units 1 and 2 in the next 20 years.

5.1.2 Views of the Interveners

Clean Energy Coalition

CEC stated that the domain used in the impact assessment was too small an area for such a tall stack with the magnitude of emissions expected. While the 30-kilometre study area would likely capture the area of maximum predicted concentration, much of the emissions would travel beyond this range.

Also, the formation of secondary pollutants could not be fully addressed within the distance modelled. Ground-level ozone and particulate were pollutants specifically not included in the assessment. CEC believed that EPCOR's view on ozone formation may be valid in the immediate vicinity of these facilities but it did not take into account the chemical reactions that could happen further downwind.

The CEC also questioned comparisons made between monitored and predicted values. As the monitors in the area are located mostly upwind of the proposed source of emissions, they felt that

such a comparison was not valid. The CEC stated that there was not a good baseline from the monitoring data, and thus, it was not possible to predict the future impact.

By evaluating the maximum concentrations of individual pollutants in isolation, CEC believed that the impact assessment did not consider cumulative or synergistic effects. It believed that this consideration was necessary especially given the many different sources of both natural and anthropogenic sources in the region.

Also, the CEC felt that the principle of pollution prevention had been ignored in EPCOR's EIA. Instead, they felt that the application implied that polluting up to the limit of the guideline was acceptable.

The CEC believed that NO_x emissions should be minimized for three reasons - first, NO_x formed part of the acid load; second, the emissions could lead to potential ozone formation; third, emissions contribute to the potential formation of secondary PM.

The CEC further believed that any decision by the Board to allow a new facility was also a decision to permit additional emissions of greenhouse gases, at the expense of other developments in the province. EPCOR's offer to offset greenhouse gas emissions to the equivalent of a natural gas combined cycle plant was not acceptable to the CEC. Rather, it believed that the emissions should be offset entirely, so that the project would have zero net emissions of greenhouse gases.

Mewassin
The members of the Mewassin community believed that the commitments put forth by EPCOR should become conditions of approval, if the project were approved. Further, they believed that the concept of emission thresholds was outdated. Instead, they believed that emission should be minimized, not just down to an emission standard. Mewassin also believed that EPCOR's participation in the WCAS may not address the individuals who would be affected by any impacts to air and water quality. It believed that a new region should be established to address the area between the WCAS and Edmonton.

Government of Alberta
AENV stated that its interest in this application was because of its responsibility for the protection of the province's air, land, and water. Under the *Environmental Protection and Enhancement Act* (EPEA), AENV had specific regulatory responsibility regarding the EPCOR proposal. EPEA also put forth the requirement for an EIA.

AENV noted that EPCOR's current EPEA approval for the Genesee power plant sets stack emission limits for NO_x, SO_2, and PM. Furthermore, the EPEA approval requires EPCOR to conduct ambient monitoring.

The results from ambient monitoring stations in the Genesee – Lake Wabamun area show that ground-level ambient concentrations of SO_2 and NOx meet the AAAQG. Concentrations of PM meet the guidelines 95% of the time. AENV added that PM concentrations were also generated through wind blown dust from agricultural land and highways.

AENV recently set new stack emission standards for new coal fired generation units of 125 nanograms of NO_x per joule (ng/J) of heat input, 180 ng/J of SO_2, and 13 ng/J of PM, all on a 720 hour rolling average basis. The department was confident that the technology proposed by EPCOR for the GP3 expansion would be capable of attaining these new standards. AENV confirmed that EPCOR's cumulative effects modelling of NO_x, SO_2, and PM concentrations was done in accordance with its modelling guidelines, and predictions were within the air quality guidelines. Existing NO_x, SO_2, and PM monitoring would need to continue if the expansion were approved and the monitoring network might need to be adjusted. AENV also specifically recommended that non-stack sources of NO_x should be minimized by EPCOR wherever possible in order to minimize the formation of secondary PM.

AENV highlighted the fact that monitored ground-level ozone concentrations can be difficult to attribute to a specific source. This is partly due to the complex processes leading to the production of ozone from NO_x and VOCs. As a result, NO_x emissions might actually reduce ozone concentrations close to a source, while increasing further away. Also, VOCs might result largely due to emissions from trees and vegetation while ozone might also be transported to ground level from the upper atmosphere. AENV does not require modelling of ozone in EIAs because accurate inventories of all ozone precursors are not available to project proponents. In conjunction with Environment Canada, AENV is working on an ozone modelling study of central Alberta. Ozone monitoring in the region has shown concentrations to be below the AAAQG more than 99.95% of the time. AENV did not expect future ozone levels to change significantly if the expansion were approved, but noted that additional ozone monitoring (specific to the region of the Genesee power plant) would be necessary for verification purposes.

AENV stated that they have adopted the Alberta Acid Deposition Management Framework developed by the Clean Air Strategic Alliance (CASA). While this framework was not designed to be applied at the local project scale, comparison to the framework might provide guidance for monitoring actions. AENV acknowledged that the inputs used in EPCOR's modeling were conservative. Although it felt the modelling likely overestimated the acid deposition load, it indicated that a program would be necessary to quantify and evaluate the impact. AENV believed this could be addressed through the EPEA approval if the Board were to approve the project.

AENV reported that it took Greenhouse gas reduction commitments very seriously. The use of voluntary emission offsets was supported, and AENV would require EPCOR to report its greenhouse gas emission annually. It also indicated that the subject of greenhouse gas emission objectives would be discussed with stakeholders as part of the consideration of post-2005 standards for coal fired power plants.

AENV noted that the predicted increase in cooling pond temperature would lead to an increased frequency of fog occurrences. Given the safety implications such as visibility and road icing, they expected EPCOR to discuss this impact with Alberta Transportation and consider the need for additional road safety measures to mitigate the effects of the increased fog, should the project be approved.

In response to many of the air quality issues relating to this proposed project, AENV recommended that monitoring be undertaken to manage the potential impacts, if an approval were granted. Ground-level ozone and acidic deposition were among the pollutants specifically identified for co-operative programs with stakeholder participation. AENV indicated that EPCOR's involvement in the WCAS may provide a venue for accomplishing these requirements, and encouraged EPCOR's participation. AENV also expected EPCOR to take the lead in establishing and administering new co-operative programs where they are needed.

Government of Canada (Environment Canada)

The *Department of the Environment Act* (1985) (DOE Act) requires Environment Canada to cooperate with provincial governments and agencies in the preservation and enhancement of environmental quality. Further, the new Canada Wide Standards for PM and ozone commit governments to meet specified ambient levels of $PM_{2.5}$ and ozone. The Standards also encourage continuous improvement and use of the Best Available Technology (BAT). In addition, the CEPA (1999) shifts the focus of pollution management to one of pollution prevention.

Environment Canada emphasized the need to shift to a regional approach for assessing the cumulative impacts on air quality, rather than evaluating impacts from single facilities. This shift would require co-operation between all facilities in the region. Environment Canada recommended that stakeholders collectively identify performance indicators and feedback mechanisms. Environment Canada also stated that some of the pollutants from this proposed project could have impacts outside of the area being studied. It acknowledged that EPCOR would be only one of many contributors to these regional issues.

Environment Canada provided evidence that commercially-proven technology could attain emission performance of 50 to 70 ng/J for NO_x, 50 to 80 ng/J for SO_2, and 8 to 9 ng/J for PM. This was based on a 30-day rolling average for plants comparable to the GP3 proposal. In keeping with the intent of the Canadian Council of the Ministers of Environment, Environment Canada recommended that the emissions performance from GP3 be required to meet these levels. It also recommended that the existing Genesee units be retrofitted with BAT to minimize impacts to regional air quality, as part of an adaptive management approach.

Environment Canada stated that although coal-fired power generation is not the sole source of pollutants such as greenhouse gases, smog precursors, acidifying emissions, mercury and other heavy metals, it has higher emissions per unit of power generated than alternative technologies. It also noted that monitored values for NO_x in the area met the National Ambient Air Quality Objective. It cautioned, however, that the atmospheric chemistry of NO_x, and its linkages to other air quality parameters, must not be overlooked.

Environment Canada acknowledged that although coal combustion is a source of VOC emissions, its contribution is small compared to other sources.

Environment Canada stated that monitoring data and modelling results indicated that the region is NO_x-limited with respect to ozone formation. Therefore reducing NO_x emissions would be the most effective means of controlling ground-level ozone formation. It also pointed out that the

region to the south of Edmonton represents a gap in the ozone monitoring network. Thus, it recommended that stakeholders in this region collectively re-evaluate their monitoring programs.

Environment Canada believed that a potential exists for exceedance of the acid loading criteria defined by CASA and that adding a project such as GP3 would only add to this loading. It submitted that deposition monitoring should be conducted, including NO_x, NH_3, NH_4^+, and SO_2/SO_4^{2-}. In regard to long-range transport, the preliminary modelling performed by AENV and Environment Canada showed that acid deposition would be below the level of harmful effects. However, in order to substantiate this result, further modelling with a longer meteorological data set would be required.

Environment Canada highlighted its specific concerns about the health effects associated with elevated levels of PM. As a result, they recommended that $PM_{2.5}$ inventories, modelling and monitoring should be improved in the area and the potential for long-range transport should also be addressed.

5.1.3 Views of the Board

Through the submissions filed and the evidence provided at the hearing, the Board heard significant concern related to air quality and the predicted emissions of the proposed project. The Board also notes that in addition to the direct potential effects of airborne emissions, there are linkages to several other environmental components such as the terrestrial and aquatic domains.

The Board views that the AAAQG and other reference criteria accepted by AENV are the appropriate benchmarks for assessing predicted ambient air quality impacts of the proposed project. That is, the Board finds that these standards, guidelines and other environmental and health protection criteria define the maximum predicted cumulative effects that would be permissible. The Board views that emissions reductions or other mitigation would have to be incorporated into projects should substantive exceedances of the criteria be predicted.

The Board also recognizes the value of minimizing potentially harmful emissions, to the extent reasonably possible, consistent with the Canada Wide Standard for PM and ozone, which encourages "keeping clean areas clean" and incorporating best available technologies to reduce particulate matter and ozone levels. The Board agrees, for example, with Environment Canada's submission that reducing NO_x emissions is an effective method for reducing the potential for ground-level ozone formation. Thus, the Board expects proponents to contribute to keeping clean areas clean by implementing reasonable measures to minimize cumulative effects on air quality and to seek opportunities to improve upon the AAAQG and other ambient air quality benchmarks.

The Board accepts EPCOR's evidence that its proposed project will be designed and constructed to comply with the source emission standards recently laid out in AENV's Air Emissions Standards for Coal-Fired Power Plants. In its review of GP3, the Board is more concerned with the level of emissions than with the technology or approach used to achieve them. The Board believes that dictating the required technology may limit the options available to the proponent in accomplishing the desired results. The Board has additional views pertaining to emission levels and defers this discussion to the Decision section of this report.

The Board agrees with AENV that the dispersion modelling conducted as part of the EIA was completed in accordance with AENV's Air Quality Model Guideline, the recognized guide on modelling requirements in Alberta. On that basis, the Board accepts EPCOR's evidence that incremental emissions from its project will not result in exceedance of the AAAQG and other air quality reference criteria outside the immediate industrial facility sites. The Board therefore believes that the EPCOR project could be approved on the basis that it would not result in unacceptable air quality when considered with other cumulative emissions in the region.

While predictive modelling is a useful tool for impact assessment, the Board also realizes there are inherent uncertainties. Consequently, the Board views that appropriate monitoring programs must be in place to verify predictions and to provide early detection of ambient air quality impacts. The Board accepts the testimony of Environment Canada and other interveners that monitoring improvements are required in the region. In particular, the Board supports improved monitoring of PM and ozone, as well as precursor emissions in the region to assess air quality and to verify predictions of industrial emissions impacts on ambient air quality. The Board directs EPCOR to the satisfaction of AENV, and singularly or in cooperation with other organizations such as WCAS, to define additional air quality monitoring needs in the Genesee-Edmonton region. The Board notes that monitoring related to the existing Genesee units 1 and 2 is currently required by the respective EPEA approvals, and the Board directs that EPCOR support and implement further regional ambient air quality and effects monitoring to the satisfaction of AENV.

Regardless of whether an existing airshed region such as WCAS can be modified to address the Wabamun/Genesee region or whether a new region specific to the power plant operators in the area needs to be formed, the Board expects EPCOR to take the lead in creating such a forum for monitoring regional air quality.

The Board notes that the acid deposition target loads are intended to apply on a 1º latitude by 1º longitude grid cell (about 111 km by 60 km) basis as regulatory objectives. That is, if cumulative contributing acidifying emissions result in an exceedance of the target load for such a grid cell, then mitigation is required. The target load objectives, however, were not intended to be applied as regulatory standards for proposed projects based on predictions for project study areas. Rather, the target and critical loads are reference benchmarks indicating the need for more detailed evaluation of predicted local acid deposition impacts.

The Board agrees with EPCOR that the CASA evaluations[3] of provincial acid deposition indicate that the Genesee area is generally well buffered and that calculated acid deposition for the above mentioned grid cells in the area were found to be well below target and critical loads. That evaluation also provides insight on long-range acidifying emissions transport issues.

However, the Board views that the CASA study is not sufficient to draw conclusions with respect to local acid deposition impacts from the proposed project. The methodology used by

[3] *Application of Critical, Target, and Monitoring Loads for the Evaluation and Management of Acid Deposition*, Alberta Environment, Edmonton, Alberta

CASA does not have the sensitivity to assess local deposition from specific emission sources. Therefore, the Board expects that proponents will assess local impact of projects with computer models, acceptable to AENV such as CALPUFF, that are more suited to small scale (local) airsheds than the RELAD model used in the CASA provincial scale study. If predictions of local acid deposition exceed the benchmarks, the Board expects that proponents would take the initiative to investigate in greater detail the actual sensitivity of local terrestrial and aquatic systems as part of EIA evaluations. It is the Board's view that this assessment would include defining protection priorities based on the ecological or agricultural significance of acid sensitive areas that could be impacted by the proposed project. The Board would then expect proponents, on the basis of more detailed assessments, to explain how soils, aquatic and ecological systems would be monitored and protected with respect to acid deposition.

The Board directs EPCOR to take steps to verify acid deposition predictions with its monitoring programs. Further, the Board expects EPCOR to address the limitations of its EIA by investigating in greater detail the acid deposition sensitivities of the areas predicted to receive acid deposition at rates in excess of the monitoring load for sensitive areas (0.17 keq $H^{+}ha^{-1}yr^{-1}$). The Board expects that the assessment of acid deposition would also identify protection priorities and strategies for receptors where the predicted acid deposition rate exceeds target loads. The Board will require that EPCOR implement an acid deposition monitoring program and conduct a more detailed assessment of local area acid deposition sensitivity to the satisfaction of AENV.

The Board directs EPCOR in relation to GP3 and the potential for increased hazards (e.g., fog) to assess the need for additional road safety measures for Highway 770 in consultation with Leduc County and Alberta Infrastructure.

The Board notes that this application represents a significant source of greenhouse gases. The Board appreciates the position taken by AENV and the guidance it provides regarding the management of greenhouse gas emissions in the province. The EUB also encourages actions taken to reduce greenhouse gas emissions and supports the use of emission offsets. In this application, the Board notes that EPCOR has made significant efforts to offset greenhouse gas emissions. In the event this application were approved, the Board would also direct EPCOR to fulfill its voluntary commitment of offsetting greenhouse gas emissions, such that they are equivalent to those from a natural gas combined cycle plant. The Board also directs those offsets to be updated to correspond to any future changes in emissions standards for a coal-fired power plants or a corresponding gas fired power plant, as was the basis for the offsets. The Board notes AENV's intent to consider the introduction of emission objectives related to greenhouse gases as part of its post 2005 emission standards. Given the potential for disagreement on emission offset accounting, the Board recommends EPCOR and AENV use a third party audit process to verify the offsets.

5.2 Surface Water

5.2.1 Views of the Applicant

EPCOR indicated that its existing cooling pond was licensed as an industrial wastewater pond. EPCOR managed water resources at its Genesee site by re-circulating cooling waters through the pond as well as discharging mine waters, sewage and other effluents. The configuration and operation of the cooling pond would not change significantly by the addition of GP3. Existing

operations resulted in water diversion from the NSR in the range of 4,800 to 12,200 dam^3. With GP3, diversion was expected to increase to approximately 20,300 dam^3, which EPCOR noted was still within the approved water diversion licence for GP 1 and GP 2. EPCOR tested the need for increased allocations of makeup water at 1 in 100 year low levels of precipitation and determined there was a low probability for the need to amend EPCOR's water diversion licence.

EPCOR stated that blowdown of the cooling pond water to the river had not previously occurred at Genesee, although it had been proposed in 2001. Blowdown would become a standard operating practice with or without GP3. Water quality of the cooling pond with GP3 was expected to be generally comparable to the Alberta Surface Water Quality Objectives and releases via blowdown were not predicted to adversely affect the NSR. Due to additional makeup water with GP3, some improvement in cooling pond water quality was reasonably expected.

Assessing water quality of the cooling pond against Alberta surface water quality guidelines and Canadian Council of Ministers of the Environment's (CCME) freshwater aquatic limits, EPCOR determined that suspended sediment concentrations for aluminum and dissolved concentrations of zinc were above guidelines. However, ambient concentrations of those same parameters from the NSR exhibited similar exceedances.

Recent analyses showed that the concentration of dissolved mercury in cooling pond waters was less than 0.00002 mg/l (20 ng/l) the laboratory detection limit used by EPCOR. This detection limit met the CCME guideline concentration of 0.0001 mg/l (100ng/l) for total mercury. (The CCME Mercury Guideline was referenced by EPCOR since AENV guideline values for total mercury are in draft format). EPCOR found the mercury concentration of the NSR was frequently less than 0.000025 mg/l. It concluded that water quality of the Genesee cooling pond was comparable to the NSR, and this was not expected to change with GP3. Background ranges of mercury from other Alberta water bodies and the cooling pond were comparable.

