Report

**Eastmain-1-A and Rupert Diversion hydropower project**

Report by the Provincial Review Committee to the Administrator of Chapter 22 of the James Bay and Northern Québec Agreement.
REPORT

EASTMAIN-1-A AND
RUPERT DIVERSION
HYDROPOWER PROJECT

Report by the Provincial Review Committee to the Administrator of Chapter 22 of the James Bay and Northern Québec Agreement.

October 31st, 2006
OBJECT: COMEX REPORT ON THE EASTMAIN-1-A AND RUPERT DIVERSION HYDROPOWER PROJECT

Madam Administrator,

The Environmental and Social Impact Review Committee (COMEX) sends you the Environmental and Social Impact Assessment report regarding the Eastmain-1-A and Rupert Diversion Hydropower project. In accordance with section 162 of the Environment Quality Act and section 22.6.13 of the James Bay and Northern Quebec Agreement, this document acts in support of its recommendation, accompanied with conditions, which you will find enclosed, under separate cover.

This report explains the Assessment and Review procedure, summarizes the proponent’s project, indicates the main concerns expressed by participants at the public hearings and offers a detailed analysis of the principal environmental and social issues of the project.

To assess and review the Eastmain-1-A and Rupert Diversion project, COMEX relied on the documents provided by Hydro-Quebec Production in support of its application for authorization, on the information gathered at the public hearings and on any relevant literature.

Although COMEX deems the project as environmentally and socially acceptable, it supplements its recommendation with conditions aimed at, among others, ensuring appropriate protection for all environmental components and to involve the Crees with follow-up of the different biophysical and human components of the project.

Several conditions are based on the necessity for environmental and social follow-up programs to assert the extent of the impacts and to verify the efficiency of the proposed mitigation measures, with close attention to the proponent’s adaptative management of the ecological instream flow regime of the Rupert River. COMEX wishes to emphasize that any modification of the instream flow regime must be submitted to the Administrator, for authorization, following recommendations by COMEX.

COMEX also took note of the Crees’ concerns regarding the effects of the environmental changes on the pursuit of their traditional activities in the sectors affected by the project. To prevent the abandonment of these environments, it is necessary for the Crees to adapt their knowledge and their practices regarding the new resource.
COMEX recommends that, in order to acquire and share this knowledge, the Crees participate in the development and implementation of the field surveys programs required by the different monitoring programs. To do so, the proponent must work in close collaboration with the affected communities.

Considering the scope of the project, its location in a region already affected by hydropower development and the lessons drawn from the La Grande complex project since 1975, COMEX recommends that the proponent take part in a public consultation, to be held around 2011, that is to say between the end of the construction period and the beginning of operations. This consultation, held by COMEX, would aim to evaluate community satisfaction regarding the project and its mitigation measures, and also to assess the cumulative impacts of the different projects undertaken in the territory.

Yours sincerely.

Clément Tremblay, Québec
President

Philip Awashish, ARC

Brian Craik, ARC

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EXECUTIVE SUMMARY
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LEGAL AND ADMINISTRATIVE FRAMEWORK

The COMEX report is the outcome of a long and complex environmental and social assessment that took place pursuant to the Environment Quality Act, the James Bay and Northern Québec Agreement, and the Canadian Environmental Assessment Act. The parties responsible for the implementation and smooth functioning of the various environmental assessment processes agreed to incorporate their processes into a whole in a tripartite agreement signed in April 2003 by the governments of Canada and Québec and the CRA (P1). This agreement stipulates that to the greatest extent possible, the review bodies strive to harmonize the assessment processes in order to avoid duplication, and work together to ensure effective and appropriate assessments.

Analysis of the project, which ends with the filing of COMEX’s recommendation with the Administrator supported by this report, was also completed in the same spirit. COMEX has always considered that this development project, of a size and schedule rarely before equalled in Québec, has, and will have, significant, complex effects on the surrounding communities as well as on the economic development of the region and of Québec as a whole. Moreover, it represents a societal choice in the development of a power generating option that experienced something of a slowdown over recent years and its analysis is done against the backdrop of the 2002 signing of the Paix des Braves agreement (R5) between the Cree Nation and Québec, as well as a series of sectoral agreements which include the Boumhounan Agreement (M70.5).

PUBLIC CONSULTATION FINDINGS

The public hearings held on the project and its impacts revealed that Cree society, whose demographics are rapidly growing, is divided on the project. As a matter of fact, it is clear from the public hearings that all of the Crees are attached to their culture and feel that the practice of hunting, fishing and trapping is a core value of Cree society. On the other hand, a percentage of them want to modernize, with the changes to traditional values that this entails. COMEX wishes to emphasize that at times it is difficult to classify the causes of the profound social changes that these communities have experienced, since the hydropower development envisaged by the proponent has coincided with the arrival of modernity.

In Chibougamau and Montreal, emphasis has been placed primarily on the economic spin-offs a project of this nature produces through the awarding of contracts and job creation, as well as the regional development opportunities and the resulting development of expertise. COMEX understands that this project, which will require over $4,000,000,000 in investments, represents a significant economic generator, and in some cases, will stimulate regions experiencing slowdowns in other natural resource development sectors. We must remember that the prospect of jobs related to the project also creates hope among some members of Cree communities who therein see the possibility of development and a solution to the chronic lack of jobs for youth.
ENVIRONMENTAL AND SOCIAL IMPACTS

The project entails reducing the flow of the Rupert River from KP 314 to its mouth. This flow reduction will range from 71% at the diversion point to 51% at the mouth of the Rupert Bay compared with the mean annual flow. Despite maintaining an instream flow regime, restoration of flow corresponding to the mean natural hydrograph in the Lemare and Nemiscau rivers and the construction of nine control structures along the reduced-flow reach, it is undeniable that the appearance of the river will change and that these expected modifications raise questions and concerns on the part of users. From a biophysical impact perspective, the proponent has made a certain number of commitments, ranging from environmental follow-ups to remedial measures (development of spawning grounds, seeding the banks, fish passage systems, etc.) to better identify or correct the expected impacts. COMEX finds that these efforts are adequate and are going in the right direction, i.e., the maintaining of a “living” river, attractive from a survival perspective for species currently inhabiting the river as well as for multiples uses.

The proponent is committed to respecting the principles of adaptive management for the anticipated instream flow downstream from the Rupert River diversion point. This mitigation measure, a key element of the project design, created a great deal of interest when the project was being analyzed. COMEX acknowledges that the proponent’s efforts to establish this type of regime were impressive and above and beyond the efforts normally made in hydropower developments that entail a reduced-flow reach in a river. On the other hand, the very nature of the project and the scope of the work require considerable effort in this regard as the flow reduction in 314 km of the Rupert River has undeniable impacts on a set of factors which include fish, the landscape, navigation and traditional activities. COMEX concludes that the implementation of the principle of adaptive management of instream flow allows, if need be, this scheme to be revised in order to correct an impact detected after the fact by the multiple environmental follow-ups that the proponent must carry out or by means of the observations made by the land users.

COMEX’s recommendations regarding biophysical impacts are in great part focused on the filing for approval with the Administrator of the various environmental monitoring programs and their findings. These conditions for authorization will ensure that the assessment of actual impacts and the success of mitigation measures are monitored continuously by the bodies responsible for the implementation of Chapter II of the Environment Quality Act and Chapter 22 of the JBNQA. Additions have, however, been made regarding the monitoring indicators that the proponent used in its impact assessment for the purpose of completing the environmental assessment and impacts once the facilities are in operation. In order to partially correct the gaps in the dissemination of information gathered by the proponent on-site on the evolution of the ecosystems, the proponent is also requested to include the Crees in planning, producing and disseminating the findings of the various follow-up campaigns. This condition has two objectives: dissemination of information and education about the new environments created by the project. This condition aims to correct a situation brought to light by the public hearings: the very negative perception that the Crees have on the matter of practicing traditional activities in the environments that have been altered in the past by hydropower development projects.

COMEX also feels that the proponent will be able to benefit from the Crees’ ideas and knowledge in planning environmental monitoring programs and creating mitigation measures. This could be the opportunity for the proponent to innovate in this area, particularly in the mitigation and
compensation measures planned to encourage hunting and fishing, taking traditional knowledge into account.

**COMMUNICATION BETWEEN THE CREES AND THE PROONENT**

In the matter of communication, COMEX recommends that the proponent participate in the implementation of an a posteriori consultation process with the Cree population. COMEX is of the opinion that this consultation with the Crees should be done before the project is in operation for the purpose of understanding their points of view on the completion of the project as a whole and its impacts, as well as the effectiveness of the mitigation measures that have been carried out. COMEX advocates public hearings as a consultation mechanism as they allow a large audience to be reached and all topics to be addressed. These hearings would be held by COMEX and the proponent would be required to collaborate. The hearings would be held after construction of the project but before it goes into operation, around 2011. The COMEX report on the lessons to be drawn from these consultations will be used, in part, to implement corrective measures in view of minimizing any residual impact.

**ECONOMIC SPINOFFS AND THE FUTURE OF CREE COMMUNITIES**

COMEX acknowledges that this project will shape and implement the *Paix des Braves* agreement signed in 2002 between the Cree Nation and the province of Québec (R5). This project will provide Crees with an opportunity to direct their future development through the creation of jobs and businesses that will contribute to long-term economic development. It is in this spirit that COMEX stresses the future relations between the proponent and Cree society and in building on the opportunities that this project represents, without, however, losing sight of the nature of Cree society or the fact that the latter occupies territory that is shared with Jamesians who, just as much as they, want this sharing to be permanent and harmonious.

Hydropower development has had a tremendous impact on Cree society in the past 30 years and is at the root of the signing of the JBNQA and Cree society’s entry into modern times. The *Paix des Braves*, signed in 2002, is also founded on the territory’s development through hydropower. COMEX, as a JBNQA committee, has been a privileged witness to the debates and tremors that have stirred the Cree society and the adjustment difficulties this society is currently experiencing. With the Eastmain-1-A and Rupert Diversion project, COMEX hopes that this society will enter into a new era that is characterized by the Crees’ desire to take their future in hand. In order to do so, they must preserve their attachment to their society’s core values, which have enabled them to survive and grow as a nation, while taking advantage of the opportunities that arise to improve their individual and collective well-being. This balance will only be achieved by maintaining a window on the outside world and positive relations with all of Québec society.
INTRODUCTION
INTRODUCTION

FILING THE PROJECT

In November 2002, Hydro-Québec Production filed the preliminary information (R6)\(^1\) with provincial and federal authorities for the partial diversion of the Rupert River located in James Bay while also preserving an instream flow regime. The project also includes the construction of the 768 MW Eastmain-1-A powerhouse at the exit of the Eastmain 1 Reservoir, and the establishment of the 125 MW La Sarcelle powerhouse at the outlet of the Opinaca reservoir.

I THE PROPOSENT

The administrative structure of Hydro-Québec, a government corporation, includes a number of divisions: Hydro-Québec Production, Hydro-Québec TransÉnergie, Hydro-Québec Distribution and Hydro-Québec Équipement. Hydro-Québec Production is the proponent of the proposed project. This division’s mandate is to harness and develop hydropower potential accessible in Québec and to commercially operate the generating facilities. Hydro-Québec Production produces electricity, sells it on various markets and provides a maximum of 165 TWh per year of heritage pool electricity. In 2004, its generating fleet included 51 hydropower generating stations, five thermal generating stations and one wind farm with a total installed capacity of 33,473 MW.

Hydro-Québec TransÉnergie is responsible for the design, operation and maintenance of Québec’s electricity transmission system. The grid includes 32,539 km of lines, over 500 substations and 18 interconnections with neighbouring grids outside Québec. The Hydro-Québec Distribution division is the main distributor of electricity in Québec. It serves nearly 2.7 million residential customers, 152,000 business customers and 255 major customers in Québec.

On the land governed by the James Bay and Northern Québec Agreement (JBNQA), Hydro-Québec Production entrusts completion of hydropower development projects to the James Bay Energy Corporation (JBEC), which is a Hydro-Québec subsidiary. Consequently, the JBEC will complete the Eastmain-1-A and Rupert Diversion project.

II ORGANIZATION OF THE REPORT

The main objective of this report is to demonstrate and justify the relevance of COMEX’s recommendation to the Provincial Administrator of Chapter 22 of the James Bay and Northern Québec Agreement on the Eastmain-1-A and Rupert Diversion project. This recommendation and the accompanying conditions for improving the project submitted by the proponent are dealt with in a separate document specifically addressed to the administrator. The report essentially deals with the key issues that have been topics of major concern during the public consultations or that entail the necessity of conditions to the proposed certificate of authorization. The recommendation has four parts and four appendices.

\(^1\) Code used in the text for references and corresponding to the documentation collected in Annex 1.
Following a brief introduction, Part I (Chapters 1 and 2) explains the review and assessment processes that apply to the project as well as the mandates and roles of the two agencies that are responsible for them. The agreement, which sets the guidelines for their joint work is then presented. Chapter 2 summarizes the project as submitted by the proponent as well as the environmental and social characteristics and the modifications that completion of the project entails to these two components.

Part II (Chapter 3) presents the stakeholders’ main concerns that were expressed during the public hearings. Part III (Chapters 4 to 8) is entirely devoted to COMEX’s earlier analysis of the project justification (Chapter 4) and its impacts on biophysical (Chapter 5) and human (Chapter 6) environments. Chapter 7 deals with safety of the facilities and people, while Chapter 8 examines the project’s cumulative effects. Finally, in Part IV, COMEX delivers its findings (Chapter 9). The various chapters were largely designed to prevent the reader from having go back to other sections, which can occasionally make some parts of the report seem repetitive.

COMEX and the federal review panel have agreed to coordinate their efforts in accordance with the agreement; COMEX lent itself to a consensus building effort in drafting its report. Thus, comments and suggestions were made on chapters 1 to 7 inclusive by the members of the federal review panel, which allowed some aspects to be made more specific or to be improved. It must also be mentioned that the basic texts of certain parts of these chapters were developed either by the panel (parts 2.4.6 and 5.5) or by the Cree Regional Authority (parts 3.7 and 3.8). The panel’s contribution to compiling documentation (Appendix 2) must also be mentioned. Appendix 1 contains the list of the members of the federal assessment review panel, COMEX members and other individuals who have contributed to completing the report.
PART I

General context
PART I

General context

From the outset, certain events that have contributed to the development of the Eastmain-1-A and Rupert Diversion project by Hydro-Québec Production must be recalled. On February 7, 2002, the Government of Québec and Crees of Québec, the Grand Council of the Crees of Québec and the Cree Regional Authority (CRA) entered into an Agreement regarding the establishment of a new relationship between the Government of Québec and Crees of Québec entitled Paix des Braves (R5).

The purpose of the Agreement is:

“The establishment of a new nation-to-nation relationship, based on the common will of the parties to continue the development of the James Bay Territory and to seek the flourishing of the Crees and the Cree Nation within a context of growing modernization.”

The Agreement states that:

“In consideration of this agreement, the Crees consent to the carrying out of the Eastmain-1 A/Rupert Project.” and that “…the Project will be subject to the applicable environmental legislation and to the environmental and social protection regime stipulated in Section 22 of the James Bay and Northern Québec Agreement according to the terms of that Section.”

The same day, Hydro-Québec, the JBEC, the Grand Council of Crees of Québec, the CRA, the Cree Nation of Eastmain, the Cree Nation of Waskaganish and the Cree Nation of Mistissini signed the Boumhounan Agreement (M70.5). This Agreement includes the definition, description, the draft design, as well as the participation of the Crees in many stages of the proposed completion of the Eastmain-1-A and Rupert diversion project. The Agreement provides for funding, administered by the Crees, for mitigating the project’s impacts on the residents and land.

In November 2002, filing of the preliminary information by the proponent started the environmental assessment process.
1 THE ENVIRONMENTAL ASSESSMENT PROCESS

In accordance with legislative provisions, the project was submitted to the provincial and federal authorities for review. On the one hand, it was subject to Québec’s process for assessment and review of the environmental and social impacts set out in Chapter 22 of the JBNQA and Chapter II of Québec’s Environment Quality Act (R.S.Q., c. Q-2) (EQA). The Provincial Administrator provided for in the JBNQA and the EQA manages the stages of the process for Québec. Analysis of the project by the federal government is done in accordance with the process set out in the Canadian Environmental Assessment Act (S.C., 1992, c. 37) (CEAA). This law is administered by the Canadian Environmental Assessment Agency (CEAA).

In order to harmonize the two environmental assessment processes, the governments of Québec and Canada and the CRA signed the Agreement Concerning the Environmental Assessments of the Eastman-1-A and Rupert Diversion Project (P1). The main provisions of this administrative agreement are described in section 1.3.

The first phase of the harmonized processes was the preparation of guidelines specifying the scope and nature of the impact assessment that the proponent must submit in order to obtain the approval required before carrying out the project. Some preliminary guidelines have been developed by the Evaluating Committee (COMEV), a Canada-Québec-Cree tripartate agency created under Chapter 22 of the JBNQA in cooperation with the Canadian Environmental Assessment Agency. On May 9, 2003, the preliminary guidelines were published and the public was granted a period of 60 days in which to relay their comments on the points to be included in the final guidelines. From May 28 to June 11, 2003, public hearings in Montreal, Mistissini, Waskaganish, Chibougamau, Nemaska and Chisasibi. The preliminary guidelines were modified taking the public’s various comments into account and on August 8, 2003, the final guidelines (P2 and P3) for the preparation of the impact assessment were sent to the proponent by the Provincial Administrator and the Minister of the Environment of Canada.

At the end of December 2004, the proponent filed its impact assessment with the Provincial Administrator, the Ministry of Fisheries and Oceans, and the Canadian Environmental Assessment Agency. In January 2005, the proponent filed some 30 complementary background studies to the impact assessment and a summary report in French, English and Cree. All these documents were then relayed to the Environmental and Social Impact Review Committee (COMEX) and to the federal review panel for analysis and review of the project. The Environmental and Social Impact Review Committee, as described in Section 1.1, and the federal review panel, as described in Section 1.2, will hereinafter be referred to jointly in the text as “the review bodies.”