Much of the historical water quality data for mercury was of limited usefulness due to unreliable sampling methods or high laboratory detection limits above guideline values.

Water quality assessment for surrounding creeks and streams indicated that a number of aquatic protection guidelines were exceeded for some metals (aluminum, cadmium, zinc), likely attributed to high suspended sediment concentrations. EPCOR concluded that water quality of local creeks had not been adversely affected by existing operations since start-up, and was not expected to change as a result of GP3.

Based on 1998 sampling, bottom sediments of the Genesee cooling pond had low concentrations for most parameters, including mercury. 1998 sampling results were measured against AENV and CCME soil criteria for contaminants. No sediment quality data was available for the NSR. GP3 was predicted not to affect sediment quality of the cooling pond.

EPCOR believed that environmental assessment of mine drainage waters would be subject to a mine permit application. EPCOR committed to monitor the volume and water chemistry of mine drainage waters. Additional monitoring of makeup waters and sediment composition entering the cooling pond were also proposed.

Regarding blowdown, most mixing of the blowdown plume occurred within 7 km of the Genesee outfall, so that at a distance of 14.1 km downstream, concentrations of chemical constituents (e.g. total dissolved solids, sulphate, sodium, magnesium) were approaching ambient conditions. At a distance of 27 km, near the Genesee Bridge, both the EPCOR and TransAlta blowdown plumes were predicted by modelling to be fully mixed in the river, with only marginally increased concentrations above background.

EPCOR predicted that for temperature conditions, effects of the blowdown plume from all three EPCOR units would not be measurable within several hundred metres of the outfall. With temperatures of the current blowdown plume 8° to 10°C above ambient river temperature, the incremental increase from GP3 blowdown was predicted to be 0.03 to 0.04°C at fully mixed conditions. The size of the thermal plume with water temperatures greater than 3°C above ambient river temperature would increase in spring from 750 m^2 to 1250 m^2 and in fall from 400 m^2 to 750 m^2 in area. Thus any effects of the plume would occur in a localized area immediately downstream of the outfall and were not considered to be significant.

EPCOR proposed to mitigate the effects of blowdown to the NSR by restricting blowdown to open water periods and avoiding low flow conditions of the river during winter months. Releases to the river would be staged gradually to avoid sudden temperature changes.

In considering the cumulative effects of power generation upon water quality of the NSR, EPCOR predicted there would be minor overlap of the edges of the EPCOR and TransAlta plumes. Relatively small changes in total dissolved solids concentrations with other chemical constituents and temperature of the river water would not contribute to adverse effects. EPCOR concluded that combined NSR consumptive water use upstream of Edmonton, including EPCOR and TransAlta projects would equal 0.14 % of the median annual flow volume measured at Edmonton. Since this was within the range of flow measurement error in determining annual flows, cumulative effects to flows of the NSR were considered insignificant. The same conclusion was reached regarding cumulative effects predicted for local creeks and the EPCOR cooling pond. No change in water quality was expected within the cooling pond, and no discharge of cooling pond water to receiving water bodies other than the NSR was predicted.

5.2.2 Views of the Interveners

Clean Energy Coalition

CEC was critical of EPCOR's GP3 environmental assessment, stating that environmental monitoring programs (e.g. baseline and proposed) were not of sufficient scope or scale to adequately assess impacts to surface water resources. Some data sets were limited in size so that seasonal trends or variability were lacking. The CEC believed trace contaminants deposited from atmospheric emissions (e.g. mercury and acidification) had not been thoroughly assessed for their impacts to regional surface water bodies. Another weakness of the assessment identified by CEC was the small size of the regional study area. With more than 50 percent of GP3 air emissions being transported beyond the regional study area, depositional effects of contaminants and acidification were not adequately assessed, in this intervener's view.

CEC indicated that limited sampling to construct surface water data sets contributed to poor statistical significance from which conclusions were drawn. CEC noted that sampling of trace elements (arsenic, selenium, total mercury) lacked the necessary accuracy. Concentrations of some water quality constituents were observed at laboratory detection levels that were not precise enough to determine compliance with guideline criteria, in CEC's view.

CEC noted that EPCOR recorded exceedances of environmental standards (e.g. aluminum) for surface waters and sediments in local water bodies, the cooling pond, and, the NSR, but did not address their environmental significance. CEC believed that EPCOR's use of historical average values for climatic conditions and river flows underestimated conditions of change as well as the water demands of GP3. Further, EPCOR's modelling work was thought to underestimate cooling pond temperatures, temperatures of the blowdown water, and the thermal plume to the NSR. CEC recommended more thorough environmental sampling and monitoring procedures to overcome several limitations identified in EPCOR's submission.

Mewassin
Mewassin identified the need for residents to be provided with a greater understanding of EPCOR's project specific and cumulative effects monitoring programs. It requested that EPCOR provide funding for the community to acquire expertise necessary in the design of monitoring programs and interpretation of the data. Mewassin supported the position and evidence of CEC regarding water resources.

The Paul First Nation
PFN expressed a general concern about environmental deterioration on reserve lands in relation to GP3. The PFN members cited evidence of water quality degradation and changes to water levels of Lake Wabamun in relation to fish resources. The PFN members indicated that these changes had impacted their quality of life.

Government of Canada
The Department of Fisheries and Oceans (DFO) noted there were several issues under the Fisheries Act where DFO would exercise some regulatory responsibility. In relation to water resources, DFO recommended additional periodic monitoring of the cooling pond and the NSR to verify predicted thermal conditions. This was in addition to the thermal plume monitoring proposed by EPCOR during the early stages of blowdown.

DFO had not discussed the issue of mine drainage water with EPCOR at the time of the hearing. DFO agreed with EPCOR's commitment for follow-up monitoring of water quality, including mine-site runoff. DFO would participate in the review of that monitoring data to ensure protection of fish and fish habitat. DFO had a continuing interest in the GP3 project, however it neither supported nor objected to the project. Environment Canada did not give evidence regarding water resources.

Government of Alberta
Due to the level of uncertainty with predicted water quality of the NSR, AENV stated that should GP3 be approved it would recommend inclusion of water quality monitoring within EPCOR's EPEA licence. It would further recommend verification of the thermal effects of blowdown and

determination of the effects area. AENV commented on EPCOR's position that high mercury levels in cooling pond fish tissues resulted from naturally high levels of make-up water from the NSR as being plausible, but was by no means certain. Furthermore AENV acknowledged that methylation of mercury in a reservoir or cooling pond situation with increased water temperatures was a possible mechanism for mercury to be concentrated. Generally, the movement and uptake mechanisms of mercury in the environment have been poorly understood.

AENV testified that one of its important objectives was the monitoring and reduction in mercury source emissions. AENV explained that it was a participant in the process to establish Canada Wide Standards for mercury (e.g. air emissions). Applicable AENV water quality standards for mercury were currently in the form of interim guidelines**.** AENV intended to incorporate a mercury monitoring and management program in any EPEA licence that would be issued if GP3 was to be approved.

Quantification of water quality, sediment quality and bio-receptors relative to mercury sources with appropriate response actions by EPCOR would be addressed in any EPEA approvals issued by AENV. Since EPCOR had not previously discharged blowdown to the NSR, there was some uncertainty regarding EPCOR's water quality predictions. AENV recommended that EPCOR conduct additional water quality monitoring to validate its conclusions of no adverse effects from GP3. Similarly a river monitoring program was recommended to verify thermal effects predictions and determine the spatial extent of any thermal effects.

Regarding cumulative effects upon surface waters, AENV stated the importance of considering regional emissions from GP3 and multiple sources within the airshed. Stakeholder input in establishing management objectives for airshed emissions would have high importance in the on-going management of surface waters.

5.2.3 Views of the Board

Local interveners such as Mewassin have expressed their desire to participate more actively in the planning and communications of EPCOR's GP3 environmental monitoring programs. EPCOR has committed to public consultation beyond the application stage of GP3, which provides opportunity for EPCOR to engage interested stakeholders. The Board further recommends the Genesee Power Project Advisory Committee (GPPAC) be expanded to include additional representation of local stakeholders such as Mewassin.

Based on the EIA data provided for this application, the Board accepts EPCOR's findings that surface waters should not experience significant adverse effects. However, the importance of EPCOR's commitments to conduct additional monitoring of cooling pond water and sediments, mine drainage waters, and waters of the NSR cannot be understated. High importance is also attributed to the stated recommendations of AENV, Alberta Sustainable Resource Development (SRD), and DFO to further address the protection and management of water resources in the context of GP3. Examples include validation of EIA predictions for water and sediment quality in the cooling pond and NSR and the establishment of a program for mercury monitoring and management.

The existence of AENV draft guideline values for protection of aquatic life below detectable concentrations of mercury used in EPCOR's water quality analysis poses some uncertainty to the Board. To avoid limitations of some past environmental baseline data, the Board recommends that AENV establish with EPCOR appropriate sampling frequencies, analytical protocols and reporting methods, including the analyses of trace elements within EPEA and Water Act Licences. The Board believes that a mercury monitoring and management program is mandatory for GP3 to receive Board approval and directs EPCOR to establish such a program with AENV and SRD prior to GP3 commissioning.

Notwithstanding findings of the EIA, the Board believes a regional framework is needed to monitor environmental effects upon regional water bodies. Detailed information of this nature is generally lacking and should be collected in conjunction with regional air monitoring programs. The Board believes regional environmental monitoring is a multi-stakeholder responsibility, representative of industrial and non-industrial activities present in the Genesee - Wabamun - Keephills region. EPCOR is directed to participate and contribute to regional monitoring of water and sediment quality related to GP3, to the satisfaction of AENV.

5.3 Fish and Other Aquatic Biota

5.3.1 Views of the Applicant

EPCOR presented the view that because water quality was not expected to change with the operations of GP3, elemental uptake by aquatic organisms should not increase. EPCOR did indicate that increases of mercury in fish tissues were possible, but attributed that possibility to continued methylation of mercury in the cooling pond resulting from its initial flooding, and continued bioaccumulation through the aquatic food chain. Neither methylation nor bioaccumulation was considered to be associated with GP3. EPCOR committed to periodic monitoring of fish tissues for mercury and other metals to determine concentration trends as part of their application.

EPCOR sampled 15 northern pike from the Genesee cooling pond over a two year period for the purposes of analyzing levels of heavy metals in fish muscle tissue. Of the fish caught, five were above Alberta's legal size limit. Mercury levels in the northern pike tissue sampled exceeded the 0.5 ppm daily consumption guideline in four of the five individuals. EPCOR noted that the relationship between fish size and mercury concentrations was linear in these fish. EPCOR also caught and analyzed 16 walleye from the cooling pond, of which 13 were above the legal size limit. Nine of the 13 walleye exceeded the daily consumption guideline, and one of the three fish below the legal size limit also exceeded this guideline.

EPCOR also caught and analyzed six walleye from the NSR in a single field season for heavy metal concentrations in tissue. The walleye had mercury levels below the consumption guideline but only one was above the provincial legal size limit. One northern pike was captured and analyzed for heavy metals in tissue. It had mercury concentrations above the consumption guidelines, but EPCOR indicated that it was lower than that recorded for pike of similar size in the cooling pond.

Under cross examination regarding the levels of mercury in fish exceeding consumption guidelines, EPCOR stated that the fish from the cooling pond had similar levels of mercury as

fish from the NSR and other regional waterbodies. EPCOR indicated that the scientific literature pertaining to mercury levels causing effects on fish generally concluded that mercury concentrations of 1 ppm in fish tissue resulted in adverse effects, including reproductive failure, renal failure or liver problems. EPCOR indicated that there were a number of walleye that had mercury concentrations in excess of 1 ppm, and that the mitigation measure it proposed to implement to protect human health was a fish consumption advisory.

In the EIA, EPCOR considered potential thermal effects on aquatic biota. EPCOR stated that the predicted average increase in the water temperature of the cooling pond would be approximately 1 - 2 °C with the addition of GP3, which it believed would have no significant adverse effects on the fish. EPCOR stated, however, that fish spawning might be initiated earlier in spring in response to temperature increases.

EPCOR also indicated that total gas pressure in the outlet canal was elevated, which can lead to gas-bubble disease in fish. Total gas pressure reflects the level of supersaturation of dissolved atmospheric gases in the water, which in turn is affected by both depth and temperature. At high levels of gas supersaturation, fish may suffer a number of symptoms and eventually, mortality. EPCOR stated that no symptoms of gas bubble disease were observed in fish occupying the outlet canal, and maintained that fish were able to avoid areas of supersaturation by utilizing the deeper areas of the canal. EPCOR committed to continued monitoring of total gas pressure and fish condition to determine whether gas bubble disease was becoming a concern and, if so, appropriate mitigation measures would be implemented.

EPCOR stated that during EIA preparation, it was identified that the existing intake facility was causing fish entrapment. EPCOR considered this to be an existing operational issue separate from GP3. Nevertheless, it investigated mitigation plans including a fish barrier located just outside of the inlet canal, and committed to its implementation before GP3 was operational, if approved.

With regards to potential thermal effects on the NSR, EPCOR stated that the blowdown of water from the cooling pond would not have a significant adverse effect on the aquatic organisms in the NSR. It reported that no blowdowns were scheduled during the winter, when potential for thermal effects would be greatest. EPCOR expected that effects to benthic invertebrates would be minor and localized to the vicinity of the blowdown pipe. They proposed mitigation through staging water releases gradually to minimize the effect of the thermal plume on aquatic resources.

When questioned during the hearing about anecdotal evidence regarding the presence of abnormal pike in the cooling pond which were physically deformed, EPCOR indicated that it was aware of informal testing by Alberta Fish and Wildlife that included some community members, but that nothing was found from those tests.

EPCOR expected that cumulative effects as a result of GP3 would be negligible. The thermal plume produced during EPCOR's blowdown operations was predicted to be within 0.1 °C of ambient water temperature at the point where blowdown water from TransAlta's Keephills

operations enters the NSR. EPCOR noted that all other coal-fired generating plants were beyond the 10 km radius established as the boundary for the regional study areas.

5.3.2 Views of the Interveners

Clean Energy Coalition

CEC stated that there was no assessment of fisheries, invertebrate communities, algal communities or other components of fish habitat in surrounding creeks, lakes, ponds or wetlands, all of which had the potential to be impacted by current and future plant operations. CEC argued that a baseline had not been established, in part because potential synergies between chemical or physical processes were not considered, making it difficult to determine the incremental impacts of the GP3 project. Furthermore, CEC argued that EPCOR's proposed monitoring program was inadequate and would not result in sufficient data to adequately assess the environmental impacts of the expansion on aquatic biota.

With regards to levels of mercury in fish, CEC cautioned against comparing levels of mercury in fish tissue from fish in the NSR with those found in the cooling pond for several reasons. It stated that factors such as bioaccumulation and biomagnification may be influencing concentration levels found in fish. It would therefore be difficult to isolate the depositional impacts of the generating station. CEC maintained that there was not enough information provided by the applicant to conclude that the impacts of GP3 would be insignificant. CEC stated that imposing a fish consumption advisory might discourage people from eating the fish, but it wouldn't mitigate the ecological effects of the mercury on the fish themselves, or on the other aquatic biota.

CEC recommended that baseline information be established in the freshwater systems surrounding the EPCOR power plant. This would involve sampling aquatic systems in surrounding lakes, using appropriate statistical tools and methods to facilitate effective analysis, and conducting repeated sampling to determine seasonal and annual trends. CEC also suggested taking sediment cores from the applicable lakes, which would facilitate a historical understanding of the chemical and physical trends over time, thus contributing to the cumulative effects assessment.

The Paul First Nation

The PFN expressed concerns regarding the potential health effects of elevated mercury concentrations in fish and EPCOR's proposed mitigation measures. It indicated that EPCOR's response to the potential contribution of GP3 emissions to increased mercury concentrations in fish was essentially to restrict the PFN's intake of fish via a fish consumption advisory, which it considered an inappropriate mitigation strategy given that the PFN generally catch and consume fish on a regular basis. Members of the PFN argued that a consumption advisory would hinder their traditional lifestyle.

Government of Alberta

In its submission, AENV indicated its view that water diversion and blowdown were unlikely to have significant effects on fish in the NSR. It noted that EPCOR's pumping operations on the NSR in connection with the power plant cooling pond have resulted in a fish population in the pond. AENV confirmed that recreational fishing does occur at the cooling pond. AENV stated

that in order to confirm EIA predictions, EPCOR needed to implement a systematic monitoring program on the condenser outlet canal to ensure that fish were not being acutely or chronically affected by high temperatures, gas supersaturation, or other factors either alone or in combination with one another. AENV was of the view that such a monitoring requirement could be addressed through the EPEA approval process.

AENV noted that for all scenarios in its human health risk assessment, the consumption of fish was identified as the primary exposure pathway resulting in elevated exposure ratios. AENV stated in their submission that it believed EPCOR's conclusion that power plant emissions do not contribute to mercury concentrations in fish was subject to some uncertainty. Nevertheless, it believed that even if power plant emissions were contributing to mercury concentrations in fish, fish consumption advisories would be an effective risk management option to consider providing appropriate health protection.