On January 31, 2005, the review bodies announced the start of public consultation on the impact assessment’s conformity with the guidelines. The public had a 90-day period in which to submit written comments. A number of briefs and letters were received from the public and various bodies and were taken into consideration by the review bodies.

On May 5, 2005 and June 23, 2005, the preliminary requests for additional information were relayed to the proponent so that the summer period could be taken advantage of to complete some of the missing inventories. The final request for additional information enabling the impact assessment to be completed, was officially relayed to the proponent on August 2, 2005 (COE11).
The additional information was filed in stages by the proponent, starting on September 27, 2005. Subsequent to the analysis of all the documentation, the review bodies deemed that based on the information available it would be possible to proceed with the public hearings starting March 15, 2006. The review bodies announced the public hearings on January 26, 2006.

Between the filing of the impact assessment and the announcement of the public hearings, seven technical information meetings took place between the proponent and the review bodies, in order to clarify certain issues. The complete proceedings of these meetings were, moreover, made available to the public (see references VRT1 to VRT9).

Public hearings on the project and its environmental and social impacts took place from March 15 to June 9, 2006, in the Cree communities of Mistissini, Nemaska, Eastmain, Wemindji, Waskaganish and Chisasibi as well as in Chibougamau and Montreal. The main concerns of the various stakeholders during the hearings are presented in Chapter 3 of the report.

The documents produced and received in the context of the assessment process were filed with the Public Information Office created under the administrative agreement, and with the public registry of the Canadian Environmental Assessment Agency.

### 1.1 ROLE REVIEW COMMITTEE – COMEX

The Provincial Review Committee (COMEX) was established following signing of the JBNQA in 1975. COMEX is responsible for reviewing projects in the James Bay region, south of the 55th parallel, which are subject to the impact assessment and review process as set out in Chapter 22 of the JBNQA and Chapter II of the Environmental Quality Act. COMEX is a standing body created under Section 22.6 of the JBNQA and Section 148 of the EQA. It is comprised of three members that are appointed by the government of Québec, including the chair, and 2 members appointed by the Cree Regional Authority (CRA).

When the Provincial Administrator sends an impact assessment to COMEX, COMEX must ensure that the information required for the analysis of the project has been provided by the proponent and that the information meets the requirements of the guidelines. COMEX can also conduct public hearings on the project’s environmental and social acceptability. Following analysis of a project, COMEX drafts a recommendation on whether or not to authorize the project, including, if necessary, conditions for authorization. The Review Committee relays its recommendations to the Provincial Administrator, who is responsible for deciding whether or not to authorize the project, with or without conditions. If the Provincial Administrator does not agree with COMEX’s recommendations, he must consult with COMEX again before relaying any decision to the proponent.

Under the provisions of Section 22.2.4 of Chapter 22 of the JBNQA and Section 152 of the EQA, COMEX must pay particular attention to the following guidelines:
- the protection of Native hunting, fishing and trapping rights in the targeted region, in consideration of all activities related to the projects having repercussions on the land;
- social and environmental protection, particularly through measures proposed subsequent to the impact assessment and review procedure, with a view to reducing as
much as possible the negative repercussions on Native people of the activities related to the projects affecting the region;
• the protection of Native people, their societies, communities and economy, in light of all activities related to the projects affecting the region;
• the protection of the region’s wildlife, the physical and biological environment, and ecosystems, in light of all activities related to the projects affecting the region;
• Native rights and guarantees in Category II lands;
• Cree participation in the implementation of the environmental and social protection regime;
• the rights and interests of non-Native people;
• the right to create projects in the region.

1.2 THE FEDERAL REVIEW PANEL’S MANDATE AND LEGAL FRAMEWORK

On February 27, 2003, upon request of the Minister of Fisheries and Oceans, the Minister of the Environment of Canada referred the environmental assessment of the project to an environmental assessment panel in accordance with Section 33 of the CEAA. The Environmental and Social Impact Review Panel, also called the Federal Review Panel (the Panel), was thus created and the members were appointed on November 1, 2004 by the Minister of the Environment of Canada. The Panel has five members, two of whom were appointed based on the CRA’s recommendation.

The Minister of the Environment of Canada determined the specific mandate for the draft study by the Panel. This mandate (P4) includes the responsibilities, the scope of the matters dealt with by a review, a description of the process and the duration of the project’s mandate. The Panel must conduct an assessment of the project’s environmental effects and in accordance with Section 34 of the CEAA, submit a report to the Minister of the Environment of Canada and the responsible authorities (Fisheries and Oceans and Transport Canada). The Government of Canada must then reply to the Panel’s report so that the responsible authorities can, in this case, issue their respective permits under the Fisheries Act and the Navigable Waters Protection Act.

1.3 PROVISIONS OF THE ADMINISTRATIVE AGREEMENT CONCERNING ENVIRONMENTAL ASSESSMENTS RELATED TO THE PROJECT

In April 2003, the governments of Canada and Québec and the CRA signed the Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project (P1). This Agreement requires that the parties strive, to the greatest extent possible, to harmonize the assessment processes to avoid duplication and work together to ensure that assessments are effective and appropriate.

This Agreement, which is specific to the Eastmain-1-A and Rupert Diversion project, establishes that the recommendations on the guidelines concerning the scope of the impact assessment be prepared by the Evaluating Committee, as set out in Chapter 22 of the JBNQA and in Chapter II of the EQA in cooperation with the Canadian Environmental Assessment Agency.
The agreement stipulates that the project be completed by COMEX and the Panel and that these bodies each act independently. The agreement also stipulates that the duration of the assessment and project review, from the delivery of information to the Evaluating Committee to the filing of COMEX’s final recommendations, should not normally exceed 20 months. This period does not include the time required by the proponent to submit the impact assessment and to provide additional information. Considering the parties’ firm commitment to coordinating the assessment and review processes and their desire to work together to ensure an effective and appropriate assessment and review that takes their respective concerns into account, the schedule set out in the Procedures for an Assessment by a Review Panel has been adjusted in order to synchronize with the steps and timelines set out in the administrative agreement.

A financial assistance program is also provided for in the Agreement in order to facilitate public participation in the assessment and review of the project during the stage when the guidelines, the conformity analysis, and the analysis of environmental and social impacts are being prepared. $400,000 – half of which has been provided by the Ministère du Développement durable, de l’Environnement et des Parcs, and the other half by the Canadian Environmental Assessment Agency – has been allocated to various non-government bodies and private individuals. The review bodies did not take part in the management of the financial assistance program.

The agreement provides for the creation of the Public Information Office in order to reply to requests for information from the public in French, English and Cree. This office, located in Montreal, has enabled rapid consultation of the documents filed as part of the project. The office was in operation until June 30, 2006.
2 THE PROJECT AND ITS ENVIRONMENT

The project selected by the proponent is located in the southern part of a vast territory where major hydropower developments have been built in the last 30 years. The La Grande complex was built in this territory between 1970 and 1990, and the Eastmain-1 project, still under construction, is to be completed by 2007. This section briefly describes the hydropower developments in the James Bay territory and the projects currently being studied by the proponent (see Map 2-1 and Map 2-2, pocket insert).

The La Grande complex

The signing of the James Bay and Northern Québec Agreement (JBNQA) paved the way for hydropower development of the territory covered by the agreement, and the La Grande complex development was built on the La Grande Rivière in two phases over a period of 20 years.

Phase I of the La Grande complex project began in 1973 and was completed in 1985. During this phase, the Robert-Bourassa (La Grande-2), La Grande-3 and La Grande-4 generating stations were built, each with a reservoir. Reservoirs were also built on the Caniapiscau, Eastmain and Opinaca rivers, which were diverted. Total installed capacity of the three generating stations is 10,282 MW and their annual output is 64.6 TWh. The reservoirs cover close to 11,343 km².

Phase II of the La Grande complex project was launched in 1987 and completed in 1995. Five generating stations were added: La Grande-1, La Grande 2-A, Laforge-1, Laforge-2 and Brisay. These generating stations added 4,954 MW to the installed capacity of the complex and increased its annual output by 18.3 TWh. Three new reservoirs covering a total of 1,618 km² were created. The La Grande complex has an installed capacity of 15,244 MW and an annual output of 80.7 TWh.

In addition to these developments, 11 electric power lines were built: four 315-kV lines, six 735-kV lines and one 450-kV direct-current line. Together these lines run more than 6,570 km, carrying the energy generated in the north to southern Québec. Some 1,800 km of permanent roads were built as well as seven airports.
Eastmain-1 hydropower development

On February 7, 2002, the Grand Council of the Crees, the Cree Regional Authority (CRA), the Cree Nation of Eastmain, the Cree Nation of Mistissini, the Cree Nation of Nemaska, the Waskaganish Band, Hydro-Québec and SEBJ signed the Nadoshtin Agreement (M70.2) covering construction, operation and maintenance of the Eastmain-1 project. The purpose of this agreement is to reduce the impact of the project on the Cree, protect their way of life, encourage community development, promote advantageous conditions for the Cree and establish compensation. Part of the agreement deals with environmental measures to correct or mitigate project impacts.

The Eastmain-1 hydropower development comprises a dam on the Eastmain River, Eastmain-1 generating station with an installed capacity of 480 MW and an annual output of 2.7 TWh, a permanent access road, a 315-kV transmission line and a workcamp. The development also includes the Eastmain 1 Reservoir, covering 603 km². Work began in the spring of 2002, and the impoundment of the reservoir was completed in the summer of 2006. The project will be completed in 2007.

The Eastmain-1 hydropower development is located in the study area for the project currently under review, affecting the analysis and evaluation of the project. A number of references to this development will thus be made in analyzing different issues related to the Eastmain-1-A Powerhouse and Rupert diversion project.

For purposes of comparison, and before undertaking a detailed analysis of the project, a brief description of the Eastmain-1-A Powerhouse and Rupert diversion project and the Nottaway-Broadback-Rupert project (mentioned in Section 8 of the JBNQA) is presented, as these projects were discussed by the bodies concerned.

The Eastmain-1-A Powerhouse and Rupert diversion project

This project calls for partial diversion of the Rupert River at KP 314 and the creation of the Rupert diversion bays (covering a total of 346 km²). It also includes construction of Eastmain-1-A Powerhouse, with an installed capacity of 768 MW, and Sarcelle Powerhouse, installed capacity 125 MW. The diverted waters of the Rupert River will be routed north to La Grande Rivière to increase the generation of the Robert-Bourassa, La Grande-2-A and La Grande-1 generating stations. Annual output of the project is estimated at 8.5 TWh. Along the reduced-flow stretch of the Rupert River, the proponent plans to build eight hydraulic structures to prevent bank exposure, among other things. The project also calls for construction of the 40-km Muskeg–Eastmain-1 permanent road and a 315-kV transmission line 101 km long. Several temporary workcamps must also be built to accommodate the 5,500 workers required. The project will cost four billion dollars, including the financing cost.

Nottaway-Broadback-Rupert project

The Nottaway-Broadback-Rupert (NBR) project, mentioned in Section 8 of the JBNQA, called for complete diversion of the Rupert and Nottaway rivers into the Broadback River, impoundment of several reservoirs to control the diverted flows and construction of two generating stations on the Rupert River, seven on the Broadback River and two at the outlet of the Evans and Quénonisca reservoirs. The project would have a total installed capacity of about 8700 MW and an annual output of 45 TWh. A definitive draft design has never been developed for the NBR project, and the technical and environmental aspects of the project have never been assessed.
As agreed in the *Paix des Braves*, should the Eastmain-1-A Powerhouse and Rupert diversion project be built, Hydro-Québec will abandon the NBR project. According to the proponent, abandoning the NBR project in favour of building the Eastmain-1-A Powerhouse and Rupert diversion project will be a major gain environmentally, as the following table shows.

### Table 2-1: Comparison of the Eastmain-1-A Powerhouse and Rupert diversion project and the Nottaway-Broadback-Rupert project

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>EASTMAIN-1-A POWERHOUSE AND RUPERT DIVERSION PROJECT</th>
<th>NOTTAWAY-BROADBACK-RUPERT PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESERVOIRS</strong></td>
<td>Creation of 2 diversion bays</td>
<td>Creation of 4 large reservoirs and the forebays of 11 generating stations</td>
</tr>
<tr>
<td><strong>TOTAL AREA FLOODED</strong></td>
<td>346 km²</td>
<td>6,497 km²</td>
</tr>
<tr>
<td><strong>NUMBER OF DAMS</strong></td>
<td>4</td>
<td>About 20</td>
</tr>
<tr>
<td><strong>NUMBER OF DIKES</strong></td>
<td>72</td>
<td>More than 130</td>
</tr>
</tbody>
</table>

#### 2.1 VARIANT ANALYSIS

##### 2.1.1 RUPERT DIVERSION

The project calls for partial diversion of the watershed of the Rupert River into Eastmain-1 reservoir. The water will then flow into the La Grande Rivière via existing hydropower developments. An instream flow regime will be maintained in the Rupert River downstream of the diversion point.

**Variants studied by the proponent**

The proponent has analyzed three variants:

- **Cramoisy variant**: diversion at KP 314 of the Rupert River for a total output of 12.8 TWh including existing facilities, a maximum diversion flow of 800 m³/s and flooding of 356 km², including 33 km² of Nemaska Category II lands.
- **Arques variant**: diversion at KP 324 of the Rupert River for a total output of 12.7 TWh, a maximum diversion flow of 800 m³/s, flooding of 631 km² and an impact on Mesgouez Lake among other sites.
- **Île-de-l’Est variant**: diversion at KP 490 of the Rupert River for a total output of 10.8 TWh, a maximum diversion flow of 700 m³/s, flooding of a total of 617 km² entirely located in Mistissini Category II lands (where the Crees have the exclusive right to hunt, fish and trap) and impacts on lakes Mesgouez, Woollett and Bellinger among other sites.

To determine which variant to select, the proponent performed a comparative analysis based on energy, technical and hydrological criteria, applying in each case an instream flow representing
10% of the mean annual flow. This minimum instream flow was later increased to 20%. The environmental aspect was not considered at this stage in the selection process. The closure point on the Rupert River is the same in the Cramoisy and Arques variants. However, the forebay in the Arques variant is larger, which means more and bigger retaining structures are required, and water level will rise in Mesgouez Lake. Both of these variants call for a control structure to restore an instream flow regime in the Rupert River. Control structures are also required to restore mean flow in the Lemare and Nemiscau rivers, as the route of the diverted water is virtually the same in the two variants. However, in the Arques variant, the water enters the Eastmain 1 Reservoir a bit farther east. Both variants require building 735-kV transmission lines (104 km for the Cramoisy variant and 58 for the Arques variant) and dismantling existing power lines (76 km for the Cramoisy variant and 51 for the Arques variant) (see Table 2-2 and Map 2-3).
<table>
<thead>
<tr>
<th>Output</th>
<th>12.8 TWh/year</th>
<th>12.7 TWh/year</th>
<th>10.8 TWh/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of diversion bays (km²)</td>
<td>221</td>
<td>350</td>
<td>287</td>
</tr>
<tr>
<td>Total area affected</td>
<td>356</td>
<td>631</td>
<td>617</td>
</tr>
<tr>
<td>Diverted and restored flow (m³/s)</td>
<td>585/677</td>
<td>581/670</td>
<td>465/525</td>
</tr>
<tr>
<td>Maximum diversion flow</td>
<td>800</td>
<td>800</td>
<td>700</td>
</tr>
<tr>
<td>Restored flow</td>
<td>92</td>
<td>89</td>
<td>60</td>
</tr>
<tr>
<td>Main rivers affected (km)</td>
<td>Rupert 18</td>
<td>Lemare 30</td>
<td>Nemiscau 37</td>
</tr>
<tr>
<td>Total 85</td>
<td>Rup 49</td>
<td>Lem 30</td>
<td>Nem 32</td>
</tr>
<tr>
<td>Rup 65</td>
<td>Nat -</td>
<td>The 40</td>
<td>East -</td>
</tr>
<tr>
<td>Length in diversion bays</td>
<td>314</td>
<td>135</td>
<td>1493</td>
</tr>
<tr>
<td>Length with reduced flow</td>
<td>314</td>
<td>150</td>
<td>509</td>
</tr>
<tr>
<td>Length with increased flow</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Main lakes affected</td>
<td>Desert Champs</td>
<td>Arques</td>
<td>Cramoisy</td>
</tr>
<tr>
<td>Caumont</td>
<td>Nemiscau</td>
<td>Wolleit</td>
<td>Thereau</td>
</tr>
<tr>
<td>Du Glas</td>
<td>Des Champs</td>
<td>Arques</td>
<td>Nasacauso</td>
</tr>
<tr>
<td>Des Montagnes</td>
<td>Du Glas</td>
<td>De la Marée</td>
<td>Bellinger</td>
</tr>
<tr>
<td>Teilhard</td>
<td>Des Montagnes</td>
<td>Caumont</td>
<td>Mesgouez</td>
</tr>
<tr>
<td>Biggar</td>
<td>Nemiscau</td>
<td>Nemiscau</td>
<td>Nemiscau</td>
</tr>
<tr>
<td>Structures and infrastructure</td>
<td>3 dams and 38 dikes</td>
<td>3 dams and 65 dikes</td>
<td>7 dams and 28 dikes</td>
</tr>
<tr>
<td>Dams and dikes</td>
<td>10,900</td>
<td>11,600,000</td>
<td>3,350,000</td>
</tr>
<tr>
<td>Canals (m)</td>
<td>1115</td>
<td>14,250,000</td>
<td>150 km and 4 bridges</td>
</tr>
<tr>
<td>Earthwork (m³)</td>
<td>81.0</td>
<td>85.0</td>
<td></td>
</tr>
<tr>
<td>Roads (km)</td>
<td>76.4</td>
<td>51.3</td>
<td></td>
</tr>
<tr>
<td>Line to dismantle (km)</td>
<td>104.0</td>
<td>58.0</td>
<td></td>
</tr>
<tr>
<td>Line to rebuild (km)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

In the Île-de-l’Est variant, the diversion starts at the headwaters of the Rupert, with the first structures being located about 10 km downstream of Lake Mistassini. The flow is directed to the Rupert closure point at KP 490 by a series of control structures and eventually reaches the Eastmain River via Thereau River 99 km upstream of Eastmain 1 Reservoir. The diversion will create three diversion bays, and 150 km of new roadway will have to be built. Instream flow release structures are planned at the closure points on the Nataskan, Thereau and Rupert rivers. The diversion bays are larger than in the Cramoisy variant but smaller than in the Arques variant. This variant does not affect any power lines.