AENV indicated that it would incorporate a mercury monitoring and management program into the EPEA approval, should approval for GP3 be granted. It specified that accurate quantification of mercury emissions, water quality, sediment and bioreceptor monitoring would be considered in the requirements, in addition to response actions based on monitoring. It also recommended that mercury levels in fish tissue in both the cooling pond and the NSR be monitored

With regards to the thermal blowdown into the NSR, AENV concurred with EPCOR that the thermal effects on benthic invertebrates was likely to be localized, however that those conclusions needed to be verified and the boundary of effects determined. In light of these uncertainties, the province recommended that EPCOR conduct a monitoring program on the NSR to assess thermal impacts, which again could be incorporated into the EPEA approval if issued. The province noted that water diversion and blowdown return were unlikely to have significant effect on fish in the NSR.

Government of Canada

The DFO indicated that despite EPCOR's demonstration that fish habitat was not likely to be harmfully altered, disrupted or destroyed as a result of the GP3 project, DFO continued to have regulatory responsibility for development of appropriate fish screens at the water intake sites at both the generating plant and the river water supply facility. DFO also indicated that it was involved in discussions with EPCOR regarding further monitoring of gas supersaturation of fish, and of any future changes in fish utilization of the outlet canal or in the overall operations of the cooling system. DFO described continued discussions with EPCOR and Environment Canada regarding mine runoff, and the potential effects of the chemical constituents found in the runoff on receiving aquatic systems. Regarding potential mercury inputs into the NSR, DFO stated that the responsibility for regulating such an effect would fall under Environment Canada's administration pertaining to deleterious substances.

DFO indicated that EPCOR's assertions regarding thermal effects needed to be verified. Additionally, the effects of thermal inputs from the Genesee operations on the cooling pond and the NSR were modelled based on predictions of mean daily temperatures and might not predict potentially acute temperatures as a result. Although it supported EPCOR's commitments to monitoring characteristics and fish usage of the thermal plume area during the early stages of

blowdown, DFO suggested that further periodic monitoring within the cooling pond and the NSR should also be conducted, to verify the predicted thermal conditions and the predicted impacts on fish and fish habitat. At the hearing, DFO indicated that a thermal discharge would be treated as a deleterious substance if there was an impact, and as such, would trigger an enforcement action from Environment Canada.

Environment Canada noted that methylmercury was a potent neurotoxin, that was readily absorbed in the gastrointestinal tracts of humans and most wildlife, and noted that it bio-concentrated in predatory fish such as trout and pike. As such, methylmercury concentrations measured in some fish could be greater than one million times higher than concentrations in surrounding waters. One of the uncertainties Environment Canada noted that contributed to assessing the impacts of mercury was the uncertainty in the response of fish mercury levels to changes in atmospheric input of mercury.

Environment Canada also referenced the US EPA as concluding that the primary pathway of mercury to most humans, producing the greatest health risk, was through methylmercury in fish consumed for food. Although the average North American did not consume enough fish for this to be of concern, studies showed that populations of subsistence fishers were particularly likely to receive large doses of methylmercury, potentially exceeding the US EPA reference dose. Additionally, Environment Canada noted that many provinces in Canada had fish consumption advisories pertaining to the fish in select waterbodies. Environment Canada stated that within Alberta, the area that was most likely to have a regional mercury problem was the Wabamun Lake-Genesee-Edmonton area, as a large percentage of Alberta's known anthropogenic mercury emissions were emitted by coal plants in that region. Environment Canada indicated that although EPCOR stated in its EIA that deposition of mercury from its emissions into the Genesee cooling pond and the NSR was not contributing to baseline methylmercury concentrations in fish, modelling to substantiate such a statement was not performed. Environment Canada also noted that it had some uncertainty regarding EPCOR's belief that the slightly elevated levels of mercury in the cooling pond resulted from naturally high levels of mercury in the make-up water from the NSR.

Environment Canada recommended long-term measurements of atmospheric mercury levels and wet and dry deposition of mercury in the Wabamun Lake region. Environment Canada indicated that this would provide baseline deposition information (prior to new developments) against which future impacts could be compared, and would also provide validation of current model predictions. Environment Canada also recommended identifying suitable indicators for potential mercury accumulation in terrestrial and aquatic ecosystems and the implementation of a long-term monitoring program to document changes in levels of mercury.

5.3.3 Views of the Board

The Board appreciates that in EPCOR's application for GP3, the company studied potential impacts to fish and fish habitat, and proposed to mitigate potential concerns through ongoing cooperation with AENV and DFO. The Board notes DFO's participation in the hearing, and their acknowledgement of EPCOR's commitment to continue to work with their organization to ensure that the federal requirements for fish and fish habitat protection are satisfactorily met.

With regards to the thermal effects on other aquatic biota in the NSR, the Board notes that while EPCOR has predicted impacts to be relatively small, a study has not been undertaken to understand the localized effects of the thermal inputs. There is little existing research that indicates the sensitivity of the aquatic biota that comprise fish habitat to changes in the thermal regime and particularly to warm water. As such, the Board directs that as part of regional monitoring efforts, benthic macro-invertebrates and the algal communities be examined by EPCOR to establish an existing baseline from the time GP3 begins operations, and provide comparable monitoring data subsequent to GP3 start-up. Details of such a study must be developed in cooperation with the AENV and SRD, but the Board expects that enough samples should be taken to allow statistical analysis of the results and to allow for analysis of inter-annual trends.

The Board also notes the concern raised at the hearing regarding mercury being emitted by coal-fired power plants generally, relatively high background levels of mercury in the environment of the RSA, and the links of the mercury issue to other aspects of the EIA (e.g. human health and water quality).

The Board heard evidence from EPCOR that some fish from the cooling pond exceeded consumption guidelines for both subsistence and occasional human consumption, and that there are consumption advisories placed on the cooling pond for this reason. The Board also notes the Alberta Government's support of that advisory. The Board is aware that generally, there are uncertainties with respect to comparison of mercury levels in fish in the cooling pond as compared to background levels of mercury in fish in the NSR. This uncertainty includes the concept that elevated levels of mercury in the cooling pond could be a result of methylation of mercury, and that chemical process may be subject to enhancement with temperatures in the cooling pond, which occur with the current use of the cooling pond, and that temperatures would be likely to increase somewhat with the addition of GP3.

In order to address potential impacts of increased airborne or methyl mercury on fish resulting either directly or indirectly from GP3, the Board directs that EPCOR, in consultation with other regional industry operators, develop and implement a detailed study of mercury in fish tissue for the region. Sampling must be performed in such a manner as to facilitate statistical analysis of the results and with appropriately large sample sizes, which does not however, jeopardize natural fish populations. Sampling must commence prior to commissioning of GP3 and continue at appropriate intervals as decided upon by AENV and SRD. Fish of the same species and of comparable size should be analyzed in parallel to facilitate a scientifically defensible investigation.

While the Board believes that the consumption advisory on fish is a suitable mechanism to minimize any potential public human health risk that may result from current mercury levels in the cooling pond and elsewhere, there are remaining uncertainties regarding how future additional mercury in the environment may impact environmental components (e.g. fish) directly, and how that mercury may bioaccumulate in the food chain.

The Board places high importance upon the recommendation of AENV to require EPCOR to implement a mercury monitoring and management program for GP3. The Board believes

ongoing monitoring and research are necessary for the management of localized and regional environmental effects from mercury. The Board recommends EPCOR contribute in a meaningful way to establishing a regional mercury database for the Genesee-Wabamun-Keephills region. The Board also recommends EPCOR to continue to strengthen its research efforts regarding: 1) cleaner coal burning technology, and 2) the processes and pathways of EPCOR's source emissions of mercury in the local and regional environment.

The Board has additional views pertaining to mercury that encompass issues beyond fish and other aquatic biota, and therefore defers further discussion on this matter to the decision section of this report.

5.4 Groundwater

5.4.1 Views of the Applicant

EPCOR stated that its groundwater monitoring wells located around the plant and cooling pond have not detected any impact to the quality of shallow groundwater. The applicant stated that its operation had not adversely affected shallow groundwater, as the plant and cooling pond are located in a groundwater discharge zone. It was explained that in a groundwater discharge zone, groundwater is naturally flowing upward; therefore, cooling pond water is unable to enter the groundwater system, and is naturally contained within the cooling pond. EPCOR also noted that a thick layer of naturally occurring clay underlies the plant and cooling pond, through which groundwater movement is extremely slow.

In response to questions from the Board, EPCOR indicated that its mining activities removed shallow aquifers. This removal resulted in reduced water levels in these aquifers in areas adjacent to the mine. As a result, a water policy was developed with the Leduc County in 1983 whereby EPCOR would replace any water wells within a prescribed distance of the mine that became dry. As deeper usable aquifers are present, this was accomplished by drilling deeper water wells. EPCOR noted that mine reclamation does not recreate the mined-out shallow aquifers, but that water levels in shallow aquifers in un-mined areas were expected to recover after mine reclamation. EPCOR noted that it has a network of shallow groundwater monitoring wells around the mine, such that it is aware of the mine's impact on the water levels in the shallow aquifers.

5.4.2 Views of the Interveners

Mewassin expressed concern with EPCOR's ash disposal method, which employed an unlined pit. Potential existed for the migration of contaminants such as heavy metals into groundwater aquifers, in Mewassin's view. Mewassin also stated that current water testing programs were not adequate for EPCOR's current operations, and should be expanded with independent monitoring for GP3.

AENV identified historical groundwater monitoring data, the cooling pond locations within a groundwater discharge zone and the presence of naturally occurring clay material underlying as reasons why contaminant migration from the cooling ponds was unlikely. AENV did not take a position regarding possible migration from ash disposal sites.

5.4.3 Views of the Board

Ash from GP3 will be disposed of in the coal mine, and the Board recognizes that mine activities in support of GP3 will be subject to future EUB and AENV regulatory review. Current ash disposal practices are licenced activities according to AENV's EPEA approval, which determines groundwater monitoring and reporting requirements. Based on the evidence provided, the Board is satisfied that EPCOR's GP3 will not contribute incremental effects to groundwater quality resulting from ash disposal. The Board expects EPCOR will meet all regulatory requirements regarding groundwater and ash disposal.

The Board accepts EPCOR's evidence that shallow groundwater has not been impacted by the plant and cooling pond as they are located in a groundwater discharge area, which prohibits water in the cooling pond from entering the groundwater system. The Board notes EPCOR's continuing commitment to monitor groundwater in this area.

The Board notes that EPCOR and the County of Leduc have a water policy in place to compensate or rectify the problem for those whose water wells become affected as a result of coal mining activities. In addition, the Board understands that the impact of mining on shallow groundwater is closely monitored, and would expect this monitoring to continue. The Board believes that this approach to ensuring minimal impacts to groundwater resources is appropriate for the open-pit coal mining operation associated with the Genesee power plant.

5.5 Terrain, Soils And Reclamation

5.5.1 Views of the Applicant

EPCOR undertook a soil-sampling program in April 2000 to determine if air emissions from Genesee and other facilities had increased the concentrations of chemicals in the soils of the regional study area as compared that found inherently as background. Soil sampled from seven sites at varying depths was investigated for chemical parameters of potential concern from a public health perspective.

The sampling points were chosen to be as close as possible to predicted high deposition areas, an intermediate deposition area, and low deposition area (based on the air dispersion modelling in the EIA) while maintaining other sampling criteria. One site was located outside of a predicted depositional area to serve as a control site. In order to confirm the natural variation in the soil, EPCOR was of the opinion that the number of samples taken was sufficient when compared to the detailed soil data collected in 1981, as all the samples indicated typical base chemical parameters within the expected natural range of variability.

EPCOR argued that the results from the soil analyses showed no detectable increase in parameters analyzed at any of the sites when compared to the control site, except for the hydrocarbon content and some inorganics at one site. The concentrations of the various metals in the samples were consistent at all the sites and were within the range normally encountered in soils of the region. EPCOR also concluded that the high hydrocarbon content of the soil at one site was a result of naturally occurring soil organic matter causing interference with the hydrocarbon analysis.

In its opening statement, EPCOR stated that in the Local Study Area (LSA), the actual disturbance of previously undisturbed soil for GP3 would be very limited because the new unit would be located within the plant footprint on previously disturbed soils covered by a clay pad. There would be temporary disturbance to the soils of the lay down areas during construction, after which the area would be reclaimed. The extension to the switchyard, parking lot, and the intake canal would disturb soils in small areas, and topsoil would be salvaged. When referring to the Regional Study Area (RSA), EPCOR stated that accelerated mining would not have a significant adverse effect on soil disturbance, since reclamation would be accelerated proportionally with the rate of mining.

EPCOR stated that cumulative effects of acidifying emissions on regional were presently well within acceptable levels. These soils had been assessed according to the framework developed and recommended by the CASA and AENV. EPCOR predicted that future values of acid deposition and associated impacts on soils would tend to decrease because of fewer SO2 and NO_x emissions from mine fleets in the area as a result of reduced sulphur content in the diesel fuel and the installation of NO_x control devices on off-road vehicles.

EPCOR indicated that as a member of the WCAS, it would participate in long-term biological monitoring to verify the predictions contained in their CEA, as well as the EIA,. EPCOR stated that soils in the areas of predicted maximum deposition should be monitored through sampling every ten years, which would allow enough time for measurable effects to occur.

EPCOR indicated that no soil sampling was done on the Paul Band Indian reserve, as it was outside EPCOR's regional study area. EPCOR did indicate that soils information for the area east of Lake Wabamun was possible to determine using the provincial soil survey. With that information, EPCOR found that the majority of soils in the area have low to medium sensitivity to acid deposition. The remaining soils in the area have medium to high sensitivity to acid deposition.

5.5.2 Views of the Interveners

Clean Energy Coalition and Mewassin

Both the CEC and the Mewassin stated that the emphasis for considering PAI was on the critical load of 0.5keq/ha/yr for medium sensitive soils in the application, while it should have been on the monitoring load of 0.35 keq H + /ha/y, in addition to the critical load. CEC stated that in the EIA, the area potentially impacted by exceeding the monitoring load was much greater than that potentially impacted by the critical load, and extended beyond the LSA into the RSA. The extent to which this exceedance would be environmentally significant was not determined.

When considered on a provincial level, this intervener stated that an exceedance may be smaller in size and perhaps importance, but that it was necessary to recognize that the potential for exceedance exists and consider the implications for this and future developments. CEC stated that once the potential for environmental exceedance is recognized, an adequate monitoring program for environmental damage due to acidification would be possible.

CEC stated that the CASA guidelines for monitoring, target and critical loads for acid deposition presented by EPCOR fail to show what the actual measured levels are in the area. it argued that reference should be made to the modelling results prepared for the CASA Acidifying Emissions Monitoring Implementation Team. CEC testified that a January 2001 presentation by that team showed that several areas in central Alberta (using 1995 data) already had deposition that exceeded the monitoring load. CEC further stated that reference should also be made to the monitoring results from the WCAS.

CEC further indicated that in their view, there was insufficient information about the treatment of hydrocarbon contaminated soil, noting that land-farming of wastes can result in the build up of metals and other non-biodegradable contaminants.

Government of Alberta

AENV noted that changes in the chemical properties of the soil (or water) occur when deposition of acidifying substances exceed the buffering capacity that may be present. Such chemical changes may modify chemical and nutrient cycling and the biological functioning of these systems. AENV has adopted the Alberta Acid Deposition Management Framework developed by the CASA. The Framework sets three different critical loads based on three categories of soil sensitivity to acid deposition. Target loads are lesser acid loads set as environmental management objectives. Monitoring loads are lower still, and under the Framework, are used to point to a need to collect additional data.

AENV noted that the Alberta Acid Deposition Management Framework was not designed to and does not apply at a local, project-specific scale. However, comparisons of project-specific acid deposition modelling results to the Framework's critical, target and monitoring loads may provide some guidance for monitoring actions. Based on modelling, EPCOR predicted that the cumulative acid deposition load level in some parts of the study area would be higher than 0.5 keq ha -1 y -1, particularly in mining areas. In comparison, the Alberta Acid Deposition Management Framework's critical, target and monitoring loads for moderately sensitive soils are 0.5, 0.45, and 0.35 keq ha -1 y -1 respectively.

AENV noted that EPCOR's model inputs likely overestimate the future acid deposition load. Nonetheless, Alberta stated that the results suggest the need for a program to accurately quantify acid deposition load, evaluate the environmental significance to terrestrial and aquatic ecosystems, and take action to reduce the load if necessary. AENV intended to incorporate such a requirement into the EPEA approval if GP3 was approved.

5.5.3 Views of the Board

The Board notes that historically, substantial soil survey work has occurred in the area surrounding Genesee, and that EPCOR has made efforts to use that information to the extent possible.

The Board fully supports AENV's view that the results regarding future acid deposition load suggest the need for a program to accurately quantify acid deposition load, evaluate the environmental significance to terrestrial as well as aquatic ecosystems, and take action to reduce the load if necessary. The Board recommends that AENV incorporate the requirement to

accurately quantify acid deposition load and to take appropriate action to manage any reduction in that load into their EPEA approval.

The Board is of the view that future soil sampling should focus on monitoring for impacts due to acid as well as heavy metals deposition, and preparedness to reduce the loading if required.

While WCAS may be one mechanism by which such monitoring could occur, the Board directs EPCOR, in conjunction with AENV, to use suitable methodology for monitoring acid deposition and heavy metals deposition on soils, whether singularly or in collaboration with other industry in the region. The Board directs EPCOR to ensure that a suitable soils monitoring program is in place and ready for commencement by the date of GP3 start-up. The Board recommends that AENV incorporate such soils monitoring requirements into the EPEA approval, and strongly supports such actions.

The Board is also concerned that the design of the soil sampling, while adequate for the purposes of an EIA, was not as rigorous as it would have been, had the study been designed for the purposes of interpreting a potential bio-accumulative pathway though the human food chain via soils. The typical base parameters (pH. EC, etc.) referred to by the applicant with respect to the detailed soils data collected in 1981 do not include the suite of contaminants assessed for the 2000 EIA. Therefore, the Board does not agree with EPCOR's conclusion that all chemical parameters of the soils sampled were within the natural range of variability, but rather believes the data to be inconclusive.