A procedure involving experts from all engineering disciplines as well as the Mistissini Cree was established to select one of the three variants. Comparison criteria were developed to evaluate each of the variants based on the following objectives:

- Reduce the area flooded
- Minimize the area of water bodies raised
- Reduce the distance over which rivers are affected by reduced flow and minimize impacts on river reaches downstream of closure points
- Minimize any increase in fish mercury

To achieve these objectives, the proponent assessed the impacts of each variant on such components as land wildlife habitats, forest stands and Cree hunting, fishing and trapping grounds and related equipment.

According to the proponent, the comparison shows that the Cramoisy variant meets most of the objectives. It raises natural water bodies over the smallest area and leaves Mesgouez, Thereau and Woollett lakes untouched. It increases fish mercury levels as much as the Île-de-l’Est variant (comparable land areas flooded) but less than the Arques variant, which floods 631 km². The Île-de-l’Est variant scores lowest based on most of the selected comparison criteria, especially length of river at reduced flow and impacts on river stretches downstream of closure points. The Cramoisy variant preserves the land environment best, but it does require relocating 76.4 km of 735-kV transmission lines (Table 2-3). For these reasons and according to the conclusions of the impact assessment, the proponent selected the initial Cramoisy variant, which was optimized before it was presented to the Crees and ratified in the Boumhounan Agreement (see Map 2-4).
According to the Boumhounan Agreement, “the natural water levels and natural water flows of the Rupert River and its tributaries upstream of the forebay limits at km 337 shall not be affected by the Project. The natural water levels and natural water flows of Lake Woolet, Lake Bellinger and Lake Mesgouez will not be affected by the Project.” These guarantees given by the proponent effectively eliminate the Arques and Île-de-l’Est variants.

Although the three variants presented did not initially include mitigation measures to reduce the impact of partial diversion of the lower reaches of the Rupert River, the Boumhounan Agreement stipulates that “Hydro-Québec shall, at the option of the Cree users, design and construct up to 10 weirs along the Rupert River downstream from the point of diversion …. The design and location of these weirs will be determined in concert with the Crees.” The proponent explained how the sites were selected and described their drawbacks and advantages. Section 5.2 of the report explains the importance of the weirs and how they work to mitigate the impacts of the diversion.

During the public hearings, the review bodies received a brief from the Fondation Rivière (M59) stating that the proponent’s variant analysis was incomplete, as the modified Île-de-l’Est variant, called the Langelier variant in the brief, was not considered. The Langelier variant calls for diverting the Rupert River at the Île-de-l’Est variant closure point and channelling the water through a network of water bodies (four of which are large), canals and a tunnel to empty into the Eastmain River upstream of Eastmain 1 Reservoir. It also calls for construction of two run-of-river
power plants on the Eastmain River (Eastmain-2 and Eastmain-3) before the diverted water reaches Eastmain 1 Reservoir. Based on information available, this variant, like the Île-de-l’Est variant, would affect Category II lands and have a significant impact not only on Mesgouez and Woollett lakes but also on a long stretch of the Rupert River and the Albanel-Témiscamie-Otish Park project.

COMEX believes that the Cree Nation’s acceptance of the Cramoisy variant (optimized in 2001) with the signing of the Boumhounan Agreement backs the choice made by the proponent. The Langelier variant, on the other hand, cannot be selected as it has impacts (such as flooding of Category II lands) that are considered unacceptable by the signatories to the Boumhounan Agreement. Considering the signing of the Boumhounan Agreement, COMEX approves the 2001 Cramoisy variant, the option preferred by the Cree should the project be executed.

2.1.2 EASTMAIN-1-A AND SARCELLE POWERHOUSES

Eastmain-1-A Powerhouse: variants studied by the proponent
Eastmain-1-A Powerhouse will be integrated into a working hydropower development that includes Eastmain 1 Reservoir and Eastmain-1 Powerhouse at KP 203 of the Eastmain River. The number of variants presented by the proponent is accordingly limited by the site layout. Essentially two variants were studied. Variant 1 locates the powerhouse close to the dam and the spillway at KP 213, and variant 2 locates the new powerhouse close to the existing Eastmain-1 Powerhouse, at KP 204. Both variants are technically very similar, but the maximum installed capacity will be of 626 MW with variant 1 compared to 768 MW with variant 2; the Boumhounan Agreement sets the maximum installed capacity of Eastmain-1-A Powerhouse at 770 MW. In addition, variant 1 requires building 10 km of transmission line, compared to 0.6 km for variant 2. Variant 2 will also cost less to build (see Map 2-5).
Also, in variant 1 the tailrace canal will be built in bedrock and clay, but in variant 2 it will be built entirely in bedrock. To protect the environment, lake sturgeon spawning grounds were recently built at KP 207 of the Eastmain River and at the foot of the first rapids of the Rivière à l’Eau Claire as part of the Eastmain-1 project. According to documents filed by the proponent, these spawning grounds are meant to compensate for the loss of spawning grounds at KP 215 with the commissioning of Eastmain-1 Powerhouse. Furthermore, to preserve the lake sturgeon habitat and minimize bank erosion, a weir was built at KP 207 of the Eastmain River that maintains water level up to KP 215. This work has been completed.

These enhancements must be considered in siting Eastmain-1-A Powerhouse. Variant 1 will require they be adjusted, as it will alter hydrological conditions in the river stretch enhanced for lake sturgeon: with variant 1, mean annual flow between the powerhouses and Eastmain-1 dam will increase to 661 m$^3$/s from 58 m$^3$/s when the two powerhouses are in operation. The proponent believes variant 2 will have less impact, given the interrelated management of the two powerhouses and the mitigation measures already introduced for the Eastmain-1 project. With variant 2, hydrological conditions in the stretch of the Eastmain River between the dam and the powerhouse will remain the same as if the Eastmain-1 Powerhouse were operated without the Rupert diversion. Flow in this stretch will increase only during flooding, when the reservoir spillway must be used—mainly in the spring, one year out of four compared to two years out of three under baseline conditions (conditions after commissioning of Eastmain-1). Section 5.4 discusses the effect of this spillage on the spawning grounds developed for the Eastmain-1 project.

COMEX believes the variant selected for siting Eastmain-1-A Powerhouse (variant 2) is the logical choice, as it means developing and managing the new powerhouse in tandem with the existing Eastmain-1 Powerhouse. In addition, variant 2 has less impact on the river stretch developed for lake sturgeon downstream of Eastmain-1 dam as part of the Eastmain-1 project. COMEX considers, in this situation, that it would also be best to coordinate the two environmental monitoring programs to optimize environmental protection and collect maximum data.

**Sarcelle powerhouse: variants presented by the proponent**

There are no variants for Sarcelle powerhouse. However, the Boumhounan Agreement mentions that future facilities at the Sarcelle site shall consist of either a new control structure or a powerhouse, as the Crees decide if they exercise their option respecting the existing control structure. Following the signing of the Boumhounan Agreement, the Crees agreed to replace the existing control structure at the Opinaca reservoir outlet by a powerhouse with an installed capacity of 125 MW that uses the 10.8-m head. The powerhouse will be built with its axis parallel to the existing water flow. Chapter 5 of this report discusses the impact of building a powerhouse at the site of a control structure to replace that structure.

Given the decision to build a powerhouse to replace the Sarcelle control structure, the new powerhouse is included in the project and analyzed as a complete component. The choice was left to the Grand Council of the Crees, and they elected to build a powerhouse. No variant is presented for this structure.
2.1.3 TRANSFER STRUCTURES BETWEEN THE DIVERSION BAYS

Variants studied by the proponent

The diverted waters of the Rupert River flow through the diversion bays into the Eastmain 1 Reservoir guided and contained by dams, dikes, canals and a tunnel. The proponent studied two variants to transfer water from the forebay to the tailbay.

The first of these calls for a transfer canal at the west end of Lac de la Sillimanite. This variant comprises the following components:
- An open channel about 2,500 m long
- An aboveground control structure at the downstream end of the channel
- Two long canals (1,450 m and 2,900 m) to carry water from the control structure to Arques Lake

Two large dikes will have to be built west of the canals to contain the water and guide it to Arques Lake. About 7,000,000 m³ of material must be excavated to build this variant, and the two planned dikes will require about 500,000 m³ of fill.

The second variant involves digging a tunnel under Lac de la Sillimanite to connect the watersheds of the Lemare and Nemiscau rivers. The tunnel has a control structure at its intake portal, and two canals at its outlet take the water down to Arques Lake. Total length of the structures is 3,800 m. About 2,530,000 m³ of material must be excavated for this variant, and about 160,000 m³ of fill are required for two small dikes west of the structure.

The tunnel option was selected by the proponent because it will cost less than the canal and offer greater flexibility in scheduling construction as work could progress year-round rather than just in the summer. Two types of facilities were studied for the transfer tunnel entrance: a concrete control structure with two gates and a concrete weir. According to the proponent, the weir has several technical, economic and environmental advantages: it is simpler to operate and will maintain water level in the Rupert forebay upstream without gates to operate at the tunnel. The main environmental advantages in opting for the tunnel to transfer water to the tailbay are sparing of Lac de la Chlorite and Lac de la Sillimanite, a smaller area flooded in the tailbay and less excavated material (see Map 2-6).
In the Supplement to the Environmental Impact Statement (RP10, p. 73-79), the proponent added to the tunnel project with plans for a bypass for the diverted waters in case of reduced flow capacity. This option, which will be used only in case of major work in the tunnel, will allow partial diversion of the waters of the Rupert River into Cabot Lake until the tunnel is restored to service (see Section 2.2.4).

COMEX deems the option selected by the proponent to transfer the diverted waters from the forebay to the tailbay acceptable as it will thus be unnecessary to empty Lac de la Chlorite and Lac de la Sillimanite and the area flooded in the tailbay will be smaller by 5 km².

### 2.1.4 WORKCAMPS

It will take five years to build the project. Peak workforce during the construction is estimated at 5,500 men and women. These workers will be lodged in eight workcamps, three of them existing camps (the Eastmain workcamp, the Nemiscau workcamp and the KM 257 workcamp on the James Bay highway). The other five workcamps will be built for the project and decommissioned when the work is completed (the Sakami Lake, Sarcelle, Rupert, Jolliet Lake and Kauschiskach workcamps).

The proponent used the following selection criteria to site the camps: available land area, nature of the foundation soil, topography, drinking water supply, wastewater disposal, land drainage, water table level, proximity to work areas and accessibility.

The proponent identified possible sites for the Sakami Lake, Sarcelle, Jolliet Lake and Kauschiskach workcamps right next to the construction sites. Though the locations are approximate and exact sites will not be selected until the execution phase of the project, it is unlikely that the camps will be located elsewhere. As a possible alternative to the Kauschiskach workcamp, the proponent is considering the possibility of accommodating workers at the existing KM 257 workcamp on the James Bay highway. A final choice between these options will be made when construction starts.

Given the number, distribution and size of the construction sites in the two diversion bays, variants for siting of the Rupert workcamp were studied. Variants with one or two workcamps were first compared on the basis of cost, worker travel and construction site proximity. This comparison concluded that the best strategy was to build one new temporary workcamp in the diversion bay area and to use the existing Nemiscau workcamp as a backup if necessary.

Once this decision was made, four possible locations were studied for the Rupert workcamp:

- Site C-1: along the Rupert forebay access road about 2 km south of the Lemare control structure
- Site C-2: along the Lemare River, near future dike C-R-15, about 2 km west of the Rupert forebay access road.
- Site C-3: along the Lemare River, near future dike C-R-14, about 4 km west of the Rupert forebay access road.
– Site C-4: between the two diversion bays, about 5 km northwest of the transfer tunnel access road

Only sites C-3 and C-4 meet the proponent’s criteria for the Rupert worksite. Site C-4 was selected because of its central location with respect to the construction sites, its construction cost and its lesser impact on the environment. It is less then 5 km from a passable road. With this option, a 15-km stretch of the future access road to the Rupert diversion bays can be relocated to an area with less impact on Nemaska Category II lands.

COMEX believes that the analysis conducted by the proponent to site the Rupert workcamp meets established standards and that the site selected (C-4) is technically and environmentally the best choice.

### 2.1.5 ROAD CORRIDORS

The proponent must build about 255 km of road and improve another 105 km.

The proponent developed the network of roads required for the project on the basis of technical, environmental and social criteria, the application of which led to gradual optimization of the corridors studied. These criteria included presence of potential borrow pits, preference for the shortest route possible, sensitive environmental components liable to be modified by the presence of the road, number of water crossings and presence of areas of special value to tallymen.

Variants of the permanent access roads were studied. Based on consultations with Cree trappers, a number of changes were made to avoid valued areas. All preferred corridors for the main roads and the secondary roads that were discussed with land users are presented in the impact assessment.

Design criteria selected for roads to be built or improved are as follows:

– **Type I roads**: these are the main access roads to the territory. Design right-of-way is 25 m. These roads are designed for a base speed of 70 km/h and have a standard width of 9.6 m.

– **Type II roads**: these are the main access roads to strategic project sites. Design right-of-way is 25 m. These roads are designed for a base speed of 50 to 70 km/h. Standard width of these roads is also 9.6 m, for safe traffic of heavy machinery and trucks.

– **Access roads to dikes and control structures**: these are permanent secondary single-lane roads with a roadway 6 m wide.

– **So-called “temporary” roads**: these roads are designed for construction machinery, trucks and pick-up trucks. The roadway is 7 m wide, the road surface is rough (of natural gravel) and base speed is 40 km/h. These roads are meant to be used only during the construction period, and the environment will be restored when construction is complete unless a special agreement is made with the tallymen.
Permanent access road to the diversion bays

The initial stretch of this 31-km type I road runs from Albanel substation to the transfer tunnel intake canal, passing by the site of the Rupert workcamp. The first 5 km run along a maintenance road for two 735-kV power lines (circuits 7069 and 7070). In the summer, the Cree travel this road by car. The rest of the year they use all terrain vehicles or snowmobiles on this road. This 5-km stretch of maintenance road will be upgraded to meet the criteria of a type I road.

The proponent studied two variants for the corridor of the permanent access road to the diversion bays starting at km 5 of the line maintenance road:

- A direct link between KP 5 and the Lemare control structure, extending right to the Rupert workcamp. This would require building 12 km of road (about 10 km in Nemaska Category II lands) to get to the Lemare control structure as well as 9.5 km of road to reach the Rupert workcamp site.
- Use of the Circuits 7069 and 7070 road between KP 5 and KP 17 to reach the Rupert workcamp directly. This variant involves upgrading 12.4 km of the existing road and building a new 4.4-km stretch of road to reach the Rupert workcamp site. In this variant, the road will extend to the intake canal of the transfer tunnel and pass about 5 km north of the Lemare control structure.

The proponent prefers variant 2 because it will not be necessary to build 12 km of road, (10 of them in Category II lands) and construction of the Rupert workcamp can begin earlier.

Based on a structure optimization analysis, four major stretches of the Rupert forebay access road (4 km, 5 km, 2 km and 7 km) were relocated to keep them away from lakes or reduce environmental impacts.

COMEX agrees with the proponent’s choice for location of the permanent access road to the diversion bays, running from Albanel substation to the intake canal of the transfer tunnel, and with the modifications to the access road to the forebay.

Muskeg-Eastmain-1 permanent road

This 40-km road provided for in the Boumhounan Agreement to give tallymen and the Eastmain community easier access to this part of the territory requires construction of a bridge with a 22-m span across the Acotago river as well as installation of 94 culverts.

The proponent began the studies for construction of this road in 1993. For this project, the proponent studied four corridor variants. The criteria used to select a corridor were total road length, construction constraints related to rock surfaces, peatland, number of water crossings required, favourable soil, proximity to borrow pits and impact on wildlife. This study included data validation in the field as well as characterization of potential sources of borrow material.
COMEX believes the proponent’s analyses to identify a corridor and route for the Muskeg-Eastmain-1 road meet established standards. COMEX approves the route the proponent has selected for this permanent road, destined to become a major component of the road network in the James Bay territory.

2.1.6 TRANSMISSION LINE CORRIDORS

The project includes construction of two 315-kV transmission lines: the line connecting Eastmain-1-A Powerhouse to the Québec grid (1 km) and the line connecting Sarcelle powerhouse to the Québec grid (101 km). Two 25-kV lines are also planned: the line linking Albanel substation and the Lemare control structure (30 km) and the line connecting Albanel substation to the Rupert control structure (30 km).

No variants were studied for siting the 25-kV lines as they will run along existing roads: the 25-kV line between Albanel substation and the Lemare control structure will be built along the access roads to the diversion bays, and the line between Albanel substation and the Rupert control structure will be built along the Route du Nord and the access road to the Rupert control structure.

As for the 315-kV lines, corridor variants were studied only for the line connecting Sarcelle powerhouse to the Québec grid (101 km). Opinaca reservoir is the major obstacle this line must cross to connect the two points.

The proponent used several technical, economic and environmental criteria to select a preferred corridor: land use, obstacles (Opinaca reservoir, streams and peatland), wildlife habitats, presence of existing access roads, line length, technical construction difficulties and ease of line maintenance.

Three corridors were studied for the power line:

- The east corridor: this corridor is about 115 km long and runs north and east of Opinaca reservoir. Entirely located in an area where there is no road infrastructure, this corridor would create a new inroad into the territory.
- The central corridor: some 90 km long, this corridor crosses through the centre of Opinaca reservoir at a place were it narrows. Several rockfill islands on which to erect towers for the reservoir crossing would have to be built. Three or four of these towers would be erected in deep water (about 16 m).
- The west corridor: this corridor is 101 km long and runs south and west of Opinaca reservoir. It lies along existing road (including the Muskeg-Eastmain-1 road) for virtually its entire length and along existing line for much of its length.

The proponent selected the west corridor as it offers the most technical, economic and environmental advantages. It involves few technical difficulties, and there is already access infrastructure that will facilitate construction of the power line.
COMEX believes the analysis of the corridor variants presented in the impact assessment for the 315-kV line connecting Sarcelle powerhouse to the Quebec grid is adequate. COMEX agrees with the proponent’s selection of the west corridor.

2.2 PROJECT OVERVIEW

The Rupert River flows east-west for 580 km from its source in Mistassini Lake to its mouth in Rupert Bay. The Rupert River watershed covers 43,260 km².

The project will split the watershed of the Rupert River in two along a 70-km north-south line from the southeast end of Eastmain 1 Reservoir (Ruisseau Caché) to the northwest end of Mesgouez Lake that cuts across the proposed site for the Rupert control structure (KP 314 of the Rupert River) (see Figure 2-1).

Partial diversion of the waters of the Rupert River into Eastmain 1 Reservoir, in the Eastmain River watershed, will be accomplished via the Rupert forebay (in the south) and the Rupert tailbay (in the north). To create these two diversion bays, four dams with control structures, 72 dikes, 10 canals and a tunnel between the two bays must be built.

The Rupert forebay will cover 228.7 km² and partially flood the Rupert River watershed, including parts of the subwatersheds of the Misticawissich River, Kayechishekaw Creek and the Lemare River. A 2.9-km tunnel built under Lac de la Sillimanite at the north end of the forebay will transfer the diverted water from the Rupert forebay to the Rupert tailbay. Water level in the Rupert forebay will be controlled by a weir in the intake canal upstream of the entrance to the transfer tunnel and by the Rupert control structure. These two structures will control maximum water level in the Rupert forebay so as not to affect natural water levels in Mesgouez Lake. As stipulated in the Boumhounan Agreement, the Rupert forebay shall have no effect on natural water levels and flows in Mesgouez, Woollett and Bellinger lakes.

The Rupert tailbay will cover 117.5 km² and partially flood the Nemiscau River watershed, including the Arques Creek subwatershed, before emptying into the watershed of Ruisseau Caché, a tributary of Eastmain 1 Reservoir.

The diverted waters of the Rupert River will then follow the path taken by the waters of Eastmain 1 Reservoir (the Eastmain River, Opinaca reservoir, Boyd Lake, Sakami Lake, the Sakami River, Robert-Bourassa reservoir and La Grande Rivière) to the mouth of the La Grande Rivière, at Chisasibi.

The Rupert diversion project is designed so that future water levels in Eastmain 1 Reservoir, Opinaca reservoir, Boyd Lake, Sakami Lake and Robert-Bourassa reservoir will not exceed existing authorized maximum water levels for each of these bodies of water. However, diversion of the waters of the Rupert River will increase maximum flow beyond that authorized under the Sakami Lake Agreement. This increase has, however, been approved under the Boumhounan Agreement. The increased flow in the Boyd Lake and Sakami Lake sector will require construction of a canal and a concrete weir at the Sakami lake outlet. The Sakami weir will limit maximum water level in Sakami Lake at the lake outlet to 186.7 m—below the maximum 187.04 m stipulated in the JBNQA.
Figure 2-1 Diagram of the Eastmain-1-A powerhouse and Rupert diversion project
The project comprises construction of Eastmain-1-A Powerhouse (768 MW) at the Eastmain 1 Reservoir outlet and construction of Sarcelle powerhouse (125 MW) at the Opinaca reservoir outlet. At the Robert-Bourassa reservoir outlet, the waters will be channelled through Robert-Bourassa generating station or La Grande-2-A generating station and then through La Grande-1 generating station.

The flow control structure required at KP 314 of the Rupert River will alter the natural hydrograph of the river. The river bed will be flooded in the Rupert forebay between the outlet of Mesgouez Lake (KP 332.5) and the control structure at KP 314. An instream flow managed by the Rupert control structure will be introduced between the control structure at KP 314 and the mouth of the river (KP 0).

All waters from tributaries that empty into the Rupert River east of the 70-km north-south line separating the Rupert River watershed in two will be harnessed for the hydropower project, including those of the Natastan and Misticawissich rivers. Natural flows in tributaries that empty into the Rupert River west of this north-south line, will either be left intact (Rivière à la Marte and Jolliet River) or, if affected by a diversion bay, restored using a control structure (the Lemare and Nemiscau rivers and Arques and Kayechischekaw creeks).

<table>
<thead>
<tr>
<th>Table 2-4: Mean annual flow (m$^3$/s) of the Rupert diversion impounded by the diversion bays</th>
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<tbody>
<tr>
<td><strong>MEAN ANNUAL FLOW (M$^3$/S)</strong></td>
</tr>
<tr>
<td>Rupert forebay</td>
</tr>
<tr>
<td>Rupert River</td>
</tr>
<tr>
<td>Misticawissich River</td>
</tr>
<tr>
<td>Kayechischekaw Creek</td>
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<tr>
<td>Lemare River</td>
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<tr>
<td>Rupert tailbay</td>
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<tr>
<td>Arques Creek</td>
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<tr>
<td>Nemiscau Sud River (Nemiscau-2)</td>
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<tr>
<td>Nemiscau Nord River (Nemiscau-1)</td>
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<td><strong>Total</strong></td>
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Flow impounded at the Rupert River closure point (KP 314) is 637.3 m$^3$/s, as it includes flow from the Misticawissich River, whose mouth is 10 km upstream of the dam.

The restored flow in the Nemiscau River will maintain the water level not only in Teilhard, Biggar and Caumont lakes but also in Champion Lake, on whose banks the village of Nemaska is located. The restored flow in the Nemiscau River, the instream flow in the Rupert River and the weir to be constructed at the outlet of Lake Nemiscau will keep the lake at its natural levels at Old Nemaska.
Mean annual instream flow in the Rupert River downstream of the Rupert control structure will be 184.7 m³/s after the diversion—that is, about 29% of mean annual flow under natural conditions.

To maintain use of the Rupert River downstream of the control structure, the proponent is planning to build eight structures designed to preserve, in the reaches they affect, not only the Rupert’s natural features but also navigation, fishing, spawning grounds, feeding habitats for fish and aquatic beds. These eight structures together with the instream flow will conserve more than 90% of the wetted area of the Rupert River in August and September between KP 314 and KP 5.

In the increased-flow section, the diverted waters of the Rupert River will reach James Bay via La Grande Rivière. The banks of the La Grande Rivière are currently showing signs of erosion between La Grande-1 generating station and Chisasibi (26 km). Though there is reason to believe the modifications will not be extensive, the impact of the Rupert diversion on river bank stability in this stretch cannot be predicted with any accuracy. The proponent is thus planning to place nine granular blankets at the foot of slopes prone to erosion. The granular blankets will be installed on the south shore of the river. Nine kilometres of shoreline will thus be protected against erosion. The proponent is also considering the possibility of building small spurs perpendicular to the granular blankets to improve conditions for fishing along the river banks.

The proponent is planning to build the following transmission lines: a 315-kV line connecting Eastmain-1-A powerhouse to the Québec grid; a 315-kV line connecting Sarcelle powerhouse to the Québec grid; a 25-kV line from Albanel substation to the Rupert workcamp, the transfer tunnel and the Lemare control structure; a 25-kV line from Albanel substation to the Rupert control structure. The Sakami Lake, Sarcelle, Jolliet Lake and Kauschiskach Creek temporary camps will be powered by a 25-kV line, but some of these camps may also be equipped with generators.

Creation of the Rupert tailbay will require the proponent to relocate or elevate the bases of some of the towers on three existing 735-kV power lines. In all, 8.3 km of line and 9 towers will be affected: circuit 7059 (at KP 39 of the Rupert tailbay) and circuits 7069 and 7070, in two places (KP 51 and KP 54 of the Rupert tailbay).

The project includes construction of a new drinking water plant at Waskaganish and stabilization of riverside slopes on the south bank of the Rupert River beside the village of Waskaganish and at the water intake for the drinking water plant.

### 2.2.1 DESIGN OF THE MAIN STRUCTURES

**Rupert forebay**

The partial diversion of the waters of Rupert River at KP 314 will be accomplished by a rockfill dam 474 m long and 29 m wide with a crest width of 9 m. This dam is the starting point of the impounding of the waters of the Rupert forebay, which will partially flood the Rupert River, Kayechischekaw Creek and Lemare River watersheds. To create the forebay, the
proponent will build a dam on the Lemare River and 31 dikes 22 to 1,994 m long and 1 to 20 m high with crests widths of 6 to 7.5 m. The dam and the dikes will be earthfill structures protected by riprap or rockfill on the upstream side.

The Rupert forebay is 50 km long starting at Mesgouez Lake and covers a total area of 228.7 km². It will flood 128.1 km² of land. Average depth will be about 10 m and maximum depth will be 17 m, at the Rupert dam. Mean summer drawdown is estimated at 70 cm, with a maximum of 2 m, and maximum winter drawdown is also estimated at 2 m. Maximum flow in the forebay is 800 m³/s and annual average flow is 453 m³/s. During the maximum flow period, there will be a 40-cm difference in elevation and maximum flow velocity will be about 0.4 to 0.6 m/s, with extremes of 1 to 1.5 m/s between canals S73-1 and S73-3 and downstream of canal S73-4.

Rupert dam (structure C-1) will be equipped with a concrete control structure that will release instream flows equivalent to roughly 29% of the mean annual flow of the river. The control structure has two crest gates 12.2 m wide and a bottom outlet with a gate 5 m wide and 7.1 m high. The instream flow release structure will be supplied by a 25-kV line from Albanel substation. Inflow from the Rupert River upstream of the dam will be known from data collected at a water level station in Mesgouez Lake, and models will be used to forecast flood timing and size. A high-precision measuring system will be installed in the central opening of the control structure, and river flow downstream of the dam will be measured by a water level station. The control structure is designed to discharge 3,470 m³/s, that is, the probable maximum flood. The control structure will be used to manage the Rupert River instream flow and to release from the Rupert forebay any flow exceeding the maximum 800 m³/s that the transfer tunnel can handle.

The waters of Kayechischekaw Creek will be impounded by a dike (C-R-7-8) with an instream flow release structure that will allow a mean annual flow of 0.4 m³/s to pass. The release structure consists of a pipe installed in a trench dug under the right abutment of the dike and embedded in the concrete. This pipe will remain open at all times.

The waters of Lemare River will be impounded by a sand-and-gravel dam (C-R-21A) 579 m long and 19 m high with a crest width of 7.5. It will be coupled with an instream flow release structure that will restore natural flow in the river to approximate the river’s natural hydrograph: mean annual flow of 16.2 m³/s, with spring flood peak of 88 m³/s. The concrete release structure will have three bottom outlets and will be built in the right abutment of dike C-R-22 about 250 m north of Lemare dam. The circular central opening is 0.9 m in diameter and has a slide gate on the downstream side. It will remain open at all times to allow passage of the winter instream flow of 5 m³/s, the lowest flow. The two side openings are square-shaped and have heated slide gates on the downstream side. A 25-kV line from Albanel substation will supply this instream flow release structure.

Four canals are to be built to help channel the flow in the forebay. Canal S73-1 (780 m long and 170 m wide) routes water from the Rupert River watershed to the head of the Kayechischekaw Creek watershed. Canal S73-3 (1.6 km long and 100 m wide) directs the waters of the Kayechischekaw Creek watershed into the Lemare River watershed. Canals S73-4 (280 m long...
and 125 m wide) and S73-4A (180 m long and 120 m wide) guide the water through the nameless lakes of the Lemare River watershed.

**Transfer structure between the diversion bays**
The transfer structure is located where the forebay and the tailbay meet. It includes a tunnel 2.9 km long dug 40 m down under Lac de la Sillimanite to connect the Lemare River watershed to the Arques Creek watershed, a subwatershed of the Nemiscau River.

On the upstream side of the tunnel are the 600-m intake canal, a concrete weir 90 m long with a crest elevation of 303.4 m and a head pond. The 220-m outlet canal on the downstream side of the tunnel discharges the water. The weir and the transfer tunnel are designed for a maximum flow of 800 m$^3$/s.

The underground transfer tunnel will be 12.7 m wide and 18.6 m high at the centre of the ceiling arch. Flows in the tunnel will vary between 100 and 800 m$^3$/s, with a mean flow of 453 m$^3$/s. Construction of the transfer tunnel will require excavation of 890,000 m$^3$ of overburden and 1,640,000 m$^3$ of rock.

In the event of a transfer tunnel malfunction causing a major decrease in the tunnel's downstream discharge capacity (reduced conveyance), the proponent has provided for a temporary alternative while repairs are carried out on the tunnel. Some of the water from the Rupert River (230 m$^3$/s) will be channelled into the tailbay through Cabot Lake. To do this, an opening will be made in dike C-P-17A, north of Cabot Lake, to let the waters of the forebay empty into the tailbay and flow down a valley for about 6 km before reaching the entrance of canal 15.

Modifications are required at the site of dike C-P-17A to allow this exceptional temporary bypass. The basement rock under the dike will be reshaped into a canal and a horizontal platform connecting Cabot Lake in the forebay to a nameless lake in the tailbay. Dug into the divide between the watersheds, the canal will be 100 m wide and about 300 m long. The platform will be at elevation 304.15 m and the canal will be about 4 m deep at the divide. The canal invert will serve as a control weir to prevent excessive lowering of the water level in Cabot Lake and the Rupert forebay.

Should the proponent have to use this option to transfer water from the forebay to the tailbay, the earth dike closing the canal will be mechanically removed to allow water to flow freely. The dike will be rebuilt when the repairs on the transfer tunnel are complete. However, before this option is implemented, COMEX believes the proponent must submit the proposal to level the dike to the environmental and social impact assessment and review procedure under Section 22 of the JBNQA, as the impacts of using this temporary measure for diverting the waters of the Rupert River have not been assessed.
Rupert tailbay

The Rupert tailbay starts at the transfer tunnel’s outlet canal, about 1 km south of Arques Lake, and ends at the Eastmain 1 Reservoir intake. The tailbay will flood part of the Nemiscau River watershed, including part of the Arques Creek subwatershed. Hydro-Québec Production plans to build two dams to create the tailbay, one on the south branch of the Nemiscau River (Nemiscau-2, C-108) and the other on the north branch (Nemiscau-1, C-76), as well as 41 dikes 55 to 2,225 m long and 0.5 to 10.5 m high with crest widths of 6 to 7.5 m. The dams and dikes, including the Arques dike (C-104), will be earth structures protected by riprap or rockfill on the upstream side.

Dikes PV-1, PV-2 and PV-3 at the north end of the Rupert tailbay are porous dikes, pervious embankment structures that allow water from the tailbay to percolate through, reducing flow in canal C and preventing erosion at certain low points in this reach. The dikes also channel the waters into Ruisseau Caché. Drainage ditches F-03 (1,850 m long) and F-04 (360 m long) will be built downstream of dikes PV-2 and PV-3 to help channel the flow towards Eastmain 1 Reservoir through the secondary valleys of Ruisseau Caché.

The Rupert tailbay will flood a total of 117.5 km², including 60 km² of land environment. The tailbay is 44 km long. Difference in elevation between Arques Lake, at the outlet of the transfer tunnel, and the downstream end of the tailbay at the Eastmain 1 Reservoir intake is about 13.6 m. As its water surface gradient is very steep, the tailbay divides into four bodies of water: from the transfer tunnel outlet to the entrance to canal 4, about 9 km; from canal 4 to dike C-70, about 11 km; from dike C-70 to canal C, about 14 km; and from canal C to Eastmain 1 Reservoir, about 10 km. In the ice-free season, the difference in elevation is about 3 m between the transfer tunnel’s outlet and canal C and 10.6 m between canal C and the Eastmain 1 Reservoir intake.

Average depth of the tailbay is 8.5 m and maximum depth is 19 m, at Arques Lake. Mean summer drawdown is estimated at 80 cm, with a maximum drawdown of 3.3 m at Arques Lake and a maximum drawdown of 1.5 to 2 m in the canal C area. Maximum winter drawdown is estimated at 4.3 m at Arques Lake and about 2.7 m in the canal C area. Mean water flow velocity in the tailbay will be about 0.65 m/s—except in the six canals, where it will reach 1.5 m/s. Flow velocity may also be higher in the narrows at KP 45 and KP 48 of the tailbay, in the Ruisseau Caché reach (5 to 7 m/s) and in the Eastmain 1 Reservoir drawdown zone, where flow will reach 2.5 m/s.

Nemiscau-1 dam (C-76) is a sand-and-gravel structure 810 m long and 12.9 m high with a crest width of 7.5 m. It will be coupled with an instream flow release facility built to restore natural mean annual flow in the river. The instream flow release structure consists of a concrete trench built into the bedrock on the north bank of the river in the right abutment of the dam. The structure has two square bottom outlets with slide gates designed to release a mean annual flow of 11.6 m³/s, with minimum and maximum instream flows of 4.9 m³/s and 74 m³/s respectively. Maximum flow velocity through the outlets is about 4 m/s. The gates are operated by an electrical screw hoisting mechanism.
Nemiscau-2 dam (C-108) is a sand-and-gravel structure 230 m long and 9.4 m high with a crest width of 7.5 m. It is coupled with an instream flow release structure designed to restore natural mean annual flows to the river. The instream flow release structure consists of a concrete trench built into the bedrock on the north bank of the river at the north end of the dam. The release structure has two circular bottom outlets (0.65 and 1.15 m in diameter) with slide gates. The small opening will be open at all times to release a minimum 0.8 m3/s instream flow. The other outlet will be used as needed, notably in the spring. Mean annual flow is 2 m3/s, with minimum and maximum instream flows of 0.8 m3/s and 6 m3/s respectively. Maximum flow velocity in the outlet is about 5.4 m/s. The gates will be operated manually, as needed, using a screw hoisting device.