Despite this, the combined evidence leads the Board to conclude that potential impacts resulting from GP3 on soils are of the order that can be mitigated effectively, should impacts be detected during the monitoring program. Therefore, the Board recommends EPCOR to ensure that future soil contaminant sampling for the purpose of determining pathways to the human food chain only be combined with sampling to determine impacts specific to soils where independently designed methodology will allow. The Board recommends that AENV revisit the adequacy of the baseline data, and require further baseline soil contaminant data prior to monitoring as required.

The Board also understands EPCOR's argument that monitoring soils every 10 years is valid for determining a measurable difference in soils. However, the Board fully supports that AENV may require more frequent sampling intervals (perhaps three years), in the interest of determining a trend in acid or metal deposition, allowing suitable response to any potential impacts using proposed mitigation in a more timely fashion. The Board recognizes that such a requirement may be incorporated into an EPEA approval and the Board recommends that AENV consider a more frequent sampling interval than 10 years. Further details regarding the expectations of monitoring programs can be found in the decision section of this report.

5.6 Terrestrial and Wetland Vegetation

5.6.1 Views of the Applicant

EPCOR obtained terrestrial and wetland vegetation information for the LSA and RSA through interpretation of aerial photographs and review of existing environmental studies conducted in the area as well as other data sources (white zone forest cover inventory, ground-truthing). No

detailed plot sampling was conducted, however additional information on vegetation and wetlands was obtained through visual observations and site inspections undertaken in conjunction with other surveys (primarily fisheries and wildlife). A rare plant survey of the LSA and RSA was conducted after the EIA was submitted; the information collected was provided as part of the supplemental response by EPCOR. Impact models were used to assess both the environmental and cumulative effects of the project on selected vegetation indicators.

EPCOR reported in its application that construction, operation, and reclamation of the GP3 Project may result in changes to terrestrial vegetation and wetland communities. The impacts were predicted to be minor in magnitude. Some predicted impacts included vegetation loss from site clearing associated with construction of the GP3 unit, potential habitat alteration resulting from changes in air emissions, and water releases into the cooling pond during the operation of GP3.

EPCOR proposed various measures to mitigate potential impacts to vegetation. With respect to monitoring potential impacts from acidifying emissions and heavy metals on vegetation, EPCOR indicated its commitment to participate in WCAS and associated regional bio-monitoring studies. EPCOR also noted that appropriate receptors would be chosen, measured and monitored to evaluate ecosystem health.

EPCOR's impact assessment for potential effects of water temperature change on aquatic vegetation predicted no impacts on the abundance, diversity and health of aquatic vegetation in the cooling pond and NSR. In addition, EPCOR did not anticipate any adverse effects of water releases on aquatic vegetation health in the NSR; therefore, no mitigation was recommended.

EPCOR further stated that the guidelines and criteria set by AENV (1999) and the Federal Government (1981) for SO_2 and NO_x should provide adequate protection for sensitive species including rare plants, mosses, and lichens.

The EIA described that predicted annual average ground-level PAI concentrations (keq/ha/yr) for the future Genesee Generating Station in the vicinity of the five rare mosses should be about 0.1 keq/ha/yr, which is less than the Critical Load for sensitive ecosystems. EPCOR concluded that because of this prediction, it was unlikely that the PAI levels would have an adverse impact on these species. Although PAI levels could potentially reach levels of 1.0 keq/ha/yr in the vicinity of the cooling pond as the mine site moves north of the pond, EPCOR stated that an adverse effect on aquatic vegetation in the cooling pond was not expected because of the high buffering capacity of the water.

EPCOR indicated that no significant adverse environmental effects were expected with respect to vegetation health, including rare species, as a result of the operation of GP3. Although there would be an incremental increase in the deposition of heavy metals onto soils and plants, EPCOR did not expect that the rate of heavy metal deposition would increase soil concentrations above soil quality guidelines.

The cumulative assessment for the effects of air emissions, including PAI and heavy metals, on rare/sensitive species was the same as for the project specific vegetation assessment. In

EPCOR's application, the predicted air quality for present and future developments indicated that ground-level concentrations of criteria and toxic pollutants would remain within AAAQG. Little increase in PAI levels was expected in the region.

5.6.2 Views of the Interveners

Government of Alberta
AENV noted that NO_x can be of interest in relation to acid deposition and vegetation effects in addition to human health; NO_x may also contribute to ground-level ozone. AENV indicated that ground level ozone monitoring provides information about levels relative to the AAAQG value, but that ozone monitoring results are difficult to attribute to a source. Impacts to vegetation resulting from ozone formation are therefore difficult to predict.

AENV was of the view that there should be biomonitoring established throughout the region for both vegetation and soils. Such a recommendation would be made to those writing the EPEA approvals, recognizing that vegetation assessment is a complex issue.

Clean Energy Coalition
CEC held the view that the EIA was inadequate, and did not meet the accepted standard for EIA in Alberta, or the standard which had been imposed upon projects similar in scale and magnitude by AENV in the past. CEC cited a number of deficiencies, including lack of base line data and inadequate study areas resulting in a lack of assessment of a significant impact to the area. CEC further described the proposed monitoring programs as being insufficient in scope and scale to determine impacts of future emissions on vegetation, among other VECs, and stated that many of the terms of reference had not been addressed adequately, if at all.

This intervener recommended that the condition of vegetation should be investigated and monitored regularly for changes, and that further vegetation baseline studies were needed. CEC also recommended that all sources included in the CEA should be clearly identified for the past, existing, baseline, and future emissions scenarios.

CEC noted that deposition and uptake of ground-level ozone, ozone, and organic compounds is important to vegetation, particularly crops and forests. It was also noted that acid deposition can damage vegetation at concentrations below air quality guidelines. CEC suggested that it would be advantageous to see the present ozone modelling work extrapolated to include potential vegetation effects in the region.

CEC indicated that the WCAS monitoring sites were to the west of the Wabamun and Genesee power plants, and that based on the AENV modelling results for NO_x and SO_2 emissions in central Alberta (which have been made available to WCAS), it was likely that equal or greater effects of emissions would be found on sensitive vegetation to the east of the plant.

EPCOR's proposed mitigation for rare plants found in pre-site-clearing surveys would be to relocate the rare plants. CEC indicated that while this recommendation was commendable on the part of EPCOR, relocation of rare plants was a challenging undertaking with limited probability of success, and recommended extreme care in relocation of rare plants.

CEC acknowledged that EPCOR's participation in WCAS was one possible mode to accomplish regional biomonitoring, but further cautioned that the objective was to get the best possible advice based on science regarding biomonitoring, given the issues of human health and the environment.

Uptake of SO_2, NO_x, ozone, heavy metals, and organics were all factors that would need to be considered in a vegetation monitoring program. The appropriate size of study area for the monitoring program would be dependent on whether agricultural crops or natural vegetation were the focus of the study. The study could extend appropriately as far as 60 kilometres from a source, however CEC reiterated that this was not a single point source pollution issue, but one of multiple sources.

5.6.3 Views of the Board

The Board appreciates that much of the native vegetation in this region has been previously altered through other human activity, such as agriculture. The Board also recognizes that EPCOR has reviewed existing information regarding typical regional vegetation, and has performed a rare plant study with consideration for potential impacts from GP3 as well as predicted cumulative air emissions.

The Board notes that while the evidence regarding potential health effects on vegetation in this region may be inconclusive at this point in time, long term monitoring and reporting on vegetation health effects is warranted, both in the vicinity of the project as well as the region. Monitoring should incorporate suitable methods to detect potential changes to vegetation resulting from, air emissions, ozone formation, acid deposition on soil having secondary effects on vegetation, metal uptake, changes in species diversity, and particularly impacts on sensitive species (mosses, lichens) or rare plants.

The biomonitoring associated with WCAS is one suitable mechanism for ensuring that appropriate monitoring of vegetation occurs. However, the Board directs EPCOR to take a leadership role in ensuring that scientifically defensible monitoring programs, suitable for understanding potential regional impacts of air quality on vegetation both within and beyond the WCAS boundary are designed and implemented prior to commencement of operations of GP3.

Suitable bio-monitoring will include, but is not limited to, additional monitoring stations and/or relocation of current stations as recommended by AENV. The details of appropriate biomonitoring are expected to be coordinated with the requirements of EPEA approvals. In addition to addressing potential effects of primary air emissions on vegetation, the Board recommends that a program be developed by EPCOR in cooperation with AENV to examine potential impacts resulting from ozone formation, which will likely extend beyond the current boundary of the WCAS. Further expectations regarding appropriate follow-up monitoring can be found in the Decision section of this report.

While the area around Genesee is primarily agricultural land and rare plants are not considered to be a major concern for the project, the Board nevertheless believes that caution should be exercised in handling rare plants if they are encountered. EPCOR shall, in cooperation with AENV, examine various possible methods of mitigating impacts on rare plants prior to their

relocation. EPCOR will consult with rare plant experts at AENV on the probability of success of rare plant relocation or other methods, and endeavor to maximize the potential for rare plant survival during construction and operations. EPCOR should also discuss rare plant reporting and mitigation monitoring strategies with AENV.

5.7 Wildlife

5.7.1 Views of the Applicant

EPCOR used impact models to assess the environmental effects of the GP3 on selected wildlife indicators. These models were used primarily to describe and simplify the complex cause-effect relationships between project stressors and wildlife receptors. EPCOR evaluated the effect of project stressors on wildlife abundance, diversity and health.

EPCOR proposed various mitigation and reclamation measures to address impacts to wildlife from direct habitat loss. EPCOR stated that the lay-down area would be reclaimed back to pastureland immediately following the construction period, and reclamation of the site would be monitored, thus the majority of the habitat lost would be replaced in the short-term. The area was characterized as low quality wildlife habitat, and the end-use plan is to return this area back to agricultural land base. Therefore no enhancement for wildlife was proposed for this site.

The majority of the lands used by the mine were Class 3 agricultural lands and this has been the target for the land reclamation program. EPCOR noted that future mining areas (i.e. west of Hwy 770) will encounter lands that are currently classed as wildlife habitat. EPCOR committed to reclaim these lands back to wildlife habitat with equivalent capability for future EPEA operating approvals.

EPCOR reported that sensory disturbance associated with increased activity on the mine site would have an insignificant effect on wildlife. Noise levels on the mine site were predicted to decline as the result of noise reduction equipment that was proposed for vehicles and draglines. EPCOR noted in its wildlife impact assessment that many wildlife species were capable of habituating to noise and sensory disturbances that occur frequently or are continuous.

Despite that conclusion, EPCOR stated that Peregrine falcon reproductive success might still be impacted during the GP3 Project as the result of sensory disturbance. However, the probability of this happening was considered to be very low and within natural environmental conditions.

EPCOR predicted that the incremental increase in road traffic associated with construction and operation of the GP3 unit was unlikely to alter wildlife habitat use or movement patterns. It was recommended that the extent and location of vehicle-wildlife collisions be monitored and if problem areas were identified, signage or reflectors could be installed.

Specific wildlife surveys were not conducted of the NSR intake and blowdown area. EPCOR indicated that the pump house area was an existing licensed structure approximately one hectare in size that would not be affected by the addition of GP3.

EPCOR evaluated the potential occurrence of hazardous concentrations of air borne chemicals affecting wildlife health through an assessment of tissue chemistry in resident wildlife. The

current level of exposure of wildlife to air borne pollutants in the RSA was evaluated using red-backed voles.

EPCOR reported that although chemical concentrations were generally higher in the RSA sites than control sites, tissue concentrations for the study area, in general, were considerably lower than those reported elsewhere in Alberta (i.e., Swan Hills, Pembina Landfill and the Oil sands area of north eastern Alberta). Potential increases in tissue chemical concentrations in voles following the Genesee expansion were predicted by EPCOR to be small, and indicated that the operation of GP3 would likely have no significant adverse environmental effect on health of wildlife in the RSA.

In general, EPCOR reported data gaps in the toxicology literature for the chemicals evaluated that precluded accurate estimates of safe body burdens or tissue concentrations for small terrestrial animals. Many of the chemicals detected in EPCOR's tissue analysis of voles were macro or micronutrients that are physiologically regulated. EPCOR indicated that these chemicals were not likely to accumulate in terrestrial animals in their natural habitat to a concentration where toxicity might occur.

EPCOR explained that voles can be used to monitor changes in toxins in the environment and thus may be used as indicators of wildlife health. Since there were some differences in the levels of constituents found in voles from the GP3 RSA compared to the GP3 control sites, continued monitoring of vole tissues was recommended. EPCOR recommended that tissue samples should be collected adjacent to the Genesee site, as well as in control areas, approximately once every five years until project completion.

When questioned at the hearing with respect to monitoring species in addition to the red-backed voles, EPCOR indicated that it would not likely monitor other species unless concentrations of monitored chemicals in the voles indicated that need. EPCOR also stated that it would not be inclined to sample tissue from wildlife species on the Paul First Nation reserve as part of a wildlife health study.

EPCOR proposed that the cooling pond should be monitored regularly for waterfowl presence during the late fall and winter. If waterfowl numbers increased, EPCOR could extend the fall hunt to try to discourage over wintering, and prepare for a winter-feeding program if necessary. It was recommended in the application that EPCOR work with GPPAC and Alberta Fish and Wildlife Division of SRD. Together they would monitor crop depredation complaints resulting from waterfowl over-wintering on the Genesee cooling pond. In cooperation with the GPPAC Wildlife Sub-committee, established in 1999, EPCOR stated that they were committed to long-term monitoring.

EPCOR stated that cumulative impacts of the GP3 project and other existing and proposed projects included the effects of air emissions on wildlife health and habitat, as well as habitat loss. EPCOR reported in its supplemental information that the results of the bird and amphibian surveys conducted after the EIA was submitted, did not alter the conclusions of the original assessment. EPCOR concluded that the cumulative impacts would have an insignificant impact on the birds, amphibians, and other wildlife, as well as wildlife habitat, in the region.

The cumulative effects of developments in the RSA on wildlife species diversity were assessed by comparing the diversity of species and habitats that occurred in the RSA in 1977/1983 (original Genesee baseline studies) to the diversity of species and habitats recorded in 2000/2001 (GP3 baseline study). Overall, the number of bird and mammal species observed in the RSA has increased between historical and recent baseline surveys.

5.7.2 Views of the Interveners

Government of Alberta
AENV noted in its submission that the department of Sustainable Resource Development (SRD) is responsible for the management and conservation of renewable resources such as forests, fish and wildlife. SRD works closely with AENV in a number of areas including provision of assistance in evaluation of EIA reports and EPEA applications.

AENV indicated that at present, there is no clear evidence that air emissions have impacted or will impact wildlife species. It stated that uncertainties remained regarding the potential for air emissions from the Genesee power plant to affect wildlife. SRD agreed with EPCOR that there was data gaps in the toxicology literature for the chemicals evaluated that precluded accurate estimates of safe tissue concentrations for small terrestrial mammals. Furthermore, SRD stated that scientific knowledge was lacking on the range of variability in tissue concentrations. Because of these factors, SRD was of the view that EPCOR should implement an ongoing monitoring program relative to tissue chemistry trends in Red-backed voles and perhaps other wildlife species. SRD's view was that this monitoring can be addressed through the EPEA approval process.

Government of Canada
In addition to providing evidence that methyl mercury was bio-concentrated in predatory fish such as trout and pike, Environment Canada indicated that the same holds true for piscivorous birds and mammals such as loons, eagles, and otters.

Clean Energy Coalition
CEC noted that mercury emissions are of concern due in part to their impact on wildlife, and Federal and provincial guidelines for air emissions are designed for human health, not wildlife health, stated CEC. Regarding the high sulphur concentration reported in vole tissue analysis and explained by EPCOR to be a result of vole diet, CEC stated that EPCOR's conclusion overlooked the possibility that the higher sulphur in the diet could be the result of higher sulphur deposition in the area, leading to higher uptake of sulphur via food source.

CEC recommended an increase in the frequency of testing vole tissue from every five years, to yearly for at least the first few years that GP3 would be in operation, if approved. In its view, this would allow measurement of wildlife health to be monitored more closely. CEC questioned why no survey was conducted regarding use of the NSR by waterfowl in the area, considering they could potentially be affected by water quality as a result of blowdown from the power plant.

CEC noted that if the Peregrine falcon nest was disturbed, even if the environmental consequences are considered to be within "natural" conditions, such a disturbance would remain a violation of the *Migratory Birds Convention Act*.

The Paul First Nation

The PFN indicated that the wildlife impact assessment information provided by EPCOR as it related to the PFN was unsatisfactory. The PFN indicated that members of its reserve had hunted wildlife on the reserve, but that they could not use the wildlife harvested. With respect to muskrat and beaver caught along trap lines, the PFN panel indicated that the pelts were not of a usable quality. In addition, PFN members would no longer eat ducks caught in the Lake Wabamun region. It also had concerns about the level of monitoring being conducted in the region, and suggested that there must be an environmental problem or risk if such a high quantity of monitoring was occurring.

5.7.3 Views of the Board

The Board notes several commitments made by EPCOR in the application to ongoing monitoring and mitigation for potential impacts to wildlife, and the Board supports these efforts (e.g. monitoring over-wintering waterfowl on the cooling pond in winter). The Board is assured that sufficient programs are in place, coordinated between EPCOR and AENV/SRD, to mitigate potential impacts on wildlife resulting from project effects.

Of particular interest to the Board is the monitoring of wildlife health for potential impacts resulting from air emissions, and from substances that can bio-accumulate in the food chain. It is noted that AENV/SRD recommended continued monitoring and assessment of Red-backed voles, and potentially other wildlife species. The Board believes that such monitoring should be a regional initiative, but directs EPCOR in consultation with AENV and SRD to ensure that such assessment and monitoring is adequately designed and implemented to effectively track potential trends in tissue chemical analysis, as well as serve as an indicator of potential regional impacts to wildlife health resulting from air emissions. Given that water quality in the cooling pond has the potential to be affected by the project itself, the Board directs EPCOR in consultation with AENV and SRD to monitor wildlife directly linked to the cooling pond (for example, ducks) to occur as part of understanding trends in bioaccumulation in wildlife.

Such a monitoring program has links to WCAS work as well as ongoing human health monitoring, and should be coordinated with these links in mind. The Board would expect that data collected from monitoring in this region would contribute in a meaningful way to understanding impacts of air emissions in this region. Therefore, the Board would expect concurrent studies regarding the toxicological effects of various substances specific to coal fired emissions to assist in the interpretation of results of tissue analysis. The Board refers to the decision and other sections of this report for further details on monitoring.

The Board recognizes that, without the Genesee stack, the ability of the Peregrine falcon to successfully breed at that location might be compromised. Nevertheless, ongoing monitoring of potential impacts to species at risk (perhaps the Peregrine falcon), including their response to sensory disturbance, is recognized as a regulatory requirement, and is duly supported.

5.8 Noise

5.8.1 Views of the Applicant

In the Noise Impact Assessment (NIA) and testimony, EPCOR demonstrated that it was aware of the issues and of its responsibilities respecting noise emanating from current and future power generating and mining operations. Although it was able to address its own operations, EPCOR noted that the Boundary Creek Resources compressor station north of its facilities was a source of excess noise. EPCOR stated it had approached that company and advised them of the findings of its noise study. Boundary Creek Resources responded very promptly by adding noise abatement at the compressor station. EPCOR confirmed that even with the work conducted by Boundary Creek Resources there was still one residence where there was a noise exceedance. Because the cause of the exceedance was the Boundary Creek Resources compressor station, it was EPCOR's position that there was nothing further it was able do to further reduce noise at that location.

With respect to the Genesee mine, EPCOR stated that together with its joint venture partner Fording, they have been working closely with the community to address noise issues arising from existing operations. Some of the noise issues have been addressed with recently retrofitted muffler systems installed in the mine haul fleet. EPCOR submitted that this retrofit resulted in an 80 percent reduction in noise from this fleet. In addition, EPCOR believed that further mitigation measures it had committed to would result in significant improvements in noise emissions from the operations. These measures entail the retrofit to the mine haul fleet, fans on the draglines, and abatement on the key noise sources of the fixed plant. When completed, these mitigation efforts would comply with EUB noise guidelines, resulting in the entire operation being quieter than today.

EPCOR stated that it is committed to a verification noise monitoring program immediately following the commissioning of the completed expansion, and running at full capacity to ensure that the reduced sound levels have been achieved. EPCOR stated that the varification noise monitoring program would be conducted at the same residences and with a similar type of monitoring that had been performed in the NIA. EPCOR believed that once the verification monitoring was completed and demonstrated compliance with the EUB's Noise Directive, it would not anticipate further or ongoing noise monitoring. Rather, EPCOR would work through GPPAC to resolve any issues brought forward. EPCOR also planned to use the Coal Arch Chronicle to inform the community of its progress on issues and invite the community to submit any concerns that they may have by calling the contact numbers provided in the publication.

5.8.2 Views of the Interveners

Many residents living near the power plant and associated mining operations expressed concern about the overall noise levels and the potential for them to increase. They pointed out that total noise was a growing issue and that they do not have any way of screening out other new noise sources.

Some residents believed noise primarily from the mining area is particularly problematic. They pointed out that with all the changes in the area such as road closures, the noise of chains or

cables clanging, the hum of the dragline, and the back up warning signal (beeping sound) of trucks and front-end loaders, the noise was very annoying especially when residents are trying to sleep.

The Hebners stated that EPCOR had responded to the family's complaints and conducted sound measurements at their residence. However, they pointed out that Fording was aware of the testing and shut down some of the heavy equipment to reduce noise levels. A number of neighbors believed that the mining noise could easily be solved by restricting mining activity between the hours of midnight until six in the morning. Residents felt that EPCOR should undertake some type of ongoing monitoring to ensure noise levels from the power plant and mine did not increase.

Although the interveners who expressed concern about noise accepted that modeling of the current and future noise sources could predict the noise levels at nearby residences, they questioned how conservative was the criteria used in the modeling. Residents questioned whether the model would accurately predict the power plant and mining activity noise or whether it would minimize or ignore conditions that tend to favour noise propagation toward residences.

5.8.3 Views of the Board

The Board recognizes that increasing noise levels are an important issue for area residents. The Board however is satisfied with the level of detail and comprehensive nature of EPCOR's Noise Impact Assessment to identify all power plant and mining noise sources and in turn address them appropriately. The Board believes EPCOR's commitment to conduct a verification noise monitoring program after the GP3 is complete, and while operations are at full capacity, will ensure that the permissible sound levels are not exceeded. Should the permissible sound levels be exceeded, an appropriate enforcement action would be initiated by the Board.

The Board is also satisfied with EPCOR's commitment to work with the community through GPPAC and the Coal Arch Chronicle as a means to receive resident concerns about noise and other issues and address them in a manner that is acceptable to its neighbors.

5.9 Traditional Land Use

5.9.1 Views of the Applicant

EPCOR stated that funding had been provided to the PFN to facilitate presentation of traditional land use information at the EUB hearing. At the time of its application for GP3 the traditional land use information was not available. Discussions were ongoing between EPCOR and the PFN regarding the scope of work and level of financing necessary for EPCOR to support a study of traditional environmental knowledge.

5.9.2 Views of the Interveners

The Paul First Nation

The PFN took the position that traditional environmental knowledge was an essential component of environmental assessment that complemented western scientific approaches. EPCOR's application did not contain such information and thereby failed to address the concerns of GP3's largest stakeholder group. EPCOR denied the request of the PFN for funding of an expert

witness to address traditional environmental knowledge. It was the position of the PFN that EPCOR had not fulfilled its original commitment to the PFN.

The PFN requested the Board to deny or defer EPCOR's GP3 application until such time as a human health and traditional land use studies were completed. Should the Board decide to approve the GP3 application, the PFN asked that EPCOR's licence be conditional upon the completion of human health and traditional land use studies prior to GP3 start-up. It was stated that insufficient baseline data was present to determine effects of the GP3 project upon the PFN.

No other interveners submitted evidence regarding the issue of traditional environmental knowledge.

5.9.3 Views of the Board

The Board considered all the evidence that the PFN provided, including the exhibits submitted by PFN at the hearing, which the Board undertook to review.

The Final Terms of Reference issued by AENV for EPCOR's GP3 do not contain explicit reference to a traditional land use study or requirements for traditional environmental knowledge to be used in the environmental assessment. The Board notes that, nevertheless, EPCOR was required to assess the effects of its project upon current land uses and to consider the issues raised within its public consultation process that included the PFN.

Considering the evidence of EPCOR's heritage resource impact assessment and the EIA submitted for GP3, the Board believes that it has examined the land use issue sufficiently to reach its decision.

The Board understands that both EPCOR and the PFN are negotiating to complete a traditional land use study for GP3. EPCOR has committed to support a traditional land use study by the PFN and the Board has no reason to doubt that the study would be completed, as it is of mutual benefit to both parties.

6 SOCIO ECONOMIC ISSUES

6.1 Public Consultation

6.1.1 Views Of The Applicant

EPCOR released a Public Disclosure document describing the proposed GP3 project on December 15, 2000. During the following months, EPCOR consulted with the public and key stakeholders, conducted extensive studies, and contracted preliminary engineering design work in accordance with the Final Terms of Reference for the EIA issued by AENV on March 9, 2001.

An important focus of the consultation is the involvement of the GPPAC. Since its establishment in 1981, this group has represented the interests and concerns of the neighboring community, and worked with EPCOR to ensure such matters were addressed.

In addition to public information sessions, numerous one-on-one meetings were held with stakeholders who had a specific interest in the proposal and the regulatory review process.

To ensure a high level of communication between EPCOR and interested groups, individuals and the media, four public information sessions were hosted in communities located near the Genesee Generating Station, in Leduc County, and in Edmonton. The meetings had two objectives: to inform the attendees about the proposed project, and to encourage them to provide comments on the Draft Terms of Reference to AENV.

Public information sessions were advertised in local newspapers and posted on the EPCOR website. Approximately 100 participants attended four sessions held at:

- Genesee Community Hall January 15, 2001
- Leduc-Nisku Inn January 24, 2001
- Stony Plain Community Hall January 30, 2001
- Edmonton/Shaw Conference Centre February 06, 2001

EPCOR stated that it received valuable input throughout its consultation effort and a number of issues and concerns were raised by area residents relating to increased traffic and fog, a lost sense of community, land islanding and isolation, as well as concern over human health effects caused by pollution. In EPCOR's view, they took these concerns seriously and worked hard to find a solution to each of the issues raised. EPCOR further suggested that the commitments it made to address the community's concerns and the updating of its policies with input from the community had largely resolved the local issues that were raised.

To illustrate the effectiveness of the their consultation effort, EPCOR indicated that it was useful to examine the statement made by the Kruger Group. The Kruger Group indicated that EPCOR's application for the GP3 expansion created a time for reflection on:

- EPCOR's past performance in the community;
- the need for improvement;
- what has been done properly; and
- the cumulative affects of further expansion with respect to environmental and other long-term affects on the community.

EPCOR outlined its commitments to the community in the Genesee Information Bulletin dated September 2001 and in a memo to the Genesee community dated September 12, 2001. The memo addressed a number of issues including:

- Genesee By-pass Road;
- Genesee Heritage Interpretive Centre;
- Community Liaison;
- Environmental Reporting;
- Pasturing;
- Forage Leases;
- Coal Availability;

- Landfill;
- Water Well Replacement; and
- Land Acquisition Guidelines.

6.1.2 Views Of the Interveners

Clean Energy Coalition
CEC indicated that it appreciated the initiative of EPCOR to engage it in the prehearing consultation process. This allowed CEC members to identify and review issues associated with the GP3 project. However, the CEC noted that further resolution of issues might have been possible if not for the accelerated timelines. It also questioned the effectiveness of public consultation with the current number of proposed energy projects in the province.

The Paul First Nation
With respect to public consultation, the PFN gave EPCOR credit for meeting with them about the GP3 project. The PFN indicated it was not consulted in 1981 when the existing Genesee project was first proposed. While the PFN appreciated that EPCOR had consulted with them, it expressed concerned that EPCOR was setting the terms and conditions of how the talks were to be carried out.

The PFN further indicated that the information and the description of the potential impacts on PFN members was not adequate, and it lacked information about traditional land use and information on the current state of health of the PFN people.

The PFN also noted that AENV had consulted with EPCOR and industry but not the public about the new emissions standards before they were published. All of this gives the PFN little faith in the new emission standards.

The Kruger Group
The Kruger Group noted EPCOR's attention and diligence in attempting to develop an understanding of the community's concerns and to find an acceptable solution to both parties. As a result, they believed that EPCOR had a better understanding of the residents of Genesee and of their concerns. The Kruger Group noted that negotiations between EPCOR and the community residents had been long, difficult, and at times arduous. It stated that it did not achieve all the concessions from EPCOR that had been sought and while there remained issues that were not resolved to their complete satisfaction, the group was satisfied with the extent of concessions and commitments made by EPCOR. The commitments were significant and compelling enough to persuade the Kruger Group to withdraw as an active intervener at the hearing.

6.1.3 Views Of the Board

It is the Board's view that EPCOR's public consultation process involved a concerted effort to identify those who may be affected by the project and to engage them in a meaningful dialogue about the project, its potential impacts, local concerns and possible mitigation measures. The Board notes that although EPCOR was not able to resolve all issues raised by the local interveners, the Board commends EPCOR's efforts to engage the residents and for finding a resolution to satisfy the Kruger Group's concerns.

The Board expects EPCOR to continue its consultation and communication effort in addition to honouring its policies and the commitments it has made to all parties.

The Board would encourage both EPCOR and the PFN to continue and build on the dialogue that has been initiated between the parties.

6.2 Landowner Issues

6.2.1 Views of the Applicant

EPCOR explained that its land acquisition policy had been in place since the beginning of the Genesee project and had worked well. In response to input from the community, EPCOR increased the amount of notice provided to affected landowners for land acquition to five years. Upon notification, the landowners were free to sell at anytime during the five-year period. In recent negotiations with the Kruger Group, EPCOR agreed that those landowners resident within the mine permit, whose property would eventually be mined, were given the option to sell their lands to EPCOR at any time, even though the mining activity may not reach their lands for another 15 or 20 years. Agreements had been finalized between EPCOR and all landowners located within the mine permit boundary.

EPCOR acknowledged that a number of families (such as the "Hebner group"), located north of the mine permit area had wished for EPCOR to purchase their lands. EPCOR stated that these properties did not qualify for purchase under the company's land acquisition policy and would not agree to purchase them. EPCOR justified the decision on the basis that these lands were located outside the mine permit area, the lands were not required for mining operations, and, to make an exception to the land acquisition policy would open the door to others requesting an exception, as there will always be property just outside the line.

6.2.2 Views of the Interveners

The Kruger Group
The Kruger group indicated that it was satisfied with EPCOR's land acquisition policy as it was stated in the September 2001 Genesee Community Bulletin and in a memo from EPCOR to the Genesee community dated September 12, 2001.

The Hebner Group
It was the position of the Hebner group that the Genesee Mine had "islanded" or isolated a number of properties and that EPCOR's commitments with respect to land acquisition did not go far enough. They argued that a lack of direct access to their lands and an inability to expand their landholdings had resulted in less desirable properties to potential farm purchasers. Further, they asserted that their proximity to the mine had reduced the overall marketability of their property for residential use.

The Hebner group requested that EPCOR's land acquisition policy be revised so that lands caught between the mine and the NSR, whose ownership predated the present Genesee generating station, will qualify for purchase by EPCOR.

In response to questioning by the Board, Mrs.Hebner indicated that EPCOR had made exceptions to their land acquisition policy in the past. The group pointed out that EPCOR had failed to explain why it purchased three quarter sections of land south of the mine, even though this property was located outside the mine permit area.

The Hebner group raised a number of concerns over the lack of maintenance and the overall disrepair of the vacant buildings remaining on land that had been purchased by EPCOR.

CEC advocated for an improved land acquisition policy that would include a mechanism for arbitration, the option to sell land in advance of EPCOR's mining schedule, and compensation for all of the landowners' expropriation related costs including relocation to equivalent land.

6.2.3 Views of the Board

The Board recognizes that EPCOR's land acquisition policy for the Genesee generating station has been in existence since the initial commissioning of the Genesee 1 and 2 units, and that it was developed and improved upon with community input. Nevertheless, the Board also notes the evidence put forward by the Hebner group that EPCOR has made exceptions to its land acquisition policy in the past. On this basis, the Board requests that the two parties renew their negotiations in the interest of finding a resolution that is satisfactory to both parties.

The Board directs that concerns raised by the Hebner group over EPCOR's apparent lack of property maintenance and the safety concerns over an old, water-filled foundation on EPCOR's property be properly addressed by EPCOR.

Furthermore, the Board directs EPCOR to address property that is unsightly or in a state of disrepair. These properties should be improved and maintained and steps should be taken immediately to render its properties safe to the public.

6.3 Economic Benefits

6.3.1 Views of the Applicant

EPCOR submitted that the project would create additional employment and business opportunities during the construction phase and throughout the operation of GP3. Once completed, the addition of GP3 will increase Leduc County's assessment by $320 million and will contribute approximately $3.5 million (at 2000 tax rates) annually to Municipal revenues. EPCOR also indicated that the local municipal services would be capable of meeting any increased demands associated with construction activity or from increases in local population resulting from the GP3 expansion. EPCOR noted that the project had received letters of support from municipal leaders, union leaders, building and construction trades, and local business.

EPCOR stated it strives to be a responsible and responsive corporate neighbor by participating in and supporting community activities and by attempting to maximize the benefits to the local community that are available through agricultural leasing and business opportunities. EPCOR explained that its hiring practice is to employ the best skilled people and to maximize opportunities for local residents at the Genesee generating station.

EPCOR stated that it had not met with the PFN in relation to the existing Genesee project. However, with respect to GP3, EPCOR initiated discussions with PFN in April 2001, by hosting a Confederacy of Treaty Six First Nation Elders Advisory Council. EPCOR sought ways to work with the PFN so that its members can participate in a meaningful way either through employment or other economic opportunities.

On June 7, 2001 a protocol agreement (the Agreement) was signed between the PFN and EPCOR that defined their relationship during the review process and beyond. The Agreement was intended to foster mutual understanding through communication and cooperation. The two parties established a bilateral committee to implement the objectives of the Agreement and to develop supplementary memorandum of understanding for agreed-to initiatives. While talks between the two parties had stalled prior to the hearing, it was EPCOR's intention to renew its dialogue with the PFN.

6.3.2 Views of the Interveners

The Kruger Group
The Kruger group raised concerns over EPCOR's past inability or reluctance to enter into more partnerships within the community for land management, land leasing (grazing or cropping), maintenance of EPCOR property, and a local supply of coal. Through discussion and negotiation with EPCOR these concerns had been addressed to their satisfaction.

The Paul First Nation
It was the view of the PFN that it had not realized sufficient economic benefits from the extensive industrial activity (including the Genesee generating station) that was taking place around their lands. Further, it was their position that if the Board decided to approve the GP3 application, the Board should stipulate specific economic benefits for the PFN in its approval.