The Arques stream dike (C-104) is a sand-and-gravel structure 490 m long with a crest width of 7 m. It is coupled with an instream flow release structure built in the dike footprint and designed to release natural mean annual flows. This structure comprises two steel pipes 0.75 m in diameter laid in a trench dug down to bedrock and then filled with concrete. One of the pipes will be calibrated to pass the minimum flow of 1 m3/s, and it will be open at all times. The other pipe will have a slide gate for passing maximum flow in the flood season. Mean annual flow will be 2.3 m3/s, with minimum and maximum instream flows of 1 m3/s and 6 m3/s respectively. Maximum flow speed through the openings is about 4.4 m/s.

Six canals will be built to improve flow conditions in the tailbay: canal 16, 675 m long and 100 m wide; canal 15, 750 m long and 130 m wide; canal 4, 1,300 m long and 110 m wide; canal 5, 590 m long and 110 m wide; canal C, 820 m long and 200 m wide and canal Z, 1,240 m long and 170 m wide. Canals 16 and 15 channel the water between the outlet of the transfer tunnel and Arques Lake. Canals 4 and 5 carry the waters of the Arques Creek watershed into the Nemiscau River watershed. Canal C channels the waters of the Nemiscau River watershed to Eastmain 1 Reservoir via the Ruisseau Caché valley. Canal Z facilitates water flow within the Ruisseau Caché valley.

The annual average transfer of 453 m3/s of water into Eastmain 1 Reservoir will mean the following increases in current flows:

- 80% increase downstream of the Eastmain-1 development
- 54% increase at the Sarcelle site
- 47% increase at the Sakami Lake outlet
- 14% increase downstream of the Robert-Bourassa development

The Rupert River downstream of the control structure

Mean annual instream flow in the Rupert River downstream of the Rupert control structure will be 184.7 m3/s after the diversion—about 29% of the mean annual flow in the river under natural conditions. With inflows from tributaries of the Rupert River downstream of the control structure, the mean annual instream flow at the mouth of the river, at Waskaganish, will be about 48% of the mean annual flow under natural conditions.
The Rupert River has a step-pool profile between the control structure and the mouth of the river in Rupert Bay (a distance of 314 km), with a difference in elevation of about 288 m—202.5 m of it between KP 110 and Waskaganish. The proponent plans to build eight structures to preserve the natural features of the river and maintain its uses. The selected structure sites are in areas with sharp declivities: KP 290, 2 km downstream of the mouth of Lemare River; KP 223, 7 km downstream of the mouth of Rivière à la Marte; and KP 170, at the Lake Nemiscau outlet and a few kilometres downstream of the mouth of Nemiscau River. The following sites have also been selected: KP 110.3, several kilometres upstream of the Oatmeal rapids (Kamaakwewts); KP 85, at the Fours rapids (Kanewshtekaw); KP 49, at the Bear rapids; KP 33, at Plum Pudding rapids (Kaowpischewaan) and KP 20.4, several kilometres downstream of Smokey Hill rapids (Notimeshanan).

Six of the eight structures are weirs designed to maintain water levels on 50% of the Rupert river downstream of the closure point at levels resembling mean natural levels previously recorded in August and September. In river reaches immediately upstream of the weirs, flow velocity will be typical of lacustrine environments (about 0.1 m/s)—a drop of 58 to 75% compared to natural conditions. However, water levels will be similar to those currently reported in the summer low-flow period. The other two structures are a rock blanket at KP 20.4 designed to maintain fish migration and a spur dike at KP 290 designed to maintain water level at the mouth of the Lemare River (KP 292 of the Rupert River).

At KP 290, the Rupert forks into three branches around two islands and drops about 2 m immediately downstream of the fork. A third island set back from the other two and just upstream close to the north bank creates a secondary channel in the north branch. Two riprap sills are to be built just before the drop, one 59 m long and the other 69 m long and both 3 m high. One will be in the north arm and the other in the centre stem, and they will maintain upstream water level at natural levels recorded in August and September over a distance of about 5 km on the Rupert River and about 2 km on the Lemare River. Natural conditions will be maintained in the south branch and the secondary channel in the north branch. The secondary channel in the north branch will also be dug out to create a slope that promotes free movement of fish.

The KP 223 structure site is 7 km downstream of the confluence of Rivière à la Marte and the Rupert River, at the head of rapids that drop 15 m to KP 218 and affect the river for nearly 47 km upstream. The river is about 200 m wide at this site and there is a small island on the south side. A concrete weir 130 m long and 4 m high will run from the north bank to the small island. Natural conditions will be maintained in the south branch of the river. A concrete gravity dam on the north bank will extend the weir approximately 130 m. A gently sloping channel about 160 m long and about 14 m wide will be dug in the north bank to allow free movement of fish. According to documents submitted by the proponent on July 31, 2006 (PD5.4 and PD5.5), the KP 223 structure has been re-evaluated. A few large rocks or blocks of concrete will be used to partially obstruct the flow cross section of the south branch of the river, raising water level 10 cm upstream of the weir to recreate average summer conditions, minimize bank...
exposure and restore the natural summer aspect of the river between KP 223 and KP 253, a distance of 30 km.

The KP 170 structure site is at the main Nemiscau Lake outlet, a natural control point for water level in the lake. The outlet consists of large rapids with a 7-m drop flowing on either side of an island. Lake Nemiscau has a second outlet at KP 180 which empties into the Rupert River at KP 153. There is no flow through this outlet in winter and only 7% of the flow of the main outlet during an average flood. Old Nemaska lies on the west bank of Nemiscau Lake at about KP 188 of the Rupert. The weir at KP 170 will maintain the natural level of Nemiscau Lake as required under the Boumhounan Agreement. Sited at the head of the rapids, the planned structure will comprise a concrete weir 40 m long running from the right bank of the river to the island and a concrete weir 200 m long between the island and the left bank. The weirs will be extended on the river banks by low concrete walls.

Oatmeal rapids (Kamaakwewts), between KP 110 and KP 108 of the Rupert River, drop a total of 34 m, with a 21-m drop at KP 108.9. The natural sill at the head of the rapids controls water level in the river over nearly 15 km upstream. The planned weir will maintain water level upstream right to where Jolliet River joins the Rupert (KP 129) and will help to preserve the visual aspect of the rapids. Built of sheet-pile cells filled with concrete, the weir will be 183 m long and 6 m wide, and it will be extended on both banks by dikes about 140 and 240 m long. The downstream side of the weir will be protected by riprap. A third dike about 730 m long will be built on the bank in front of a bay that bites into the left bank of the river.

The KP 85 site is immediately upstream of the Fours rapids (Kanewshtekaw). These are actually four sets of rapids in succession with a total drop of 73 m that end at KP 77. Two concrete weirs are to be built to maintain water level over a stretch of river extending nearly 11 km upstream to the foot of the rapids at KP 95.6. The right weir will be 60 m long and 2 m high and the left weir 100 m long and 3 m high. Each will run between one bank of the river and an island at the head of the rapids.

At KP 49, the Rupert River forks into two branches at the head of the Bear rapids, which drop about 10 m. A structure is to be built in the north branch, to maintain water level over a stretch of river extending 15 km upstream to the foot of the Cat rapids, while leaving flow unimpeded down the south branch, which is about 45 m wide. A concrete weir 175 m long and 6 m high will be built in the north branch of the river. A temporary bypass canal about 620 m long, 70 m wide and 1.5 m deep will also be built. Once the work is complete, the bypass canal will be closed off on the downstream side by an earth dam with rockfill and riprap protection and probably restored as wetland. The proponent is planning to build a temporary bridge across the south branch of the river at the end of the access road to the weir so the island can be reached during the work.

The Rupert River forks into three branches around a set of islands at KP 33, the head of Plum Pudding rapids (Kaowpischewaan) with their 15-m drop. The river is about 400 m wide at this point. The proponent is planning to build a concrete weir 177 m long and 3 m high from the north bank to one of the islands. Two earth dikes with rockfill and riprap protection about 200 and 260 m long and roughly 9 m high will also be built. These dikes will run from the island to a second island and then to the south bank. The structures are designed to maintain water level at natural levels reported in August and September over a 15-km stretch of the Rupert
River upstream that includes Kapeshi Eputupeyach Bay. The weir will not affect natural fish migration, as fish will use a secondary branch on the north side of the river between KP 33 (downstream of the weir) and KP 37.

The proponent is planning to install a rock blanket on the north side of the river at KP 20.4. The river is 320 m wide at this site. The blanket will be 200 m long, 200 m wide and 4 m thick, with maximum height in the upstream part. The purpose of this structure is to control water level between Gravel Pit (KP 20.4) and the foot of Smokey Hill rapids (Notimeshanan) (KP 23.7), preserve traditional dip net fishing at Smokey Hill, allow boats and fish to pass KP 20.4 freely, protect the area’s river scenery and make it less likely that cisco spawning grounds will freeze. A trapezoidal navigation channel 45 m wide upstream and 150 downstream will also be included to improve navigation conditions. In summer, water level in the Rupert River above the rock blanket will reach 0.9 m, with a maximum of 1.4 m in the centre of the navigation channel. To carry out the work, the proponent is planning to build a large temporary L-shaped jetty at the site where the rock blanket is to be built. The arms of the jetty will be 150 and 190 m long and a temporary 160-m bridge will run from the south bank of the river to the jetty.

**Eastmain-1-A Powerhouse**

Eastmain-1-A Powerhouse will be located at the north end of the reservoir, about 500 m east of the existing Eastmain-1 generating station. The waters of the Rupert River will be partially diverted into Eastmain 1 Reservoir to supply Eastmain-1-A Powerhouse. The development comprises the following structures: an aboveground powerhouse, a headrace, an intake, penstocks and a tailrace. Approximately 2,900,000 m³ will be excavated to build the powerhouse and its components; of that, 2,000,000 m³ will be rock.

Eastmain-1-A Powerhouse is equipped with three vertical Francis units, each with a rated capacity of 256 MW, for a total installed capacity of 768 MW. Each unit has a rated flow of 448 m³/s, giving the plant a design flow of 1,344 m³/s. The rated net head is 63 m. The powerhouse will be remotely controlled from the Regional Control Centre (RCC), and data will be transmitted to the System Control Centre (SCC) data acquisition and processing system. A 315-kV switchyard will integrate the powerhouse into the Hydro-Québec grid.

Eastmain-1-A Powerhouse and Eastmain-1 generating station will be operated as a single generating facility. The combined annual output of the two power plants will average 5.1 TWh. The combined capacity factor of the powerhouses will be 0.47. Adding Eastmain-1-A Powerhouse will increase output by an estimated 2.3 TWh.

The headrace is designed to ensure a good supply of water to the powerhouse intake. It is 300 m long, and funnels from a width of 400 m at its entrance down to 78.9 m just upstream of the
intake. The headrace’s invert has a 14-m difference in elevation. Maximum flow velocity in the headrace is limited to 0.7 m/s to ensure that a stable ice cover forms.

The powerhouse intake has three openings connected by a deck equipped with a travelling crane. Its wheel-mounted vertical lift gates are operated by an electric wire rope hoist. On the upstream side of the gates, there are slots for a trashrack or stoplogs. Three penstocks about 150 long cut through bedrock to connect the intake to the powerhouse.

The tailrace has a total length of 1,050 m. It runs from the powerhouse to the Eastmain River, most of it cutting through bedrock. It is about 30 m wide, but broadens out to 160 m where it discharges to the Eastmain River to lower flow velocity to about that of the river.

**Sarcelle powerhouse**

Sarcelle powerhouse is to be built at the north end of Opinaca reservoir, about 100 m east of the Sarcelle control structure. It is a run-of-river plant with a net head of 10.8 m. The Boumhounan Agreement stipulates that total discharges at the Opinaca reservoir outlet must not exceed 2,770 m³/s. Sarcelle powerhouse will have a mean 1,050 m³/s turbine flow. Current spill flow of the existing Sarcelle control structure is 1,980 m³/s. This structure will remain in operation but its spill flow will drop to 235 m³/s.

Sarcelle powerhouse is equipped with three 41.7-MW bulb turbine units, for a total installed capacity of 25 MW. The design flow of the plant is 1,305 m³/s. Average annual output will be about 0.9 TWh. Capacity factor will be 0.82. The powerhouse will be operated in the same way as the Eastmain-1-A Powerhouse. The project includes a 325-kV switchyard to integrate the powerhouse into the Hydro-Québec grid.

**Sakami structure**

Discharges from the Sarcelle control structure and Sarcelle powerhouse will flow along the existing water course through Boyd Lake, the Boyd River, Sakami Lake and the Sakami River to empty into Robert-Bourassa reservoir. However, the diverted waters of the Rupert River will increase water volume in Boyd Lake and Sakami Lake. To meet maximum level constraints for Sakami Lake, the proponent plans to build a canal with a concrete weir at the Sakami Lake outlet.

An island splits the Sakami River into two branches at the Sakami Lake outlet. To increase discharge flows downstream of Sakami Lake, the proponent plans to dig a canal in this island about 200 m long and about 125 m wide that will form a third branch. A concrete weir with a crest elevation of 185.2 m will be built across the canal to maintain normal maximum level in Sakami Lake at 186.7 m, less than the maximum 187.04 m stipulated in the JBNQA. The work will require excavation of 218,000 m³ of material.
Connection of Eastmain-1-A Powerhouse to the grid
A 315-kV line about 1 km long (the distance between the Eastmain-1-A switchyard and the existing Eastmain-1 substation) will connect Eastmain-1-A Powerhouse to the Québec grid.

Eastmain-1 generating station connects to the grid via a 315-kV line 59 km long that links Eastmain-1 substation to Nemiscau substation. This line was built in 2006 for the Eastmain-1 project.

Connection of Sarcelle powerhouse to the grid
Sarcelle powerhouse substation will connect to the existing Eastmain 1 substation via a 315-kV line 101 km long. Opinaca reservoir is the major obstacle in connecting the two points. The corridor selected by the proponent involves few technical difficulties and includes access infrastructure that will help in putting up the line.

From Sarcelle substation, the line will run west of Opinaca reservoir, following the access road to the Sarcelle control structure for close to 38 km. It will then be coupled with two power lines (25 kV and 735 kV) for about 16 km to the access road to dam 0A-11 (near Muskeg substation). From there it will use the right-of-way of a 735-kV line and then a 69-kV line for 14 km before travelling along the Muskeg-Eastmain-1 road for 33 km.

The existing or planned facilities (Muskeg-Eastmain-1 road) along virtually the entire length of this line will facilitate its construction. Though 110 km of temporary roads will need to be built, they are split in several segments to bypass or cross terrain obstacles. Whenever possible, existing roads will be used to cross or bypass the 140 creeks (most of them intermittent) and six water bodies (including Boyd Lake) and the Opinaca, Petite rivière Opinaca, Eastmain and Acotago rivers. Culverts or temporary bridges will be used to cross creeks in the line right-of-way. These will be removed when the work is complete.

The line corridor was relocated in two places at the request of the tallymen of traplines RE-1 (Eastmain) and VC-34 (Eastmain) to protect a moose hunting area.

25-kV line between Albanel substation, the Rupert workcamp, the transfer tunnel and the Lemare control structure
This 25-kV line from Albanel substation will be about 30 km long. It will run along the Circuits 7069 and 7070 maintenance road to the Rupert workcamp (km 21.8) and from there to the transfer tunnel (km 30.3) along the access roads to the Rupert forebay and the transfer tunnel. This line will supply the Rupert workcamp and the tunnel construction site while the tunnel is being built.

During the operation phase, this line will be extended roughly 3 km to power the instream flow release structure on the Lemare River.
25-kV line from Albanel substation to the Rupert control structure
During the construction phase, this roughly 30-km line will power the site where the spillway of the Rupert River control structure is to be built. When the work is complete, the line will supply power to the spillway's hoisting mechanisms and heating systems.

2.2.2 STRUCTURES AND RELATED WORK

The project includes a number of structures and related work:
- Relocation of segments of three 735-kV transmission lines
- Relocation of a stretch of the maintenance road for two 735-kV transmission line (circuits 7069-7070)
- Stabilization of the banks of the La Grande Rivière with a rock blanket
- Bank stabilization at Waskaganish
- Work at the Waskaganish water intake and drinking water plant
- Quarries and sandpits
- Excavation and disposal of excavated material
- Clearing of roads, workcamps, structure sites and other sites
- Clearing in the diversion bays
- Jobsite facilities in each of the major work sectors
- Management of waste and hazardous waste
- Restoration of areas disturbed by the work
- Diking of Jolly Bay
- Construction or improvement of access roads to Cree traplines

Relocation of segments of three 735-kV transmission lines
Two corridors for power lines from the La Grande-3 area will be partially flooded when the Rupert tailbay is impounded. Some of the towers of three 735-kV transmission lines will have to be relocated or elevated. The two corridors are as follows:
- The 735-kV line (circuit 7059) connecting Chissibi substation to Albanel substation
- The two 735-kV lines (circuits 7069 and 7070) connecting Lemoyne substation and Albanel substation

Circuit 7059 will cross the future diversion bay at KP 39. A roughly 2.5-km segment of the line will have to be relocated southeast. This will mean dismantling five towers and erecting four new towers. Workers will access the work areas via a winter road (about 4 km) built from where the line crosses the Rupert tailbay access road and then take the line corridor. An ice bridge will be built to cross Nemiscau River.