6.3.3 Views of the Board

The Board acknowledges the economic benefits to the region associated with GP3 and the letters of support from affected unions, the Alberta Building and Construction Trades Council, the City of Leduc and Leduc County.

The Board commends EPCOR's efforts to find a resolution to the concerns of the Kruger group respecting leasing of pasturelands, reclaimed forage lands, and establishing a local supply of coal.

The Board has addressed the issue of economic benefits and opportunities arising from large industrial projects being made available to aboriginal communities on numerous occasions in past decisions.

It remains the Board's view that while it encourages companies to take an active role in supporting education, training, employment, and business opportunities for members of First Nations in the region, the Board does not have the authority to direct or order that such programs be implemented by industry. The Board believes that the consultation initiated between EPCOR and the PFN in contemplation of GP3, notwithstanding difficulties that such talks often experience, is a genuine step in the direction of the resolution of mutual interests. The Board

recommends that the two parties continue their good faith negotiations in order to resolve the outstanding issues.

7 TECHNOLOGY SELECTION AND ENVIRONMENTAL PERFORMANCE OF THE PROPOSED POWER PLANT

7.1 Views of the Applicant

EPCOR stated that adding a third generating unit on the Genesee site takes advantage of an existing experienced workforce and up-to-date facilities. It utilized some pre-existing infrastructure and is located in close proximity to existing transmission infrastructure. Coal would be provided from the existing adjacent, fully operational Genesee surface mine.

EPCOR estimated that the annual coal production at the existing Genesee mine would increase from 3.5 million tonnes to 5.3 million tonnes. The existing Genesee Mine Permit area contains enough economically recoverable coal to provide fuel for all three generating units for more than 30 years. EPCOR stated that the sub-bituminous grade Genesee coal has a heating value of about 19.2 megajoules per kilogram (MJ/kg) or 8250 Btu/lb, and sulphur content in the range of 0.1% to 0.3%. EPCOR estimated that GP3 would have a coal burn rate of 226 tonnes/hour and produce about 41 tonnes/hour of ash. Ash production from GP3 would be returned to the mined out areas for disposal followed by subsequent reclamation of the ash disposal area.

EPCOR stated that the existing cooling pond and the coal-handling facilities were sized to accommodate the addition of GP3.

For several years, EPCOR investigated various coal-fired technologies for use at GP3. To select the best available and commercially reliable combustion and pollution abatement technology for controlling and reducing air emissions, EPCOR used the following six guiding principles and criteria:

Commercially proven technology
- combustion technology selected must have a proven track record
- commercial units must demonstrate reliable operation for at least 5 years

Approximately 400 – 600 MW capacity
- must meet and/or exceed current capacity of the existing units to be economically feasible

Reliable, operable, and maintainable
- must be no major concerns with the reliability of system components
- no unusual limitations to start up, shut down and load changes, frequency and duration of shutdown for repairs must be comparable to existing units

Environmental Performance & Efficiency
- must improve on current technology operating in Alberta

Cost and economically competitive
- must allow Genesee to remain competitive in the deregulated marketplace

Safety
- must be safe for operation and not present a concern for surrounding communities

Using the above criteria, EPCOR conducted a review of several coal combustion technologies and air pollution abatement technologies. The coal combustion technology review included subcritical cycle coal combustion, supercritical cycle coal combustion, ultracritical cycle coal combustion, atmospheric fluidized bed combustion, pressurized fluidized bed combustion, integrated gasification combined cycle combustion, and coal/gas hybrid. Similarly, EPCOR conducted a review of suitable technologies for abatement of air emissions of NO_x, SO_2, and PM.

EPCOR stated that the move from a subcritical cycle to a higher efficiency supercritical cycle was the only route to reducing CO_2 emissions in pulverized coal combustion power plants and have thermal efficiencies approaching 40%. Usually built for 400 MW or larger sizes, these types of supercritical units are approximately 10% more efficient than the existing subcritical units at Genesee.

Therefore, EPCOR concluded that supercritical coal combustion technology was the best choice because of its increased efficiency, which means extracting more value out of Alberta's natural resources, and reducing emissions on a per unit of output basis. Through this selection process, EPCOR believed that it had put together a project, which represented the most advanced coal combustion power generating facility ever built in Canada. When developing the project, EPCOR gave consideration to relevant environmental, social, and economic considerations associated with the GP3 project while consulting with interested parties, and while remaining consistent with ISO 14001. EPCOR believed that it must be able to deliver excellence in all three areas of the criteria before a project was viable.

After investigating other NO_x emission abatement technologies, EPCOR concluded that the most effective method was by preventing and reducing the formation of NO_x in the boiler down to acceptable limits. Consequently, EPCOR selected the low NO_x burners with over-fired air and sidewall blanketing, which would ensure GP3 operates with NO_x levels below the new Alberta standard (125 ng/J), for all load ranges of the boiler, over the foreseeable future.

EPCOR explained that the proposed system would have the ability to maximize the prevention of NO_x formation, by staging combustion by inputting the pulverized fuel coal under sub-stoichiometric conditions. This would reduce the initial temperature of combustion and sequentially adding air to ensure complete combustion at the burner and by sidewall insulation and over fired air.

EPCOR stated that all processes for removing sulphur from the flue gas of a pulverized fuel boiler converted the sulphur to a form that was inert, easy to capture, and isolated prior to the flue gas entering the stack. EPCOR narrowed its choice to dry lime and wet limestone flue gas de-sulphurization systems, noting that the dry lime system had lower capital cost but higher operating cost than the typical wet limestone system. EPCOR concluded that because Genesee coal has low sulphur content, the dry lime system was the most suitable option for sulphur removal that will perform well for GP3.

For particulate removal, EPCOR stated that essentially, there are three systems in general use for removing particulate, primarily consisting of fly ash, and narrowed its choice to the electrostatic precipitator or a fabric filter baghouse. EPCOR explained that because GP3 is designed to

remove sulphur upstream of the particulate plant, the dust removal system must handle the flue gas particulate along with the gypsum and free lime added to the flue gas to remove the SO_2. EPCOR further pointed out the advantage of a baghouse was that it is a constant output machine, consistently removing particulate at the outlet irrespective of the load on the unit. The baghouse is capable of removing very fine particles and is not subjected to the dangers of particulate carry-over, while a portion of the fabric filters are being cleaned. EPCOR stated that the baghouse reliability used to be a problem in the past, but knowledge and technology have improved to the point where bags are lasting up to 5 years without a change.

Ultimately, EPCOR selected a fabric filter, or baghouse, for particulate remove for the GP3.

Having selected the pulverized coal combustion and pollution abatement technology as described above, EPCOR stated that GP3 unit will incorporate high efficiency boiler and turbine, and would include the following principal process facilities and related equipment:

- a supercritical pressure pulverized coal fired boiler for producing steam,
- a dry flue gas desulphurization unit for removing SO_2 from the flue gas,
- low NO_x fuel burners,
- a high efficiency dust-collection system using fabric filter baghouse to reduce particulate and associated mercury emissions,
- a 138-metre stack for flue gas exhaust,
- use of the existing cooling pond,
- steam turbine condensing and cooling water equipment specially designed to minimize back pressure and enhance efficiency, and
- a generator transformer.

EPCOR explained that steam would be produced at a temperature of 565 ^{o} C and at a pressure of 24.1 Mpa. The annual electric energy production was estimated to be 3745 GWHs, at an annual availability factor of 95%. EPCOR estimated the proposed GP3 to operate at an overall thermal conversion efficiency of 42.0% (gross) and 38.5% (net). EPCOR stated that the higher moisture and ash content in the Genesee coal was a limiting factor in the overall cycle efficiency, and that higher efficiencies would be possible with better quality coal.

EPCOR estimated that the annual emissions from the GP3 would be as follows:
- SO2 – 2,700 tonnes (based on an emission limit of 78 ng/J)
- NOx – 4,400 tonnes (based on an emission limit of 125 ng/J)
- Particulate Matter – 300 tonnes (based on an emission limit of 8.6 ng/J)

In the initial planning stage, and prior to announcing its intention to proceed with the development in its Public Disclosure document issued on December 15th , 2000, EPCOR believed that any proposed coal fired power generation unit would have to be markedly better than existing coal-fired units. The projected performance of the proposed GP3 was selected to greatly out-perform the provincial guidelines for NO_x, SO_2, and PM emissions, as it existed at the date the Public Disclosure document was issued. Subsequent to announcing the GP3 project, the Government of Alberta issued new source performance standards for these three regulated

emissions, as shown in the following table.

Substance	Emission Limit (ng/J)
SO2	180
NOx	125
PM	13

EPCOR confirmed that the GP3 project would meet these new standards. In addition to meeting these new Provincial standards, GP3 would be the most efficient coal combustion power plant in Canada, existing or proposed, with an improved efficiency of greater than 10% compared to the existing Genesee generating units and other existing coal combustion units in Alberta.

EPCOR initially stated that emissions of SO_2, NO_x, and PM from GP3 would meet or be lower than the new Alberta Source Emissions Standards for coal-fired power plants for SO_2, NO_x and PM. Subsequently, EPCOR made further voluntary commitments to reduce emissions of SO_2 and PM to levels closer to the US EPA standards applicable to new coal-fired power plants proposed in the USA. The emissions of SO_2 would be limited to 78 ng/J, while PM would be limited to 8.6 ng/J.

EPCOR stated that it believed that GP3 would set the pace for coal combustion power generation in Canada with its commitment to higher efficiency and lower emissions.

EPCOR advised that it had committed to participation in Canada's Voluntary Challenge and Registry program, as well as annual corporate targets for GHG reductions. Its commitment to do its part in addressing this global challenge began in 1994 when it set its first target for GHG reduction of one million tonnes per year reduction within 5 years. That target was achieved by 1997. Specifically for GP3, EPCOR committed to offset carbon dioxide emissions to the equivalent of a natural gas, combined-cycle generating facility of the same capacity, on a corporate net basis, which represented a 53% reduction of GHGs attributable to GP3.

EPCOR outlined that this target would be achieved through a combination of three approaches:

- CO_2 emissions would be minimized at the generating station through the application of the more efficient supercritical boiler technology;
- EPCOR would continue on a program of renewable energy investment, which would generate a stream of offsets that can be applied to GP3; and
- The program would be augmented with CO_2 offset trades.

In 1998, the Government of Alberta published a strategy for Action on Climate Change. While the document was primarily an overarching policy statement, it did incorporate a commitment to support some key principles and objectives. For example, the strategy states:

> *"Alberta's response to the climate change challenge should be based on the province's needs and circumstances in the national and global context, and should maintain its commitment to People, Prosperity and Preservation. Alberta should continue to be a world leader in promoting the wise use of energy resources…"*

EPCOR stated that its plans for GP3 were entirely consistent with this approach.

EPCOR advised that the Development Permit from Leduc County for the construction of GP3 was issued on July 9, 2001.

7.2 Views of the Interveners

Clean Energy Coalition
CEC advocated the use of the least polluting coal combustion technology possible, such as integrated gasification combined cycle (IGCC) or similar process.

CEC stated that burning coal creates the most pollution from any form of power generation, and should not be approved, unless the proponent can justify the use of this option on the basis of no reasonable, less polluting alternative was available to meet the need for electrical power in Alberta. It argued that its recommendation would be consistent with the "economic, orderly and efficient" development of power generation in Alberta consistent with the public's interest in maintaining environmental health and reducing pollution to the extent possible**.**

CEC noted that EPCOR was also committed to complying with the requirements of the CEAA for assessment of environmental impacts, and noted EPCOR's claims that it's EIA met the federal standards for impact assessment. The CEC pointed out that CEAA requires an analysis of whether the project is required, the objectives of the project and analysis of whether the project is the best way to fulfill the objectives. The CEC suggested, that three specific questions need to be answered:

- What are the alternatives in technology?
- What are the environmental effects associated with each alternative?
- What is the rationale for selecting the preferred alternative?

CEC argued that EPCOR had not identified the objectives of its project or the alternatives, including demand side management, or producing electricity through natural gas, wind power or hydro power, or other less environmentally damaging alternatives.

CEC noted that on the question of efficiency of GP3, the Board should take note of the testimony of its expert witnesses that IGCC offered higher efficiency option, which was not vigorously explored by EPCOR.

CEC argued that the proposed GP3 facility would result in a significant and unnecessary addition of greenhouse gas emissions to Alberta's GHG inventory, further exacerbating the environmental and economic risk the province faces with respect to management of these emissions. It further argued that the greenhouse gas management plan proposed by EPCOR is inadequate because it has deviated from an earlier commitment for a 100% offset or reduction of emissions from new generation projects. In light of this, the CEC suggested that it was not clear how EPCOR would meet their stated target of a 6% reduction below 1990 levels in net greenhouse gas emissions from existing operations.

CEC also argued that combustion technology and emission control technology proposed by EPCOR was not the best available technology, and would result in emissions, which barely meet the new Alberta emission standards for SO_2, and NO_x. The plant would emit more of these substances than necessary for the anticipated forty-year life of the plant. The CEC stated its concern that the outdated technology proposed for GP3 may be grandfathered by Alberta Environment for a longer period.

CEC noted that the proposed licenced emission levels for GP3 for SO_2 and NO_x far exceed US standards for new source emissions. The CEC pointed out that since EPCOR was proposing to operate in a regional market including the northwest of the US, there was no justification for not requiring a "level playing field" in terms of environmental performance, and to avoid utilizing Alberta's environment to subsidize corporate profit from electricity exports.

CEC complained that there was no public review of the new Alberta emission standards for coal-fired power plants, but rather the standards were announced only after industry consultation and were not supported by any scientific rationale provided by Alberta Environment. The CEC argued that the interim standards were not based on scientific criteria, and therefore, should not be relied upon. It questioned the effectiveness of the new standards if they were, as announced by AENV, to be reviewed in the near future.

Mewassin
Mewassin recommended that if the Board decided to approve the proposed GP3, then any such approval should be conditioned upon EPCOR utilizing the best available technology:

- for combustion; namely IGCC or alternatively;
- the best available emission control technology including SCR such that EPCOR's submissions meet at a minimum, the US EPA standards for new emission sources from coal-fired power plants.

Mewassin stated that, if approved, GP3 would be a major source of environmental pollution including greenhouse gases, SO_2, NO_x, and PM, all of which are harmful to the environment and to human health. Mewassin pointed to the fact that Alberta had adopted the Canada-wide commitment to pollution prevention so that new sources of SO_2 and NO_x emissions in all parts of Canada use processes, practices, materials, products, and energy that avoid or minimize the creation of these pollutants. It also noted Alberta's commitment to ensuring that new facilities and activities incorporate the best available economically feasible technologies to reduce PM and ozone levels and to "keep clean areas clean."

Mewassin argued that it was obvious from the amount of new power generation being proposed in Alberta, and EPCOR's recent application for an export permit, that some of its new electrical power was destined for the United States. Mewassin recommended that EPCOR should be required, as a minimum, to meet the highest standards in North America, where its power would be marketed.

The Paul First Nation

The PFN recommended that EPCOR be required to use best available and commercially reliable technology for GP3. The PFN maintained that the Alberta Government's rush to have new generation constructed and operated in Alberta should not be at the lowest cost to EPCOR and at the expense of and to the detriment of PFN. The PFN urged the Board to direct EPCOR to incorporate the best-available NO_x removal technology in order to fulfill the Board's responsibility to ensure that the project meets the public interest. It cautioned that electric generation deregulation in Alberta should not be the primary test to be met.

The PFN referred to letter of August 9, 2001 from Federal Minister of the Environment to EPCOR which stated that the levels of SO_2 and NO_x emissions proposed for the GP3 do not reflect the performance of the best available and commercially reliable technology. The letter also stated that the required performance levels for a number of recently permitted and operating U.S. power plants, in areas that have similar air quality to Alberta's and burn similar coals, were much more stringent than those proposed by EPCOR for GP3.

The PFN pointed out EPCOR's position on the Alberta guidelines that these were not specifically law but mere guidelines. In this respect, the PFN stated that it brought EPCOR's commitment to voluntary reduction in SO_2 emissions into question.

While agreeing with EPCOR that one could not predict all upset scenarios with respect to plant operations, the PFN questioned EPCOR's claims that the GP3 baghouse would keep particulate emissions under 0.055 tonnes per hour, noting that EPCOR did not have any experience in the operation of the baghouses.

The PFN expressed concern that there was no Canada-wide standard yet for mercury, which implied that the PFN may have been exposed to unsafe levels of mercury emissions from the existing power plants in the region. The PFN pointed to the testimony of Government of Canada that no level of mercury emissions may be considered safe. Furthermore, it argued that there were a number of benefits of reducing NO_x, including reduction of particulates and mercury emissions. Therefore the PFN urged EPCOR to do more to reduce NO_x emissions from GP3 using best available technology recommended by Government of Canada.

Government of Canada

With respect to the emissions performance of the proposed GP3, Government of Canada believed that the application of commercially-proven technology can attain emissions performance better than initially proposed by EPCOR for NO_x and SO_2. Also, Government of Canada believed that EPCOR should consider retrofitting of the existing two Genesee units with best-available technology to offset the emissions from GP3. Government of Canada stated that these two recommendations were essential to ensuring that the current air quality in the area was maintained or improved.

In this respect, Government of Canada commended EPCOR's voluntary commitment to match the current US EPA standard for SO_2; this was a positive step forward.

Government of Canada recommended that given the concerns about cumulative environmental effects, every new project should, on its own merits, meet the goal of keeping clean areas clean. This goal involves the installation on new projects and on upgrades of the best-available economically feasible technologies to reduce PM and ozone.