The circuits 7069-7070 corridor crosses the tailbay in two places: at KP 51 and at KP 54. The corridor will not be altered at KP 51; riprap armouring will be placed around the circuit 7069 tower and the two towers of circuit 7070 will be relocated to land, the line alignment maintained. At KP 54, the circuits 7069-7070 corridor crosses a bay in the diversion bay. Here the alignment of line 7069 will remain as it is, though two towers will be slightly relocated, one to land outside the diversion bay and the other to an island. Riprap armouring will be placed around a third tower. The alignment of line 7070 will be only slightly altered; two towers
will be removed and replaced by three others, and riprap armouring will be placed around three neighbouring towers. The existing maintenance road for the lines will be used to reach the worksites; the road will be maintained until impoundment of the Rupert tailbay.

**Relocation of a stretch of the maintenance road for two 735-kV lines (circuits 7069 and 7070)**

The Rupert tailbay will flood the maintenance road for two 735-kV lines (circuits 7069 and 7070) for about 1 km in two places (KP 51 and KP 54 of the tailbay). In the KP 54 area, the access road for the Rupert tailbay runs very close to the corridor of the two transmission lines and can be used to reconnect to the maintenance road. However, to restore the connection at KP 51, the proponent will have to build a spur road 4.6 km long to the circuits 7069 and 7070 road from the Rupert tailbay access road a few kilometres north of Nemiscau-2 dam. This spur road will cross the Rupert tailbay at KP 47.5 and include a permanent single-lane bridge with a span of 140 on four piers in the water.

As for the two segments of the maintenance road flooded by Rupert tailbay, the proponent plans to restore only the segment at KP 51, the current crossing of Nemiscau River. Here a road was built on an embankment about 135 m long obstructing more than 95% of the river. The culverts and the embankment in the river will be removed—about 5,000 m³ of granular material. A spawning ground will be built on the left bank of the diversion bay with the fill removed, and excess material will be used to create an island close to the banks of the future tailbay.

**Stabilization of the banks of the La Grande Rivière**

The banks of the La Grande Rivière along a 26.8-km stretch between KP 9.7 and La Grande-1 dam (KP 37) are prone to erosion. Monitoring by Hydro-Québec since 1973 shows constant erosion since 1991, with 69% of the south bank and 15% of the north bank currently affected. According to the proponent, it is difficult to predict exactly how increasing flow by 14% and flow velocity by 0.1 m/s in the La Grande Rivière will affect the stability of the river banks, though the impacts are not expected to be major. The proponent is planning to stabilize the river banks given the erosion in this stretch of the river. This will also slightly reduce the sediment load in the river and improve water quality at the Chisasibi drinking water intake at KP 16.

In the impact assessment, the proponent mentions work planned at ten sites, nine on the left bank of the river and the tenth on the right bank close to La Grande-1 dam. However, in Volume 4 of the Supplement to the Environmental Impact Statement (RP-13, p.160 to 176), the proponent mentions a decision to stabilize the north bank regardless of the Eastmain-1-A/Rupert project.

The south bank of the La Grande Rivière will be stabilized at nine sites: KP 22, KP 20 (three granular blankets), KP 18, KP 16, KP 14 (two granular blankets) and KP 13-10 (near Chisasibi airport). In all, 9 km of river bank will be protected. The banks will be rebuilt to resemble in composition and configuration those of the La Grande Rivière estuary, which are naturally stable despite strong waves and currents. The proponent plans to remove fine material at the foot of slopes at risk and replace it with a granular blanket composed of a mix of sandy gravel, pebbles and small boulders over the entire width of the bank between the slope and the riverbed.
As the banks of the river east of Chisasibi between KP 16 and KP 22 are over 10 m high, the stabilization work will be performed in winter when the banks are frozen to prevent landslides. Winter stabilization work will be carried out on a total of 5.4 km of banks. Work will be carried out in summer on eroding river banks in the Chisasibi village area, between the pumping station (KP 16) and the airport (KP 10), since these banks are less than 10 m high. These banks cover a total of 3.6 km.

The proponent plans to use six access roads to reach the different work areas. Three of these already exist and will only require minor repairs. Three other temporary access roads will be built: one all-season road 600 m long in the Chisasibi airport area and two winter roads. One of the winter roads will follow a firebreak at the east end of Chisasibi over much of its 1.4 km length. This road will provide access to the west part of the blanket at KP 18. The second winter road will be about 1 km long with additional short stretches built on the banks to connect to the three blankets at KP 20, the blanket at KP 22 and the east part of the blanket at KP 18. In most instances, according to the proponent, the shrubby vegetation will not be affected by the building of winter roads on the banks.

The work will be carried out over a two-and-a-half-year period, that is, over two summers and three winters. An estimated 150,000 m$^3$ of material will be needed to build the 9 km of granular blanket. The proponent has identified 17 potential borrow sources, 13 on Chisasibi trapline CH33. A final selection has not however been made.

Part of the work will be carried out on Chisasibi Category I lands, notably construction of the rock blankets near the village and of the access roads to the work areas as well as work at certain quarries along the village access road. The proponent must obtain authorization from the local environment administrator for any work on Category I lands.

**Bank stabilization and Waskaganish drinking water supply**

Under the Boumhounan Agreement, the proponent must ensure the Rupert’s left bank is stable beside the village of Waskaganish and near the water intake for the existing drinking water plant.

When the water intake was built in 1996, armouring was laid to stabilize riverside slopes. The armouring is mainly gabions placed on the slope and is not stable. This armouring is to be extended and strengthened with riprap to about 200 m downstream and 100 m upstream of the water intake.

The proponent has also agreed to build a new drinking water plant before the partial diversion of the waters of the Rupert River (see Section 6.3.3).

Authorization must be obtained from the local environment administrator for any work carried out on Category I lands.
Pits and quarries
This project will require large amounts of till, granular material, rock and concrete aggregate.

At least 10,000,000 m³ of granular material and rock will be required to execute the project. The proponent has located 29 potential quarries and 291 pits. In the Rupert diversion bay section, where at least 8,000,000 m³ will be required, future borrow pits will yield an assured supply of 3,300,000 m³ of granular material and 5,300,000 m³ of till. In addition, quarries in this section will supply an undetermined volume of rock, and excavations required for the project will supply at least 9,200,000 m³ of material.

Table 2-5: Volume of material required

<table>
<thead>
<tr>
<th>SITE</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rupert dam</td>
<td>656,000 m³</td>
</tr>
<tr>
<td>Lemare dam</td>
<td>263,000 m³</td>
</tr>
<tr>
<td>Nemiscau-1 dam</td>
<td>99,400 m³</td>
</tr>
<tr>
<td>Nemiscau-2 dam</td>
<td>95,100 m³</td>
</tr>
<tr>
<td>Rupert forebay dikes(31)</td>
<td>2,447,000 m³</td>
</tr>
<tr>
<td>Rupert tailbay dikes (41)</td>
<td>2,040,500 m³</td>
</tr>
<tr>
<td>Diversion bay access roads</td>
<td>2,448,000 m³</td>
</tr>
<tr>
<td>Rupert River structures (8)</td>
<td>552,000 m³</td>
</tr>
<tr>
<td>Access roads to the 8 hydraulic structures</td>
<td>1,289,300 m³</td>
</tr>
<tr>
<td>Granular carpets on the La Grande Rivière banks (9)</td>
<td>150,000 m³</td>
</tr>
</tbody>
</table>

Quarries and pits to be operated for the project are distributed as follows:

Table 2-6: Locations of quarries and pits

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PITS</th>
<th>QUARRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rupert dam</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Rupert workcamp access road</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Rupert forebay</td>
<td>81</td>
<td>4</td>
</tr>
<tr>
<td>Rupert tailbay</td>
<td>71</td>
<td>6</td>
</tr>
<tr>
<td>8 weirs on the Rupert River</td>
<td>69</td>
<td>14</td>
</tr>
<tr>
<td>Sakami weir (road, workcamp and weir)</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>9 granular carpets along the La Grande Rivière near Chisasibi</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Muskeg-Eastmain-1 road and 315-kV Muskeg-Eastmain-1 line</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Sarcelle (road, workcamp, powerhouse, 315-kV line)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Eastmain-1-A Powerhouse</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* Authorization already obtained to operate quarries and pits

Forty-one pits will be entirely or partially flooded when the diversion bays are impounded, and two others will be isolated on islands.
The final selection of quarries, pits and excavated material to be used to build the roads, dikes, dams and other structures will be determined at the time of construction based on strategies selected at that time. In addition, operating perimeters and volumes for each quarry and pit will be determined in the construction phase.

**Excavation work and disposal of excavated material**

Excavation work is required where the dams, dikes, control structures, transfer structure, canals, powerhouses, bridges and hydraulic structures are to be built as well as in road rights-of-way and at workcamp sites and temporary work areas.

Based on information supplied by the proponent, approximate volumes of excavated material will be as follows:

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rupert dam</td>
<td>110,000 m³</td>
</tr>
<tr>
<td>Rupert control structure (spillway)</td>
<td>740,000 m³</td>
</tr>
<tr>
<td>Lemare dam</td>
<td>67,000 m³</td>
</tr>
<tr>
<td>Nemiscau-1 dam</td>
<td>35,000 m³</td>
</tr>
<tr>
<td>Nemiscau-2 dam</td>
<td>60,000 m³</td>
</tr>
<tr>
<td>Lemare (1) and Nemiscau (3) control structures</td>
<td>129,100 m³</td>
</tr>
<tr>
<td>Rupert forebay dikes (31)</td>
<td>750,000 m³</td>
</tr>
<tr>
<td>Rupert tailbay dikes (41)</td>
<td>820,000 m³</td>
</tr>
<tr>
<td>Transfer structure (transfer tunnel, etc.)</td>
<td>2,550,000 m³</td>
</tr>
<tr>
<td>Rupert forebay canals (4)</td>
<td>1,490,000 m³</td>
</tr>
<tr>
<td>Rupert tailbay canals (6)</td>
<td>2,500,000 m³</td>
</tr>
<tr>
<td>Sakami Lake outlet weir</td>
<td>218,000 m³</td>
</tr>
<tr>
<td>Eastmain-1-A Powerhouse</td>
<td>2,907,000 m³</td>
</tr>
<tr>
<td>Rupert River structures (8)</td>
<td>556,000 m³</td>
</tr>
</tbody>
</table>

Based on this information, at least 14,100,000 m³ of overburden and rock will be excavated, at least 9,200,000 m³ in the two diversion bays. Depending on the quality of the material excavated, it can be used as construction material at the site of excavation or at neighbouring jobsites for wildlife enhancements or restoration of disturbed areas. However, the proponent anticipates that it will be possible to reuse only 12% of the excavated material and that 88% will remain surplus. About 12,500,000 m³ of surplus excavated material will be disposed of in areas allocated for this purpose.

The final selection of disposal area sites will be made during the construction phase. Generally, sites close to the place of excavation and within the planned diversion bays will be selected, land relief and drainage conditions permitting. However, it will not be possible to haul large amounts of surplus excavated material to the future diversion bays—notably material excavated for
Eastmain-1-A Powerhouse (2,507,000 m³), Sarcelle powerhouse (1,059,000 m³), the Sakami canal (218,000 m³) and the Rupert River structures (506,000 m³).

The proponent suggests the following strategy for integrating the disposal areas into the natural environment:

- Areas within the diversion bays: no special measures. However, the proponent shall ensure that the top of the deposit is at least 1.5 m below minimum operating level of the diversion bay, or at least 1.5 m above maximum operating level. In addition, the disposal areas will be at least 75 m from the shores of natural bodies of water.
- Areas that are not visible from main structures or the main access road: deposits composed mainly of coarse or compacted material will be graded to a regular, stable slope, spread with loose material and earth and then reforested. Deposits composed mainly of fine or sedimentary material will be graded, and small goose-hunting ponds will be created in certain spots. A 50-m wide strip around the ponds will be seeded with grasses and leguminous plants and the rest of the disposal area will be reforested.
- Areas that are totally or partially visible from the main structures or the main access road: same strategy as for areas that are not visible from the main structures or the main access road, but a wider area will be seeded and the density of reforestation will be increased.

Clearing of structure sites, roads, workcamps and other sites

The study area touches on two bioclimatic domains: the diversion bays and the Rupert River sectors are in the spruce-moss domain, and the increased-flow sector is in the spruce-lichen domain. Black spruce is found throughout the territory, but balsam fir and jack pine are at the northern end of their range. Spruce moss forest is fairly dense, while spruce lichen forest is open and its productivity low. These bioclimatic domains also include jack-pine forest in sectors disturbed by forest fires; white spruce forest along the James Bay coast; mixed forest of black spruce and white birch or trembling aspen; and deciduous forest (white birch and poplar stands), though the latter is rare and covers little ground.

The satellite images provided by the proponent in the background report entitled “Végétation and espèces floristiques and fauniques à statut particulier” (ES 13) show immense areas disturbed by forest fires in the last 25 years. Within the 8,873 km² of the study area selected for vegetation description, about 40% of the land environment has been disturbed by more or less recent forest fires. The affected areas take the form of recent burns, regenerating burns and poorly regenerated burns. These areas are numerous and occupy vast surfaces in most project sectors, except the Rupert bay sector.

Areas that will be or could be cleared outside those that will be flooded by the diversion bays were inventoried via vegetation mapping of satellite images from the impact study. The hydraulic structure sites, however, were mapped by photointerpretation of aerial photographs georeferenced to a scale of 1:5,000.
In all, about 5,275 ha will be cleared.

Table 2-8: Nature of areas to clear

<table>
<thead>
<tr>
<th>AREA TO CLEAR</th>
<th>FOREST</th>
<th>BURNS</th>
<th>WETLANDS</th>
<th>DRY BARRENS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent roads</td>
<td>194.8</td>
<td>228.8</td>
<td>51.5</td>
<td>12.0</td>
<td>487.1</td>
</tr>
<tr>
<td>Temporary access roads</td>
<td>95.1</td>
<td>160.1</td>
<td>73.9</td>
<td>13.1</td>
<td>342.2</td>
</tr>
<tr>
<td>Sakami weir access road</td>
<td>na*</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>~6 ha</td>
</tr>
<tr>
<td>Access roads to granular carpets</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>~3 ha</td>
</tr>
<tr>
<td>Diversion bay retaining structures</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>128.8</td>
</tr>
<tr>
<td>Rupert River structures</td>
<td>10.6</td>
<td>0.8</td>
<td>2.1</td>
<td>0.2</td>
<td>13.7</td>
</tr>
<tr>
<td>Flooded Rupert riverbanks</td>
<td>11.1</td>
<td>3.7</td>
<td>2.2</td>
<td>0.1</td>
<td>17.1</td>
</tr>
<tr>
<td>Sarcelle-Eastmain-1 315-kV line</td>
<td>187.5</td>
<td>269.5</td>
<td>118.3</td>
<td>27.6</td>
<td>602.9</td>
</tr>
<tr>
<td>Albanel-Lemare dam 25-kV line</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>~65 ha</td>
</tr>
<tr>
<td>Albanel-Rupert dam 25-kV line</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>~60 ha</td>
</tr>
<tr>
<td>Quarries and pits</td>
<td>1,284.1</td>
<td>1,647.7</td>
<td>263.4</td>
<td>204.5</td>
<td>3,399.7</td>
</tr>
<tr>
<td>Eastmain workcamp</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Nemiscau workcamp</td>
<td>0.0</td>
<td>9.0</td>
<td>0.0</td>
<td>1.0</td>
<td>10.0</td>
</tr>
<tr>
<td>KM 257 workcamp</td>
<td>7.9</td>
<td>0.2</td>
<td>0.4</td>
<td>1.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Rupert workcamp</td>
<td>8.9</td>
<td>51.5</td>
<td>0.7</td>
<td>0.0</td>
<td>61.1</td>
</tr>
<tr>
<td>Sarcelle workcamp</td>
<td>0.0</td>
<td>33.5</td>
<td>0.1</td>
<td>4.5</td>
<td>38.1</td>
</tr>
<tr>
<td>Kauschiskach workcamp</td>
<td>5.4</td>
<td>4.1</td>
<td>0.4</td>
<td>0.1</td>
<td>10.0</td>
</tr>
<tr>
<td>Jolliet Lake workcamp</td>
<td>11.1</td>
<td>2.7</td>
<td>1.3</td>
<td>0.0</td>
<td>15.1</td>
</tr>
<tr>
<td>Sakami Lake workcamp</td>
<td>3.8</td>
<td>0.8</td>
<td>0.4</td>
<td>0.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

* na: information not available

The proponent plans to clear corridors 34 m wide for construction of permanent and temporary roads. The permanent roads are as follows:

- The access roads to the two diversion bays and to Rupert dam and the road that connects to the circuits 7069-7070 road (total of 402 ha, of which 265 ha will be cleared and grubbed and 137 ha close cut to the ground)
- The Muskeg-Eastmain-1 road (76 ha)
- The secondary roads that lead to diversion bay retaining structures (9 ha)

The temporary access roads include access roads to hydraulic structures (184 ha), jobsites, quarries, pits and the Sarcelle-Eastmain-1 315-kV line corridor. The proponent provides no information about clearing of the access roads and bypass required to build the Sarcelle-Eastmain-1 315-kV line, as the construction strategy has not yet been determined.
In all, 22.9 ha will be flooded along the banks of the Rupert River when water level is raised upstream of the hydraulic structures: 17.1 ha of land environment and peatland, and 5.8 ha of riparian environment (4.8 ha of swamp and 1.0 ha of aquatic grass beds). This does not include the area affected by the changes to weir KP 223 (PD5.4 and PD5.5), where water level upstream will be raised 10 cm. Based on the information available, water level will not be raised upstream of the rock blanket at KP 20.4, the weirs at KP 49 and KP 223 or the spur dike at KP 290. The 17.1 ha of land environment and peatland that will be affected are located as follows: 12.9 ha at the weir at KP 33; less than 0.1 ha at the weir at KP 85; 2.6 ha at the weir at KP 110.3; and 1.6 ha at the weir at KP 170.

No clearing is planned at the Eastmain workcamp, as it is already larger than needed to accommodate the workers required. However, the Nemiscau workcamp and the KM 257 workcamp at the service area on the James Bay highway will each need another 10 ha. At the Rupert workcamp, a total of 61.1 ha will be cleared and stripped; in all, about 50 ha will be used for earthwork. When the workcamps are built, the proponent will take necessary precautions not to disturb neighbouring peatland, at the Jolliet Lake workcamp in particular.

Wood debris will not be recovered from wetlands in the quarries and pits. Wetlands in the borrow pits comprise 177.7 ha of treed bogs and 24.5 ha of treed fens. In the quarries there are 61.2 ha of treed bogs.

Based on the information available, the tree and shrub clearing will take place as follows: about 40% in forest stands, about 54% in burns (recent burns, regenerating burns and poorly regenerated burns) and about 6% in wetland (taking into account that wetland will be protected when developing quarries and borrow pits). No exceptional plant communities were inventoried at the sites where trees and shrubs are to be cleared.

The proponent estimated the volumes of timber to be cleared from aerial photographs at scales of 1/15,000, 1/20,000 and 1/40,000. The estimates were validated in the field to take into consideration recent forest fires.

<table>
<thead>
<tr>
<th>SITES OF RELATED WORK</th>
<th>VOLUME OF TIMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent roads</td>
<td>8,946 m³</td>
</tr>
<tr>
<td>Temporary roads</td>
<td>9,275 m³</td>
</tr>
<tr>
<td>Workcamps</td>
<td>2,784 m³</td>
</tr>
<tr>
<td>Sarcelle-Eastmain-1315-kV line</td>
<td>12,850 m³</td>
</tr>
<tr>
<td>Quarries and pits</td>
<td>69,972 m³</td>
</tr>
<tr>
<td>Rupert River structures</td>
<td>2,475 m³</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>106 302 m³</strong></td>
</tr>
</tbody>
</table>

Under the *Boumhounan Agreement*, commercially viable trees felled as part of the project are to be delivered at the proponent’s expense to the Nabakatuk Forest Products sawmill in Waswanipi.
Under half of the 106,302 m$^3$ of timber (about 46,460 m$^3$) have a commercial value that partially meets these conditions.

The clearing will take place over three years. Quality criteria for felling, piling and burning require that the work be performed when the ground is free of snow, that is, between May and October. However, on the downstream reach of the Rupert River, the clearing will be carried out in fall and winter whenever possible to minimize impacts on forest birds.

**Clearing in the diversion bays**
The proponent inventoried the forest on land environments and wetlands that will be flooded by the two diversion bays. The two diversion bays will flood a total of 346.2 km$^2$—159 km$^2$ of land environment, 29.1 km$^2$ of wetlands and 158.1 km$^2$ of existing streams and water bodies. The forest inventory showed roughly 44% of the land environment that will be flooded is occupied by more or less recent burns, one third from fires since 1996. Burns occupy about 56% of the 124.8 km$^2$ of forest environment. In fact, burns occupy vast expanses in the southern part of the Rupert forebay (between Mesgouez Lake and Goulde Lake), the Rupert workcamp sector and the northern part of the Rupert tailbay (between KP 53 and Eastmain 1 Reservoir).

The proponent and the Crees agreed in the Boumhounan Agreement to use the “clearing objectives and specifications” identified for the La Grande complex (1975) in Schedule 2 of Section 8 of the JBNQA to determine areas to be cleared in the diversion bays. Working with the Cree communities, the proponent identified 35 sites to be cleared in the diversion bays. They cover a total area of 5,089 ha (50.9 km$^2$), of which 4,040 ha are forest and constitute about 25% of the forest environments that will be flooded by the diversion bays. However, 40% of the commercially viable timber will be recovered before the bays are impounded.

About 37 km$^2$ along the banks of the Rupert forebay are to be cleared and about 12 km$^2$ along the banks of the Rupert tailbay. The main sectors to be cleared are the flooded reach of the Rupert River upstream of the dam; much of the flooded shoreline of the Misticawissich River; the sector between the entrance to canal S73-1 and dike C-R-13; the Des Champs and Arques lakes sectors and the sector between Nemiscau-1 dam and the entrance to Eastmain 1 Reservoir. The upstream side of all dams and dikes retaining the two diversion bays will be cleared. Clearing within the diversion bays will also reduce the visual impact of the project where the bays can be seen from access roads.

<table>
<thead>
<tr>
<th>SITES TO CLEAR</th>
<th>AREA</th>
<th>VOLUME OF TIMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 multipurpose areas</td>
<td>3,436 ha</td>
<td>58,690 m$^3$</td>
</tr>
<tr>
<td>12 navigation corridors</td>
<td>1,307 ha</td>
<td>32,238 m$^3$</td>
</tr>
<tr>
<td>2 sites to be cleared for hydraulic purposes</td>
<td>346 ha</td>
<td>2,141 m$^3$</td>
</tr>
</tbody>
</table>

The purpose of clearing the multifunctional areas is to facilitate access to the diversion bays for navigation and fishing, improve the quality of the landscape and ensure structure safety. Navigation corridors 100 to 1000 m wide and with a minimum depth of 1.5 m in open-water
conditions will facilitate navigation between the vast diversion bays and their main tributaries. The two sites cleared for hydraulic purposes will improve flow conditions, prevent trees from being uprooted in the Ruisseau Caché valley and carried by the current to Eastmain 1 Reservoir, reduce load losses and lower water levels in the sector of canals S73-1 and S73-3.

The 12 navigation corridors to clear in the diversion bays are located as follows:

- Rupert River: the length of the river between KP 332 (Mesgouez Lake outlet) and KP 324 (KP 110 of the Rupert forebay)
- Misticawissich River: the length of the river between KP 5 on this river (KP 105 of the Rupert forebay) and the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Reserve
- Lemare River: the length of the river between KP 78 of the Rupert forebay and the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Reserve; the length of the nameless stream connecting Cabot Lake to the Lemare River; the length of the navigation route between Hore Lake and the Lemare River
- The mouth of the nameless stream that empties into the Rupert tailbay at KP 63 of the tailbay
- The length of the nameless stream connecting Bourier Lake to Arques Lake (at KP 61 of the Rupert tailbay)
- The length of the nameless stream connecting Du Glas Lake to Arques Lake (at KP 58 of the Rupert tailbay)
- Nemiscau River: the length of the river reach north of Du Glas Lake, between KP 160 and KP 171 of the Nemiscau River
- Over about 7 km the length of the nameless stream that empties into Nemiscau River (at KP 162 of the Nemiscau River), including a west branch connecting Lamothe Lake to this nameless stream
- Between KP 45 and KP 44 of the Rupert tailbay and the length of an east arm of the bay between KP 43 and KP 41
- The length of a nameless stream connecting Lake Kauakiekmatsch to the Nemiscau River (at KP 39 of the Rupert tailbay)

As Cabot Lake may be used to direct the diverted waters to the Rupert tailbay in case of malfunction of the transfer tunnel, the tallymen of traplines M18, M25 and M33 asked on September 22, 2005, during a consultation on this matter, that the plan to clear a navigation corridor along the nameless stream connection Cabot Lake to the Lemare River be altered to take into account the possible increase in flows. The proponent then agreed to consult the tallymen when preparing the specification to clear the navigation channel in this stream.

The two sites to be cleared for hydraulic purposes are located as follows:

- Between KP 98 and KP 93 (at the entrance to canal S73-3) of the Rupert forebay
- In the Ruisseau Caché valley, between canal Z and Eastmain 1 Reservoir

The proponent estimates at 93,069 m³ the volume of timber that will be cleared from the targeted 5,089 ha in the diversion bays—an average of 18.3 m³/ha. About 28,000 m³ of this is merchantable timber. The volume of recoverable wood is very low mainly because 55% of the areas to be cleared are burns and 20% are wetlands.
Clearing involves disposing of live or dead timber, standing and fallen, found within the areas to be cleared. The trees will be piled and burned, except for wood that can be recovered. Under the Boumhounan Agreement, merchantable timber shall be delivered at the proponent's expense to the Nabakatuk Forest Products sawmill in Waswanipi. In addition, at the request of the tallymen, the proponent shall facilitate recovery of valued species such as birch and larch for personal use.

The clearing work in the diversion bays will take place over three years. Work in the field will be carried out from May to October. Clearing contracts will be awarded to Cree companies and to tallymen who want them.

About 13,000 ha of woodland will remain in the diversion bays, in forest as well as wetland. At the start of the winter, the partially submerged trees will be welded to the icefield that will form in the diversion bays. When water level drops, the weight of the ice, coupled with the speed of lowering of the water level will apply sufficient force to the trees to break the trunks. About 70% of the trees left standing will break under the effect of the ice, as the diversion bays are shallow.

According to the proponent, ice action will serve as a natural clearing agent as follows:
- On about 9,500 ha: more than 75% of the tree will break under the effect of the ice
- On about 1,700 ha: 50 to 75% of the trees will break under the effect of the ice
- On about 700 ha: 25 to 50% of the trees will break under the effect of the ice
- On about 1,100 ha: less than 25% of the tree will be affected

Natural clearing by ice will be most effective in the first two years of operation of the diversion bays. If there is a major accumulation of wood debris that compromises the safety of the navigation corridors, the boat ramps or Hydro-Québec facilities, the proponent shall clean up the sites concerned.

**Jobsite facilities**

The proponent plans to allot space to contractors near their work areas for offices and equipment. There will also be service and storage areas near the main worksites. The locations of these sites allotted for jobsite facilities, the area occupied, the layout, the buildings, the equipment and the facilities (offices, workshops, garages, sanitary facilities, fuel storage facilities, vehicles, concrete plants, crushers, etc.) are not described in the impact assessment. If need be, sector-related authorizations will have to be obtained for these facilities from the Ministère du Développement durable, de l’Environnement et des Parcs as per applicable regulations.

The jobsite facilities will be dismantled and the sites restored once the work is completed, with the exception of specific areas for storing materials and products needed for long-term maintenance of structures.

**Management of waste and hazardous waste**

Kitchen waste from the workcamps will be transported to landfill sites, in compliance with *A Regulation respecting the landfilling and incineration of residual materials* (Q-2, r.6.02). The
The proponent plans to use dump trucks for daily collection (sometimes twice daily in summer) of closed containers.

The proponent is considering the following options for the workcamps:

- Eastmain and Nemiscau workcamps: prolong the period of operation of existing landfill for these camps
- Kauschiskach, Jolliet Lake, KM 257 service area and Sakami Lake workcamps: use existing sites operated by third parties, subject to authorization from these parties
- Rupert and Sarcelle workcamps: open new sites for solid-waste disposal

Methods for storing and disposing of construction waste are not specified in this report. However, the proponent would prefer to use sites already authorized and to apply for extensions of authorizations to use sites authorized under the Eastmain-1 project. Hazardous waste must be stored as required by applicable regulations and recovered when the work is complete.

Contractors are responsible for recovering tires that can no longer be used. These will be temporarily stored at a site approved by SEBJ and then the contractor must transport them outside the James Bay territory to a recovery or recycling facility. The same applies to metal waste.

Hydro-Québec plans to set up a program for management of septic tank sludge that will comply with applicable regulations and meet the objectives of the new Québec Residual Materials Management Policy, 1998-2008, (R17). The proponent is currently studying three options for the Eastmain-1-A Powerhouse and Rupert diversion project: using already authorized disposal sites (at Chibougamau, Matagami and Radisson), opening "new generation" disposal sites and using mobile dehydration units.

Industrial activities during the Eastmain-1 project generated about 100 m$^3$ of contaminated soil from about 20 minor spills attributable to different contractors. Because of the small volumes involved, the proponent decided that each contractor concerned would be responsible for transporting the contaminated soil to an authorized transfer centre outside the James Bay territory or treating it on site at the contractor’s expense. In situ treatment is the preferred option for fuel storage areas belonging to SEBJ.

COMEX would like to stress that collection and disposal of solid waste, including sanitary landfilling and incineration, is subject to the environmental and social impact assessment and review procedure called for in Section 22 of the JBNQA. In other words, authorization is required from the Ministère du Développement durable, de l’Environnement et des Parcs for any waste disposal sites not currently specified.

**Restoration of areas disturbed by the work**

SEBJ will produce a master plan for restoration of areas disturbed by construction activities, including quarries and pits. Before construction is complete, SEBJ shall present criteria for
restoring plant cover and more generally for diverse restoration work the company plans to undertake.

**Jolly Bay dike**

The tallyman on trapline N25 has expressed concerns about the possibility of losing a goose hunting area in a bay on the left bank of the Rupert River, about 3 km below Rupert dam. The section that includes this bay, called “Jolly Bay,” is a wildfowl staging area and a major goose hunting area (Canada goose). There are five permanent Cree camps and four hunting “blinds” on the shores of the bay. The tallyman goes goose hunting there in the spring, in the last week of April and the beginning of May, when the shoals of the bay are still exposed by the winter low flow. In summer, the tallyman goes gill-net fishing at three spots in the bay. The main species caught are brook trout, walleye, northern pike, longnose sucker, lake whitefish and lake sturgeon.

A 44-km\(^2\) watershed drains into the bay, the main inflow coming from a tributary at the south of the bay. At the end of winter, the bay water level would be 282.1 m. At the end of April, the bay is still almost completely exposed (water level 282.5 m). It fills up in late May (water level 284.9 m) with the high flow of the Rupert River. In summer, the body of water covers an area of 43.2 ha (water level 283.8 m).

After the partial diversion of water from the Rupert River, the bay would no longer be supplied by the high flow of the Rupert River in May. As a result, the maximum level of the bay would barely reach water level 282.5 m and the water would cover only a smaller area of 13 ha. In summer and winter, the bay would be almost completely dried up. If no steps were taken, the summer feeding habitats of the fish would disappear and the pike and brook trout spawning grounds in the tributary would no longer be accessible. In the long term, the exposed areas would be overrun by land vegetation and goose hunting could be compromised.

In October 2005, the proponent met the trapline N25 tallyman to give him a dike design for Jolly Bay to preserve the riparian habitats and goose hunting areas. The planned structure is designed to maintain a water level in the bay suitable for goose hunting at the end of the winter and a mean water level similar to natural conditions in summer.

The dike will consist of granular fill with armour rock. It will be designed to allow flow reversals between Jolly Bay and the Rupert River and withstand eventual submersion in case of high flow. Approximately 190 m long and 3.5 m high, the dike will be impervious from its base up to a height of approximately 2.5 m (i.e. water level 283.8 m), and pervious for the last metre to the top, in order to recreate the bay’s natural summer conditions. A circular culvert 0.6 m in diameter will be installed in the dike, at water level 282.5 m, to maintain the bay’s natural conditions in spring during the goose hunting period. Lastly, the crest of the dike, approximately 3.5 m wide, will be designed so that all-terrain vehicles can drive over it.

Building the Jolly Bay dike and maintaining water levels similar to present spring and summer levels will preserve the riparian habitats (marshes, swamps), maintain goose hunting, and maintain the fish habitat and the depths needed for navigation. In addition, the seven sandpits...
to be used around the bay, within a distance of about 100 to 150 m, will be developed for goose hunting.

**Construction or improvement of access roads to Cree traplines**

At the request of the tallymen, the proponent plans to build or improve more than 100 km of access routes consisting of trails for all-terrain vehicles (ATV), snowmobile paths and regular roads, in order to facilitate access to Cree tralines and camps. Some of the access roads will be barely a few dozen metres long, while others will be over 20 km in length.

Some of the major commitments made by the proponent include:

- **Trapline M18 (Mistissini):** To facilitate access to some camps, the proponent will study the possibility of developing three ATV trails. The first trail would go from the eastern end of the Cabot Lake access road to an unnamed lake located about 20 km southeast of the lake and would require the Lemare River to be crossed. The second trail, approximately 22 km long, would start at the Circuits 7069 and 7070 road, at a point about 12 km northeast of the bridge to be built over the Rupert tailbay, and go to the west shore of Kattishabocau Lake. The third trail, approximately 3 km long, would link the Rupert tailbay access road, near dike C 69, to a camp north of Cramoisy Lake, and would go over an esker. In the event that the esker is used (sandpit DG-310), this ATV trail would be changed to a regular road.

- **Trapline N1 (Waskaganish):** The proponent will study the possibility of building an ATV trail about 2 km long from the access road to the community of Waskaganish to an unnamed lake that could be developed for goose hunting, as well as a second road about 4.5 km long, to Houré Lake.

- **Trapline N9 (Waskaganish):** The proponent will study the possibility of building an ATV trail approximately 12 km long linking Waskaganish to some camps along Rupert Bay.

- **Trapline N24A (Nemaska):** The proponent will study the possibility of improving an old winter road south of trapline N25, to facilitate access to Rivière à la Marte from the circuits 7078 and 7080 road, subject to the agreement of the trapline N25 tallyman. It should be noted that, on Map 290-2, the road is mapped in the right-of-way of twin circuits 7081 and 7082, which is a few kilometres west of circuits 7078 and 7080. Although the siting of the road is very approximate, we have estimated its length at about 10 km.

- **Trapline R16 (Nemaska):** The proponent will study the possibility of building an ATV trail approximately 2 km long, starting near the Jolliet Lake workcamp and giving access to the temporary Cree camps near KP 10 on the Nemiscau River.

- **Trapline R19 (Nemaska):** The proponent will study the possibility of building an access approximately 10 km long linking one of the tallyman’s camps on the west shore of Utish Lake to the Nemiscau–Eastmain-1 road.

- **Trapline R21 (Nemaska):** In 2004, the tallymen of tralines N24, N24A and R21 requested that the access road to the spur dike at KP 290 be extended as far as KP 280 on the Rupert River, to compensate for the possible deterioration of
navigation conditions in the river section between KP 290 and KP 281. Given that extending the road could lead to an increased of trapline R21, the tallyman of trapline R21 agreed, in October 2005, to wait until the end of the work on the spur at KP 290 to observe the actual navigation conditions before making a decision about maintaining the access road to the structure at KP 290 and extending it to KP 280. If a decision is made to extend the road, the proponent plans to then examine the possible consequences of overharvesting fish in the KP 280 section beginning to build the road.