Government of Canada further recommended that emission performance of GP3 should conform with the commitments made in accordance with the Canada-wide standards for PM and ozone. While not recommending any particular technology for emission abatement, such as SCR, Government of Canada stressed that any form of best-available technology would be acceptable if it met the recommended emission levels.

Government of Canada noted that it became clear from the evidence presented at the hearing that there was still much uncertainty of the potential environmental effects of the proposed GP3, and that further study and monitoring and modelling would be required to identify not only effects from this single facility, but also the effects due to the multiple facilities in this area. Government of Canada suggested that it was not uncommon for there to be uncertainty about the future environmental effects of large or complex projects such as the EPCOR project even after extensive environmental assessment. For this reason, Government of Canada urged the Board to take into consideration in its decision the technique of adaptive management.

Government of Canada explained that adaptive management was a process whereby mitigation measures would be put in place in conjunction with a monitoring program to verify whether these measures were having the intended effect. If not, then the mitigated measures could be adapted to address any emerging problems.

Government of Alberta

In its submission, AENV noted that the technology proposed by EPCOR for GP3 would meet or better the new Alberta source performance standards for emissions of SO_2, NO_x, and PM from new coal-fired power plants.

AENV stated that it had no objection in principle to the Board granting an approval for the GP3 the project, thereby allowing EPCOR to proceed to the detailed approval phase under the EPEA. Furthermore, it indicated that should the Board grant the application, and in the event that the project is to receive an EPEA approval, AENV intended to make a number of recommendations to the Alberta Environment decision-maker about specific approval terms and conditions that may apply prior to and during GP3 operations.

AENV expressed its view that EPCOR's technology selection was capable of meeting Alberta's new emission standards for new coal-fired power plants published in June 2001. It explained that the standards were designed to guide EPEA approval requirements on stack emission limits. As evidenced by the AENV witnesses, the new Alberta standards were a timely and realistic improvement over the existing 1993 Federal emission guidelines.

Mercury emissions from the project were not addressed in Alberta's ambient air quality guidelines, and AENV acknowledged that the potential environmental and health impacts needed to be carefully addressed.

AENV submitted that if the GP3 proposal were to receive both EUB and Alberta Environment approval, then Alberta anticipated that the Alberta Environment approval would provide for a mercury monitoring and management program. Furthermore, AENV anticipated that a Canada-wide standard would be recommended to the Canadian Council of the Ministers of Environment in the spring of 2002, and any resulting standard would likely be incorporated in power plant approvals as part of implementation for that standard.

In respect to emission standards, AENV pointed out Alberta has committed to engage stakeholders, including the Government of Canada, in the consideration of post-2005 emission standards for coal-fired power plants.

AENV acknowledged EPCOR's announcement of a voluntary SO_2 target at the hearing as a positive signal from industry respecting the potential gains that could be made through this process.

Alberta noted that greenhouse gas emissions, such as CO_2, were not currently a regulated air emission in the province. The importance in taking a leadership role in encouraging of greenhouse gas emissions in the province was recognized.

7.3 Views of the Board

The Board acknowledges that EPCOR's decision to use supercritical pressure pulverized coal combustion technology for GP3 was the result of a technology review. Many technologies currently used, that have a proven track record, and ones at the demonstration stage, or that show promise in the near and foreseeable future were reviewed. The Board is very encouraged at EPCOR's decision to improve upon the coal combustion technology used in plants currently operating in Alberta and elsewhere in Canada. Indeed, the Board is of the view that it is prudent for proponents of new coal fired generating capacity additions in Alberta to show improvement in technology selection over that used at existing coal fired power plants.

The Board considers it to be very important that proponents must consider incorporating flexibility in the design of new power plants so they may adaptively respond to a changing regulatory environment.

The Board observes that use of more efficient coal combustion technologies requires less fuel to produce a unit of electric energy, which directly leads to a proportionate reduction in the generation of all emissions during the process of coal combustion. In this respect, the Board also notes EPCOR's estimate that GP3 will operate at an overall thermal conversion efficiency of 42% gross and 38.5% net. EPCOR noted that this will be greater than 10% more efficient than the existing Genesee units 1 and 2 and the average existing coal combustion units in Alberta. This means GP3 will generate fewer emissions, including the emission of greenhouse gases, per unit of production.

With respect to the recommendations made by the CEC that least polluting coal combustion technologies, such as IGCC or similar processes should be used for GP3, the Board accepts the evidence presented by EPCOR that the few IGCC plants that are in operation depend on industry

or Government subsidies and none are similar in size to GP3. The Board acknowledges that while the IGCC technology holds some promise for producing much lower emissions of $S0_2$ and NOx and higher efficiencies, it is some years away from commercial adoption for the plant size proposed for GP3.

The Board believes that the level of efficiency predicted by EPCOR for GP3 is a reasonable level of achievement, considering the moisture and ash content and the overall fuel quality from the Genesee mine. Therefore, the Board is satisfied that the proposed use of supercritical pressure pulverized coal combustion technology proposed for GP3 would represent significant improvement over the existing subcritical pressure coal combustion technology in use at existing power plants in Alberta.

The Board notes that EPCOR also conducted a detailed review of the various technologies available for controlling and reducing the emissions of SO_2, NO_x, and PM, using the criteria as shown in its evidence. Although EPCOR initially indicated in its applications that the GP3 project would comply with the new Alberta source emissions standards announced by Alberta Environment, it subsequently announced a voluntary reduction in SO_2 emissions to 78 ng/J level, which is considerably lower than the new Alberta standard of 180 ng/J. The Board views this as a significant step that EPCOR has taken in recognition of the availability of commercially proven best technology to minimize SO_2. This move by EPCOR shows concern for emissions and is a positive step toward raising the expectation for future coal-fired power plant applications.

The Board accepts EPCOR's request that this level not be made a regulatory condition of approval. The Board agrees that doing so could provide a disincentive for future applicants and the Board wishes to encourage pursuit of further emissions reductions wherever reasonably possible. Regarding EPCOR's position that reporting of operational performance of SO_2 emissions should be based on 180 ng/J standard and not on the voluntary target of 78 ng/J, the Board finds it appropriate that the reporting be based on the current Alberta standard. However, the Board is of the view that stricter emission standards for SO_2 are reasonably foreseeable, in which case it would be appropriate for EPCOR to report its performance with respect to future standards when these come into effect.

The Board believes that the baghouse technology proposed for the GP3 unit will provide superior control of particulate emissions compared to other technology options, and is an appropriate choice. Although this technology has not been utilized in EPCOR's existing facilities, the Board is confident that EPCOR will be able to operate the baghouse acceptably. The Board requires that EPCOR report its emissions performance to the public monthly, and again recommends that this reporting also be a requirement of the EPEA approval.

The Board accepts the low NO_x burner technology proposed by EPCOR as capable of complying with Alberta's Air Emissions Standards for Coal-Fired Power Plants. The Board, also however accepts the views of Environment Canada and other interveners that commercially proven approaches are available for achieving much lower NO_x emissions to the 50 to 70 ng/J range typical of the US NSPS[4] requirements. The Board considers that proponents of new power plants

[4] United States Code of Federal Regulations, Title 40, Chapter 1, Subchapter C, *Part 60 – Standards of Performance for New Stationary Sources*.

in Alberta need to be aware of foreseeable changes to current emission standards and to incorporate flexibility in the design of the plants to facilitate retrofitting of improved controls should these become necessary.

The Board recommends that since changes to the current source emission standards are reasonably foreseeable, it is prudent for proponents of new power plants to incorporate flexibility into their projects so that compliance could be assured within a reasonable timeframe.

8 IMPACT ON AREA TRANSMISSION SYSTEM AND UPGRADES

8.1 Views of the Applicant

EPCOR indicated that on January 31, 2001, it made an application for System Access Service with the Transmission Administrator (TA). The TA prepared Functional Specification outlining the scope of the switchyard extension and the required system upgrades. The Functional Specifications indicated that the Unit 3 transformer would be required to be a dual voltage tap at 500 kV and 240 kV to allow for operation of the generator while the Keephills-Genesee-Ellerslie transmission loop remains operating at 240 kV.

EPCOR plans to design the switchyard extension at Genesee as a 500 kV facility to be operated at 240 kV until the system voltage is upgraded in the future. The TA also requested that TransAlta Utilities Corporation (TAU) provide design, cost, and schedule information for a system circuit breaker upgrade work at TAU's Keephills, Ellerslie and Benalto substations. System upgrades also included line terminations for 1202L, 1203L, and 1209L.

EPCOR would submit an application to the EUB in the future for the extension to the Genesee Switchyard, and TAU will coordinate its application for the system upgrades at its substations.

EPCOR noted that TAU also intends to add approximately 900 MW at Keephills, which would tend to advance the need for further transmission reinforcements as well as the need to convert the existing Keephills-Genesee-Ellerslie loop to 500 kV operation. The conversion to 500 kV operations would require 500/240 kV substations at Keephills and Ellerslie, but would only require taps to be changed on the dual voltage transformers at Genesee.

8.2 Views of the Interveners

ESBI appeared at the hearing as a friend of the Board to provide a general overview of transmission issues resulting from the potential for new generation in the West Edmonton area.

ESBI indicated that new transmission facilities would be required to integrate the GP3 generation facility into the AIES, including:

- extending the existing 500 kV rated bus work
- installing two new 500 kV circuit breakers
- installing approximately 300 metres of transmission line running from GP3 to the existing Genesee substation
- reviewing and upgrade various transmission line elements in order to achieve the transmission line thermal limits
- checking the protection settings

- swapping a number of circuit breakers due to the higher fault levels associated with the new GP3 generation.

ESBI indicated that preliminary studies indicated the potential for growing generator instability when all three Genesee units are on line, the Genesee substation is energized at 240 kV, and a three-phase fault occurs near the Genesee plant. EPCOR commissioned a due diligence review that confirmed the instability. The generator instability can be addressed with a generator rejection remedial action scheme (the "RAS Scheme") that will trip GP3 under specified fault conditions.

ESBI indicated that it does not have any outstanding concerns with the interconnection of the GP3 to the AIES. With respect to congestive management, ESBI filed an application with the Board in November 2001.

8.3 Views of the Board

The Board agrees with the TA and EPCOR that although precise details of the connection of GP3 with the AIES were not presented at the hearing, technically it is feasible for the power plant to connect to the AIES.

9 DECISION

The Board finds that approval of the proposed 490-MW expansion of the Genesee power plant of EPCOR Generation Inc. and EPCOR Power Development Corporation is in the public interest for the reasons set out in the previous sections of this report.

Therefore, the Board approves Application No. 2001173 with the following conditions, directions, and recommendations:

The Board expects that EPCOR will adhere to all commitments it made during the consultation process, in the application, and at the hearing on such matters as mitigation, monitoring, and bilateral agreements.

Monitoring

The Board notes that in almost every discipline related to environmental issues, improved monitoring was either recommended by EPCOR or the interveners. It was suggested that the WCAS would be an appropriate forum for that monitoring. The Board does not doubt that WCAS may address several of the issues in question, however, the existence of WCAS does not alleviate EPCOR, and other regional operators, of the responsibility to ensure that appropriate regional biological baseline study and ongoing monitoring and analysis occurs. Therefore, the Board directs EPCOR, in cooperation with other operators, to design, fund and implement monitoring programs to the satisfaction of AENV. The Board requires that as a minimum, the improved monitoring will address the following items.

1) The monitoring aspect of the program must be developed on a timely basis so that it can be implemented from the commissioning of GP3. The Board notes that the program will need to incorporate further baseline data collection and analysis in the interim to define the monitoring locations and parameters to be monitored.
2) The monitoring standards must provide for conclusive, reliable assessments. Specific time periods for data collection and periodic assessment should be identifiedin consultation with the relevant regulatory authorities. EPCOR, in cooperation with other industrial operators in the region as appropriate, will be required to report to Alberta Environment and the EUB any potential or measured adverse impacts on the environment revealed through monitoring or assessment. This reporting will take place following EPCOR's (or other operators) knowledge of the adverse impacts in accordance with Alberta Environment's regulatory and approval requirements.
3) As environmental monitoring requirements are mandated by AENV and SRD, the Board looks to these regulators to determine effective reporting methods for EPCOR. These may include appropriate notification to the Board on significant monitoring trends, cumulative environmental effects or compliance issues.

If EPCOR can demonstrate to AENV that WCAS boundaries can be expanded and programs can be designed so they meet the environmental (including bio-monitoring) and health monitoring and evaluation requirements outlined in this report, then the Board will find WCAS to be a suitable vehicle to address these requirements. Should expansion of WCAS not be feasible or if WCAS consensus cannot be reached on boundaries, monitoring locations and/or responsibilities

for additional funding, the Board will expect EPCOR to lead, support and implement additional independent monitoring along with other regional industries to the satisfaction of AENV.

The Board is aware that the onus does not rest with one company to fully assess and monitor the cumulative impacts of an entire region involving many industry players. However, the Board requires that EPCOR, along with other companies in the region, play a significant role in the development and maintenance of regional programs aimed at understanding and mitigating potential impacts to human health and ecosystems. The Board believes that participation in the regional health study and development of the WCAS biomonitoring program as well as one for an expanded airshed as discussed in other sections of this report will address this need.

Source Emissions Standards/Grandfathering

The Board views that EPCOR's proposed facility will meet current source emission standards.

The Board also notes that coal fired generation projects such as the proposed GP3 project may have operational lives measured in several decades.

Therefore, the Board believes it is prudent for proponents of new power plants to be designed in such a way as to be able to incorporate the flexibility as is necessary to meet new and reasonably foreseeable environmental standards that are established by regulatory bodies.

In considering the long-term impacts of the operation of GP3, the Board makes the following observations and recommendations:

1) EPCOR's proposed facility will meet current Alberta source emissions standards for SO_2 and PM, and EPCOR has selected technology that is commercially proven to meet or exceed these standards.

2) EPCOR's proposed facility will meet the current Alberta source emissions standard for NO_x, but the Board notes that commercially proven technology exists that could achieve greater reductions.

3) The evidence appears clear that the federal and provincial standards for SO_2, NO_x and PM are expected to change in the reasonably foreseeable future.

4) The Board is aware that, generally speaking, mercury can have a significant impact on both ecological biota and human health, and the Board notes that mercury is on the Canadian Council of Ministers of the Environment's priority substances list. The issue of mercury contamination is one that remains of significant concern to the Board. The Board is aware that the Canada Wide Standards (CWS) process to develop limits for mercury is currently underway, and that a standard for mercury is expected in 2002.

   The Board has heard evidence that GP3 is not expected to contribute significantly to already high background levels of mercury in the region, but that the regional

power plants' contribution to mercury in the region remains unclear. The Board notes that several details of monitoring programs have been proposed by EPCOR, the Government of Alberta, and the Government of Canada that specifically address mercury and metals in the environment generally. The Board expects that detection of mercury and its sources, and determining changes in mercury over time, will be integral components of air and biomonitoring programs in the region. Although the exact standard has yet to be determined, the Board believes that it is reasonably foreseeable that there will be reductions in permissible mercury emissions.

The Board concludes that it is desirable for EPCOR's GP3 to take into account the likelihood of stricter environmental standards, and in particular, more stringent emissions source guidelines and standards, that are likely to be established in the near term by provincial and federal governments.

In order to ensure that Albertans enjoy the best environment possible within standards considered appropriate, the Board recommends AENV give serious consideration to addressing the matter of power generation facilities being required to meet evolving standards. The Board believes that it is beneficial to minimize incremental air emissions to the extent practicable so that current air quality will either be sustained or improved.

The Board strongly recommends to Alberta Environment that its EPEA approval process for GP3 define how reasonably foreseeable revisions to Alberta's emission standards, including mercury, are to be implemented by EPCOR, including appropriate compliance timelines. The Board does not believe that the notion of "grandfathering", that is the exemption from future, stricter environmental standards, is appropriate in this situation.

Summary of Directions and Recommendations

The following directions and recommendations drawn from previous sections of this report are meant to serve as a reference for the reader. This is not an exhaustive list, but rather a tool to assist the reader in finding key references within this report. Section numbers referring to sections of the report are provided at the end of each statement.

In the event there is any variance between the directions and recommendations below and those provided in the foregoing text of this decision, the text of the main document is to be relied on for the complete intent.

Directions

1) A regional baseline database containing concentrations of COPC in key media (air, soil, surface water, groundwater and receptors (plants, animals, aquatic organisms) was not available. The Board directs EPCOR as a condition of approval to address this deficiency promptly to the satisfaction of AENV, and singularly or in concert with other regional industrial partners and stakeholders. (Section 4.3)

2) The Board directs EPCOR to fully support and participate in a regional health exposure or assessment study should one be implemented by AHW or Health Canada. (Section 4.3)

3) The Board directs EPCOR to the satisfaction of AENV, and singularly or in cooperation with other organizations such as WCAS, to define additional air quality monitoring needs in the Genesee-Edmonton region. (Section 5.1.3)

4) The Board directs that EPCOR support and implement further regional ambient air quality and effects monitoring to the satisfaction of AENV. (Section 5.1.3)

5) The Board directs EPCOR to take steps to verify acid deposition predictions with its monitoring programs. The Board requires that the assessment of acid deposition also identify protection priorities and strategies for receptors where the predicted acid deposition rate exceeds target loads. (Section 5.1.3)

6) The Board directs EPCOR in relation to GP3 and the potential for increased hazards (e.g. fog) to assess the need for additional road safety measures for Highway 770 in consultation with Leduc County and Alberta Infrastructure. (Section 5.1.3)

7) The Board would not only direct EPCOR to fulfill its voluntary commitment of offsetting greenhouse gas emissions, such that they are equivalent to those from a natural gas combined cycle plant. The Board also directs those offsets to be updated to correspond to any future changes in emission standards for coal-fired power plants or a corresponding gas-fired power plant. (Section 5.1.3)

8) EPCOR is directed to participate and contribute to regional monitoring of water and sediment quality to the satisfaction of AENV. (Section 5.2.3)

9) The Board believes that a mercury monitoring and management program is mandatory for GP3 to receive Board approval and directs EPCOR to establish such a program with AENV and SRD prior to GP3 commissioning. (Section 5.2.3)

10) The Board directs that EPCOR, in participation with other regional industry operators, develop and implement a detailed study of mercury in fish tissue for the region. Sampling must commence prior to commissioning of GP3 and continue at appropriate intervals as decided upon by AENV and SRD. (Section 5.3.3)

11) The Board directs that as part of regional monitoring efforts, benthic macro-invertebrates and the algal communities be examined to establish an existing baseline from the time GP3 begins operations and provide comparable monitoring data subsequent to GP3 start-up. Details of such a study must be developed in cooperation with AENV and SRD. (Section 5.3.3)

12) While WCAS may be one mechanism by which such monitoring could occur, the Board directs EPCOR, in consultation with AENV, to use suitable methodology for monitoring

acid deposition and heavy metals deposition on soils, whether singularly or in collaboration with other industry in the region. The Board directs EPCOR to ensure that a suitable soils monitoring program is in place and ready for commencement by the date of GP3 start-up. (Section 5.5.3)

13) The biomonitoring associated with WCAS is one suitable mechanism for ensuring that appropriate monitoring of vegetation occurs. However, the Board directs EPCOR to take a leadership role in ensuring that scientifically defensible monitoring programs, suitable for understanding potential regional impacts of air quality on vegetation both within and beyond the WCAS boundary are designed and implemented prior to commencement of operations of GP3. (Section 5.6.3)

14) It is noted that AENV/SRD recommended continued monitoring and assessment of Red-backed voles, and potentially other wildlife species. The Board believes that such monitoring should be a regional initiative, but directs EPCOR in consultation with AENV and SRD to ensure that such assessment and monitoring is adequately designed and implemented to effectively track potential trends in tissue chemical analysis, as well as serve as an indicator of potential regional impacts to wildlife health resulting from air emissions. Given that water quality in the cooling pond has the potential to be affected by the project itself, the Board directs EPCOR in consultation with AENV and SRD to monitor wildlife directly linked to the cooling pond (for example, ducks) will occur as part of understanding trends in bioaccumulation in wildlife. (Section 5.7.3)

15) Furthermore, the Board directs EPCOR to address property that is unsightly or in a state of disrepair. These properties should be improved and maintained and steps should be taken immediately to render its properties safe to the public. (Section 6.3.3)

16) Should EPCOR propose to make any material changes to GP3 or substantially vary the design, the construction schedule, and /or specifications of the plant from what was stated in the applications, evidence provided at the hearing, or what the Board has approved, EPCOR must obtain Board approval prior to proceeding with any such changes.

17) Commencing immediately, EPCOR will provide a current construction schedule, and start submitting quarterly construction reports to the Board detailing the progress for each quarter.

18) The Board directs that concerns raised by the Hebner group over EPCOR's apparent lack of property maintenance and the safety concerns over an old, water-filled foundation on EPCOR's property be properly addressed by EPCOR. Further, the Board directs EPCOR to address property that is unsightly or in a state of disrepair. These properties should be improved and maintained and steps should be taken immediately to render its properties safe to the public. (Section 6.2.3)

Recommendations

1) The Board strongly supports the health agencies and recommends prompt planning, action and leadership by these health bodies to validate the need for and to develop a regional health assessment strategy that will include all valid stakeholders. The Board recommends AHW and Health Canada consider this region as a priority for health assessment. (Section 4.3)

2) The Board recommends that EPCOR act in partnership with its regional industrial partners and assume a leadership role by identifying priority health research needs, by organizing and assembling necessary resources and by implementing, managing and communicating to the public the results of such research. (Section 4.3)

3) Given the potential for disagreement on emission offset accounting, the Board recommends that EPCOR and AENV use a third party audit process to verify the offsets. (Section 5.2.3)

4) The Board further recommends the Genesee Public Advisory Committee (GPPAC) be expanded to include additional representations of local stakeholders such as Mewassin. (Section 5.2.3)

5) The Board recommends that AENV establish with EPCOR appropriate sampling frequencies, analytical protocols and reporting methods, including the analyses of trace elements within EPEA and Water Act Licences for GP3. (Section 5.2.3)

6) The Board recommends EPCOR contribute in a meaningful way to establishing a regional mercury database for the Genesee-Wabamum-Keephills region. (Section 5.3.3)

7) The Board recommends EPCOR to continue to strengthen its research efforts regarding: 1) cleaner coal burning technology, and 2) the processes and pathways of EPCOR's source emissions of mercury in the local and regional environment. (Section 5.3.3)

8) The Board recommends that AENV incorporate the requirement to accurately quantify the acid deposition load and to take appropriate action to manage any reduction in that load into their EPEA approval. (Section 5.5.3)

9) The Board recommends that AENV incorporate such soils monitoring requirements into the EPEA approval as includes acid deposition and metals deposition. (Section 5.5.3)

10) Therefore, the Board recommends EPCOR ensure that future soil contaminant sampling for the purpose of determining pathways to the human food chain only be combined with sampling to determine impacts specific to soils where independently designed methodology will allow. (Section 5.5.3)

11) The Board recommends that AENV revisit the adequacy of the baseline soil contaminant data, and require further baseline data prior to monitoring as required. As well the Board

recommends that AENV consider a more frequent soil sampling interval than 10 years. (Section 5.5.3)

12) The details of appropriate bio-monitoring are expected to be coordinated with the requirements of EPEA approvals. In addition to addressing potential effects of primary air emissions on vegetation, the Board recommends that a program be developed to examine potential impacts resulting from ozone formation, which will likely extend beyond the current boundary of the WCAS. (Section 5.6.3)

13) The Board also notes the evidence put forward by the Hebner group that EPCOR has made exceptions to its land acquisition policy in the past. On this basis, the Board recommends that the two parties renew their negotiations in the interest of finding a resolution that is satisfactory to both parties. (Section 6.2.3)

14) The Board believes that the consultation initiated between EPCOR and the PFN in contemplation of GP3, notwithstanding difficulties that such talks often experience, is a genuine step in the direction of the resolution of mutual interests. The Board recommends that the two parties continue their good faith negotiations in order to resolve the outstanding issues. (Section 6.3.3)

15) The Board recommends that since changes to the current source emission standards are reasonably foreseeable, it is prudent for proponents of new power plants to incorporate flexibility into their projects so that compliance could be assured within a reasonable timeframe. (Section 7.3)

DATED at Calgary, Alberta, on December 21, 2001.

ALBERTA ENERGY AND UTILITIES BOARD

<Original signed by>

M. N. McCrank, Q.C.
Presiding Board Member

<Original signed by>

R. G. Lock, P. Eng.
Board Member

<Original signed by>

G. J. Miller
Board Member

APPENDIX A TO DECISION - THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
EPCOR Generation Inc. and EPCOR Power Development Corporation (EPCOR) D. Thomas M. K. Ignasiak	A. Pettican T. Bachynski L. Johnston M. G. Brown D. Leahey D. Hackbarth D. L'Heureux L. Brocke T. Aroynk L. Esak J. Nodelman C. Faszer D. Westworth D. Whitten
ESBI Alberta Ltd. (ESBI) E. Gagner J. Bradford	R. Stubbings D. Chesterman
Capital Health Authority (CHA) A. Mak	A. Mak
Paul First Nation (PFN) R. C. Secord	D. Good Striker D. Paul O. Rain T. Bird A. Bull (Interpreter) R. Rain P. Rain
Clean Energy Coalition (CEC) K. Buss	K. McDonald A. Legge W. Donahue M. Griffiths T. Marr-Laing L. Phillips

Mewassin Community Action Group (Mewassin) K. Buss	R. Yanor-McRae H. Tyrell
D. and B.Hebner, C. and L. Forster, L. and S. Lawrence (Hebner Group) W. Shores	D. and B. Hebner
The Kruger Group For the Local Area Residents of Genesee D. J. Hannaford	D. Kruger
Government of Alberta (Alberta Environment) D. W. Stepaniuk R. Bodnarek	B. Lakeman R. Dobko B. MacDonald D. Lloyd S. Cook L. Cheng R. Bjorge N. Sawatsky V. Buchwald. Anne-Marie Anderson P. Valupadas A. Mackenzie
Government of Canada (Environment Canada, Department of Fisheries and Oceans, Canadian Environmental Assessment Agency) M. Vincent	F. Hnytka M. Kellerhals M. Fairbairn G. Ross P. Blackall
Fording Coal Limited (Fording) D. Gaspe	
TransAlta Utilities Corporation (TransAlta) L. Bernette Ho	
ENMAX Power Corporation and ENMAX Energy Corporation L. A. Cusano	
TransCanada Energy Limited R. B. Wallace	
Enron Canada Corporation	

R. N. Hemstock
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APPENDIX B TO DECISION – MEMORANDUM OF DECISION FROM THE PREHEARING MEETING

ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

PREHEARING MEETING EPCOR GENERATION INC. AND EPCOR POWER DEVELOPMENT CORP. MEMORANDUM OF DECISION
EXPANSION OF GENESEE POWER PLANT APPLICATION NO. 2001173

1 INTRODUCTION

EPCOR Generation Inc. and EPCOR Power Development Corporation (EPCOR) filed Application No. 2001173 on June 15, 2001, requesting approval of the Alberta Energy and Utilities Board (Board) to construct and operate a 490-megawatt expansion at its Genesee coal-fired power plant, adjacent to and integrated with the existing Genesee Power Plant. The Genesee Power Plant is located some 70 kilometres (km) west of Edmonton.

The Board directed that this application be considered at a public hearing, which is scheduled to commence in Edmonton on September 18, 2001. The Board also identified the need to conduct a prehearing meeting to consider the issues to be addressed at the hearing and other preliminary matters in order for the hearing to be conducted in a more efficient and effective manner.

The Board held a prehearing meeting in Edmonton on August 10, 2001, before N. M. McCrank, Q.C., (Presiding Member), R. G. Lock, P. Eng., (Board Member) and G. J. Miller (Board Member).

Those who appeared at the prehearing meeting, along with a list of abbreviations used in this Memorandum of Decision, are set out in Appendix A to the Memorandum.

2 ISSUES CONSIDERED AT THE PREHEARING MEETING

The Board established an agenda to be followed at the prehearing meeting consisting of the following items for consideration:

1) issues to be examined at the hearing,
2) identification of parties who may be directly and adversely affected by the project, if approved:
   - interveners with common interests pooling their resources in order to minimize duplication and provide for a more efficient review, and
   - costs and the funding of interventions,
3) application and the hearing procedure

4) any other preliminary matters requiring clarification which would enhance the fairness and efficiency of the main hearing.

3 ISSUES TO BE CONSIDERED AT THE HEARING

A number of issues arising from the application had been identified by the Board in its agenda of August 10, 2001, prepared for the prehearing meeting. Participants expanded on the enumerated issues and advanced additional ones at the meeting. It is the Board's view that the following matters are relevant for consideration at the upcoming hearing:

- local and landowner concerns including land acquisition policy, road access, islanding of properties, liaison between EPCOR and the community,
- potential impact on human health,
- environmental issues including impacts on air, surface and ground water, soils, long range transport of emissions,
- technology selection and environmental efficiency of the proposed power plant,
- socio-economic issues, and
- a general discussion of the proposed project's impact on the Alberta electric transmission system.

With respect to the impact of the proposed plant on the interconnected electric transmission system in Alberta, the Board believes that, if the application to construct and operate the proposed power plant is approved, the detailed and thorough review of this matter should take place at the time that EPCOR makes application under Section 17 of the Hydro and Electric Energy Act, to connect the power plant to the electric transmission system. At this time, the Board is interested in learning, in a less exhaustive way, the nature of potential impacts and the possible response to these impacts.

The Board recognizes that there may be other pertinent issues which arise out of the ones described above and it is prepared to include them in its consideration of the application, if raised by the parties.

4 INTERVENER AND PARTICIPANT STATUS

Under Section 31 of the Energy Resources Conservation Act, (the ERC Act) the Board has the authority to direct EPCOR to pay the participation costs of those persons who qualify as local interveners. Persons will meet the test set forth in section 31(1) of the ERC Act, if they demonstrate that they own land or possess an interest in land which may be directly and adversely affected by an approval of an energy project.

The Board finds that the following participants qualify as local interveners:

1) the Kruger Group,
2) the Clean Energy Coalition (CEC), and
3) the Mewassin Community Action Group (MCAG).

These intervener groups have individual members located in sufficient proximity to the proposed plant so as to raise a reasonable argument that their lands or use of their lands may be directly and adversely affected by the approval of the project. Issues such as impacts on local roads, islanding of certain properties, effects of emissions from the plant and potential noise impacts, all constitute legitimate matters for consideration at the hearing.

It is not necessary to determine whether the Paul First Nation (PFN) qualifies as a local intervener under Section 31 of the ERC Act, as EPCOR and the PFN have concluded an arrangement whereby the PFN's intervention costs will be funded directly by EPCOR.

The Board wishes to emphasize that a finding of local intervener status does not automatically mean that all costs incurred by local interveners will be approved by the Board. Costs must be shown to be reasonable and necessary to the intervention and meet the requirements of Part 5 of the Board's Rules of Practice. Duplication of effort on common issues by two or more interveners will not likely result in two sets of costs being approved in the absence of special circumstances. Parties are encouraged to review Part 5 of the Board's Rules of Practice and Guidelines for Energy Cost Claims Guide 31A.

5 ADJOURNMENT AND CHANGE OF VENUE APPLICATION

A number of the participants asked the Board to adjourn the hearing's present start date of September 18, 2001, and the existing Edmonton venue.

It is the Board's view that sufficient time has been afforded to interested parties to properly prepare and participate in the September proceedings. A brief chronology of pertinent dates follows:

- draft Terms of Reference and Public Disclosure released on December 15, 2000,
- public information session at Genesee Community Hall on January 15, 2001,
- public information session at Leduc/Nisku Inn on January 24, 2001,
- public information session at Stony Plain Community Hall on January 30, 2001,
- public information session at Edmonton/Shaw Convention Centre on February 6, 2001,
- EUB application and EIA filed on June 15, 2001, and
- Issuance of EUB Notice of Prehearing Meeting and Notice of Hearing on July 9, 2001 and publication in both major newspapers in Edmonton and Calgary as well as newspapers in Leduc, Stony Plain, and Drayton Valley.

Some concern was expressed regarding the completeness of the Environmental Impact Assessment (EIA) and the intervener's opportunity to know the entirety of the evidence in a timely way. The Board has been advised by Alberta Environment in a letter dated August 15, 2001, from J. Flett, Director of Regulatory Assurance Division that Alberta Environment has now deemed the EIA complete. The Board believes that the interveners will have adequate time to review and respond to that portion of the EIA, which had been awaiting a decision on its completeness. The original EIA was filed by EPCOR on June 15, 2001.

With respect to parties' concern that the hearing date will conflict with harvesting activities in the local community, the Board has decided to relocate the hearing venue from its current location to the Genesee Community Centre. This will more easily enable individual residents to schedule their attendance at the hearing. The Board also notes that the interests and concerns of the local community are being advanced collectively through groups of individual residents and other interested parties. This collective approach invariably ensures that the common interests of the individual members of the group are safeguarded in terms of participation at the hearing. There will be a continuous presence and participation of the group throughout the proceeding.

The Board will also consider, if necessary, scheduling the presentation of evidence of particular interest to those engaged in harvest activities at a time which may better accommodate their schedules.

As confirmed earlier, the Board will hold the hearing into Application No. 2001173 by EPCOR Generation Inc. and EPCOR Power Development Corporation at the Genesee Community Centre located on the east side of HWY #770, about 1 km south of the Genesee bridge, commencing at 9:00 a.m. on Tuesday September 18, 2001.

The Board notes the agreement of the participants that oral argument should be considered at the hearing, provided a one-day break is provided at the conclusion the evidence portion of the hearing. The Board is in agreement with this consensus.

DATED at Calgary, Alberta, on August 17, 2001.

ALBERTA ENERGY AND UTILITIES BOARD

N. McCrank, Q.C.
Presiding Board Member

G. Lock, P. Eng.*
Board Member

G. Miller
Board Member

* Mr. Lock was not available to attend the Prehearing Meeting. However he was provided with a copy of the transcript of the proceedings. Mr. Lock agrees with the views of the Board expressed in this decision.

APPENDIX A TO MEMORANDUM OF DECISION

THOSE WHO APPEARED AT THE PREHEARING MEETING AND ABBREVIATIONS USED IN THE MEMORANDUM OF DECISION

Principals and Representatives (Abbreviations Used in Report)	Witnesses
EPCOR Generation Inc. and EPCOR Power Development Corporation (EPCOR)	D. Thomas
Government of Alberta (Alberta Environment)	D. W. Stepaniuk
Government of Canada (Environment Canada, Department of Fisheries and Oceans, Canadian Environmental Assessment Agency)	M. Vincent
Mewassin Community Action Group (MCAG)	R. Yanor-McRae
Paul First Nation (PFN)	R. C. Secord
Clean Energy Coalition (CEC)	K. Buss
Fording Coal	D. Gaspe
TransAlta Corporation	D. G. Davies
ENMAX Power Corporation and ENMAX Energy Corporation, and Enron Canada Corporation	D. A. Wood
Group of Local Residents (the Kruger Group)	D. Kruger
Alberta Energy and Utilities Board Staff D. Larder, Board Counsel S. Lota, P.Eng. L. Roberts, P.Biol. P. Hunt D. Morris	