– Trapline VC20 (Wemindji): From the Transtaiga highway, the proponent will develop an access approximately 2 km long, to reach a network of lakes leading to a camp located near the Ukau Amikap Narrows (near Kachimukamach Lake). The proponent will also redevelop an existing access road, approximately 1 km long, linking the Transtaiga highway to the northeast end of Bonfai Lake.

As the exact siting and description of these works is not available at present, COMEX deems that they are not part of this analysis of the environmental and social impacts of the project and will have to be submitted to the ministère du Développement durable, de l’Environnement et des Parcs for authorization at a future date, if applicable.

### 2.2.3 WORKCAMPS

The construction phase will last for 5 years and the peak simultaneous workforce is estimated to be 5,500 people, who will be housed in eight workcamps. Section 2.1.4 presents the criteria used by the proponent to select the location of the workcamps.

The eight workcamps planned for the workers on the project include three existing workcamps and five temporary workcamps.

**Existing workcamps:**

– Eastmain workcamp: This workcamp was used during the Eastmain-1 hydropower project and is now being used by the workers assigned to finishing the Eastmain-1 Powerhouse. Its capacity will be reduced to 1,200 people and it will be used for five years, during construction of Eastmain-1-A Powerhouse, the 735-kV Sarcelle-Eastmain-1 transmission line and the Muskeg–Eastmain-1 road. Upon completion of the work, it will be either closed down or dismantled, depending on the needs of Hydro-Québec and the SEBJ.

– Nemiscau workcamp: This workcamp will be complementary to Rupert workcamp. It will be used during construction of the access roads to the diversion bays, Rupert workcamp, the transfer tunnel, the control structure on the Rupert River, as well as the installation of the two 25-kV lines linking Albanel substation to Rupert workcamp, the transfer tunnel and the two control structures. The workcamp will be enlarged in order to house 1,200 people for five years. Upon completion of the work, it will be either closed down or dismantled, depending on the needs of Hydro-Québec and the SEBJ.

– KM 257 workcamp: Located at KM 257 on the James Bay highway, this is a former workcamp that was converted into a service area. It will be enlarged and modernized, to house the workers who will build the hydraulic weirs at KP 85 and 110.3. The
proponent plans to house 250 people there for two years. In the event Kauschiskach workcamp is not built, KM 257 workcamp will then house 400 people for two years. Upon completion of the work, it will be redeveloped according to the conditions of the agreement to be reached between the service area owners and the SEBJ.

**Temporary workcamps:**

- **Sakami Lake workcamp:** This workcamp, which is to house 50 people for 10 months, will be used during construction of the Sakami weir. Although the siting is not final, the proponent has identified a location close to the Sakami Lake outlet, near the work zone. This workcamp will be dismantled upon completion of the work.

- **Sarcelle workcamp:** This workcamp will be used during construction of Sarcelle powerhouse and the 735-kV Sarcelle-Eastmain-1 transmission line. Although its siting is not final, the proponent has identified a potential location near the line to be built, about 10 km from Sarcelle powerhouse. With a life span of five years, it is expected to house 800 people. Upon completion of the work, the workcamp will be either closed down or dismantled, depending on the needs of Hydro-Québec and the SEBJ. There is also a plan to restore the site for goose hunting.

- **Rupert workcamp:** This workcamp will be used for construction of the access roads to the two diversion bays, the control structures and the dikes, and development of the upstream and downstream Rupert diversion bays. With a life span of 30 months, it is expected to house 1,800 people. Covering an area of about 60 ha, the workcamp will also include a service station with gasoline and diesel tanks and a fuel depot. Upon completion of the work, it will be either closed down or dismantled, depending on the needs of Hydro-Québec and the SEBJ.

- **Jolliet Lake workcamp:** This workcamp will be used during construction of the hydraulic weirs at KP 170 and 223. Although its siting is not final, the currently selected location is near the weir at KP 170 and the boat landing for the barge used to cross Nemiscau River during construction of the weir at KP 223. It is expected to house 250 people for two years. This workcamp will be dismantled upon completion of the work.

- **Kauschiskach workcamp:** Although its siting is not final (the workers may even be housed at KM 257 workcamp on the James Bay highway), the site being considered is about 40 km east of Waskaganish, on the access road to this community. This workcamp will be used for construction of the hydraulic weirs at KP 20.4, 33 and 49. It is expected to house 150 people for two years and will be dismantled upon completion of the work.

- For the work planned in the Waskaganish and Chisasibi sections, the proponent has not decided on its plan for housing the workers.

The workcamps will be split into two parts. The residential area will include the dormitories, cafeteria, community buildings and administration offices, while the industrial area will include the warehouses and workshops.
Drinking water at the workcamps will generally come from wells drilled into the bedrock. Wastewater will be treated in compliance with MDDEP requirements. For Rupert workcamp, several wells will supply the drinking water. The Rupert workcamp sewer system will collect the wastewater. It will be treated and the effluent will be discharged into a neighbouring peatland.

Upon completion of the construction on the Eastmain-1-A and Rupert diversion project, the people operating the structures will be housed in the Hydro-Québec employees residence in Nemiscau.

2.2.4 ROADS

To carry out the project, the proponent will have to build about 255 km of roads and improve about 105 km of roads. To this road network, it will have to add various secondary roads, whose routes have not yet been defined. These secondary roads include link roads to borrow pits, quarries, dikes, control structures, canals, the north end of the transfer tunnel and the tunnel’s outlet channel. They also include access roads to land clearing sites in the diversion bays and excavated material disposal sites.

In addition, building the 315-kV Sarcelle-Eastmain-1 transmission line will require the construction of approximately 110 km of secondary roads parallel to and very near the permanent Sarcelle-Eastmain-1 road. The removal of culverts and temporary bridges in the transmission line right-of-way, upon completion of the work, will break these secondary roads up into many parts, making them virtually impassable thereafter.

Access to Sarcelle workcamp and the Sarcelle powerhouse jobsite will be controlled by a checkpoint near Sarcelle workcamp, while access to Rupert workcamp and the Rupert diversion bay jobsites will be controlled from a checkpoint quite close to Albanel substation.
Table 2-11: Road summary

<table>
<thead>
<tr>
<th>ROADS</th>
<th>TO BE BUILT</th>
<th>TO BE IMPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sarcelle-Eastmain-1 permanent road</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muskeg-Sarcelle powerhouse permanent road</td>
<td>35 km</td>
<td></td>
</tr>
<tr>
<td>Restoration of Opinaca River bridge</td>
<td>( – )</td>
<td></td>
</tr>
<tr>
<td>Muskeg–Eastmain-1 permanent road</td>
<td>40 km</td>
<td></td>
</tr>
<tr>
<td><strong>Access roads to Rupert diversion bays</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access roads to Rupert diversion bays</td>
<td>81 km</td>
<td>17 km</td>
</tr>
<tr>
<td>Access road to transfer tunnel and Cabot Lake</td>
<td>14 km</td>
<td></td>
</tr>
<tr>
<td>Access road to Rupert River control structure</td>
<td>4 km</td>
<td></td>
</tr>
<tr>
<td>Links to control structures, dikes, canals</td>
<td>~35 km</td>
<td></td>
</tr>
<tr>
<td><strong>Roads for line redevelopment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link road with Circuits 7069 and 7070 road</td>
<td>5 km</td>
<td></td>
</tr>
<tr>
<td>Winter road and ice bridge for modification of circuit 7059</td>
<td>~4 km</td>
<td></td>
</tr>
<tr>
<td><strong>Access road to Sakami weir</strong></td>
<td>2 km</td>
<td>1 km</td>
</tr>
<tr>
<td><strong>Access roads to eight hydraulic structures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access roads to hydraulic structures</td>
<td>~65 km</td>
<td>~31 km</td>
</tr>
<tr>
<td>Access road to Jolliet Lake workcamp</td>
<td>~21 km</td>
<td></td>
</tr>
<tr>
<td>Barge (and ice bridge) over Nemiscau River</td>
<td>( – )</td>
<td></td>
</tr>
<tr>
<td><strong>Access roads to nine granular blankets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-seasons road</td>
<td>1 km</td>
<td></td>
</tr>
<tr>
<td>Winter roads</td>
<td>4 km</td>
<td></td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>255 km</td>
<td>105 km</td>
</tr>
</tbody>
</table>

According to the design criteria used by the proponent (see Section 2.1.5 of this report), these roads are as follows:

- **Type I roads**: 31-km road linking Albanel substation to the transfer tunnel intake, passing the Rupert River workcamp; 4-km road linking the Route du Nord to the Rupert River control structure; improvement of the existing 35-km road leading to Sarcelle powerhouse; Muskeg–Eastmain-1 permanent road, 40 km in length; a total of 110 km of roads.

- **Type II roads**: Rupert forebay access road, 35 km long; Rupert tailbay access road, 35 km long; 11-km road linking the transfer tunnel to Cabot Lake; link road to the Circuits 7069 and 7070 road, 5 km long, including a bridge with a 140-m span crossing Rupert tailbay; and Sakami weir access road, 3 km long; a total of 89 km of roads.

- **Access roads to dikes and control structures**: Although no specific locations are given in the impact assessment, these are estimated to be about 35 km of secondary roads. During the operation phase, these access roads will be kept in order to inspect and maintain the structures and equipment in place.

- **“Temporary” roads**: These are the 65 km of roads to be built for access to the eight hydraulic structures. They will be used during construction of the hydraulic structures, and the environment will be restored afterward, unless there is a specific...
agreement with the tallymen. As for the 52 km of existing roads that are going to be improved, their upkeep will remain the responsibility of the present users.

- Winter roads and ice bridges: Under 10 km in length, they will be used for redevelopment of the 735-kV transmission line (circuit 7059) and slope stabilization along the La Grande Rivière near Chisasibi. Moreover, if some work on the hydraulic weir at KP 223 is done in winter, the proponent will build an ice bridge over Nemiscau River.

As part of the mitigation measures for tallymen, the proponent plans to build or improve many secondary roads, to facilitate access to traplines or camps. These will include roads for vehicles, ATV trails and snowmobile trails. The exact location of the roads to be built, which will vary in length from a few dozen metres to about 20 km, has not yet been determined.

During the project construction phase, safety and maintenance of the permanent and temporary roads will be ensured by the SEBJ. During the project operation phase, the proponent will assume responsibility for permanent roads in accordance with operating and maintenance needs for the structures and equipment in place. The access roads to Sarcelle, Eastmain-1 and Eastmain-1-A generating stations will be maintained and cleared in winter. The permanent access roads to the diversion bays and structures will be maintained, but will not be cleared in winter.

**Permanent access roads to diversion bays**

To provide access to the structures in the Rupert diversion bays, 116 km of roads will have to be built or improved, including 31 km of type I and 81 km of type II roads. Building the permanent roads in the diversion bay section will require nearly 200 culverts (mostly 0.9 m in diameter), three bridges (including one temporary bridge) and three prefabricated arches.

The permanent bridges will be built to span Lemare River, across from the control structure and Rupert tailbay (bridge 160 m long), and a temporary bridge will be built over Nemiscau River, across from the Nemiscau-1 control structure. Prefabricated concrete arches will be installed to cross Lac de la Chlorite, Arches Creek and Nemiscau 2 River. Other prefabricated arches will be used for minor stream crossings, when conditions are unfavourable for installing a culvert.

**Permanent road to Rupert River control structure**

This type I road, 4 km in length, crosses three perennial streams and three intermittent streams. A bridge will be built at its east end, above the Rupert spillway, to cross the Rupert River.

**Permanent Muskeg–Eastmain-1 road**

This road is provided for in the Boumhounan Agreement, at the request of the Crees, to facilitate access to this section of the region. Covering a distance of 40 km, it will require a 22-m bridge across Acotago River and 94 culverts (mostly 0.9 m in diameter).
It will link the James Bay highway (near KM 392) to the Eastmain workcamp (Eastmain-1-A powerhouse), making it easier for many workers from Cree communities along James Bay to reach the jobsites. This new road will also complete a major loop in the road network of the James Bay region. The loop will be formed by the junction of the James Bay–Muskeg road (already existing), Muskeg–Eastmain-1 road (to be built) and Nemiscau–Eastmain-1 road (already existing). It will facilitate travel through the region, in the Chibougamau–Radisson sector.

**Permanent Muskeg–Sarcelle powerhouse road**

This permanent access road approximately 60 km long (already existing) is in good condition and is used regularly by the Crees and recreational anglers.

From Muskeg substation, for about 25 km the road uses a section of the main permanent gravel road to the James Bay highway (45 km). It then branches north for approximately 35 km along a secondary permanent gravel road to the Sarcelle control structure (already existing) and the future location of Sarcelle powerhouse. This 35-km secondary road will be redeveloped to convert it into a main type I permanent road. The work will include improving the road surface and renovating the bridge over the Opinaca River.

Sarcelle workcamp is on this road, about 10 km south of the future Sarcelle powerhouse. The Muskeg–Sarcelle powerhouse access road will be maintained and cleared of snow along its entire length, including during the project operation phase.

### 2.2.5 ISSUES RAISED BY THE PROPONENT

Based on the lessons learned from other hydropower developments in Québec, particularly in the James Bay region, and consultations with the Cree and Jamesian communities, the proponent has identified four major issues linked to the project:

- preservation of the fish community and fish habitats in the Rupert River
- continuation of hunting, fishing and trapping by the Crees
- recreational and landscape interest of the Rupert River
- economic spinoffs for the Cree and Jamesian communities.

A major issue is the preservation of the fish community, namely the productive capacity and habitat functions in the reduced-flow reach of the Rupert River (downstream of KP 314). Special attention must be given to the traditional fishing of anadromous lake cisco at Smokey Hill (near Waskaganish) and the following species: lake sturgeon, walleye, northern pike and lake whitefish (see Chapter 5).

The project will affect 30 or so traplines in six Cree communities. Land users from the community of Mistissini will be especially affected by the creation of the two diversion bays, while users from Nemaska and Waskaganish will be affected by the reduced flow of the Rupert River. Users from the communities of Eastmain and Wemindji will be affected by increased flows in Opinaca reservoir, Boyd Lake and Sakami Lake, while Chisasibi users will have to adapt to increased flows in the La Grande Rivière (see Chapter 6).
Table 2-12: Areas of Cree traplines flooded by diversion bays

<table>
<thead>
<tr>
<th>TRAPLINE</th>
<th>COMMUNITY</th>
<th>LOSS (km²)</th>
<th>% OF TRAPLINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>M25</td>
<td>Mistissini</td>
<td>214.9</td>
<td>15.5</td>
</tr>
<tr>
<td>M18</td>
<td>Mistissini</td>
<td>56.4</td>
<td>4.9</td>
</tr>
<tr>
<td>M33</td>
<td>Mistissini</td>
<td>34.8</td>
<td>1.5</td>
</tr>
<tr>
<td>M26</td>
<td>Mistissini</td>
<td>15.8</td>
<td>2.3</td>
</tr>
<tr>
<td>R21</td>
<td>Nemaska</td>
<td>11.5</td>
<td>1.7</td>
</tr>
<tr>
<td>R19</td>
<td>Nemaska</td>
<td>4.9</td>
<td>0.4</td>
</tr>
<tr>
<td>N25</td>
<td>Nemaska</td>
<td>1.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

The Rupert River is highly used by the Crees of Waskaganish, Nemaska and Mistissini when they travel by boat or snowmobile, and also for activities that pass on Cree traditions such as the canoe brigades. Many permanent and temporary Cree camps have been built along the river. Some camps include many homes, such as the camps on the left bank east of Lake Nemiscau as well as at Old Nemaska and Gravel Pit. The Rupert River is also used for recreational canoe trips and kayaking. Maintaining the river’s navigability, recreational interest and beauty, and enhancing its tourism potential are of great concern to the users.

The Cree and Jamesian populations have expressed a desire to see the proponent promote economic spinoffs in their communities in terms of awarding contracts, splitting the work and purchases of goods and services so that regional businesses can participate in the calls for tenders, job creation and manpower training (see Section 6.6).

### 2.3 STUDY AREA

#### 2.3.1 AREAS SELECTED BY THE PROponent

##### 2.3.1.1 Biophysical environment – ecosystemic approach

The proponent has divided the study area into different sections of land where the impacts are liable to occur. As requested in the directives, the various biophysical components of the environment have been described and analyzed using an ecosystemic approach. This approach was imperative in order to facilitate an understanding of the impacts on the vast tract of land being studied. The environment was subdivided into six sections that have, or will have, different ecological characteristics, particularly with reference to aquatic habitats. These sections, illustrated in Map 2.2 of the impact assessment, are described briefly below:

- The Rupert diversion bay section includes flooded land upstream of the closure points on the Rupert, Lemare and Nemiscau rivers.
- The Rupert-Lemare-Nemiscau section corresponds to their watershed downstream of their closure point and takes into account the ecological minimum flow regimes.
– The Rupert Bay section includes Rupert Bay, Boatswain Bay and the estuaries of the Nottaway, Broadback, Rupert and Pontax rivers.
– The increased-flow section begins at the head of Eastmain-1 Reservoir and includes Opinaca reservoir, the Boyd-Sakami diversion system, Robert-Bourassa reservoir and La Grande Rivière.
– All sections affected by structures and related activities such as access roads, power lines, workcamps, jobsite structures, quarries and sandpits.
– The La Grande Rivière estuary and James Bay coast section encompasses the estuarine segment and the coastal waters of James Bay included within the freshwater plume from the La Grande Rivière. The boundary of the study area in the marine environment is dictated, according to the proponent, by the fact that the project impacts do not extend beyond the winter limits of the La Grande complex plume. The area of the winter plume, under present conditions, was determined by the isohaline of 20 ppt and varies from 2,100 to 3,500 km². The flows leaving the La Grande Rivière are in the vicinity of 4,400 m³/s to 4,600 m³/s.

2.3.1.2 Human environment – by area of use

As required in the directives, two geographic scales have been used to analyze impacts on the human environment. The extended study area, based on the James Bay region as defined in Chapter 22 of the JBNQA, corresponds to the reference area for analyzing the impacts on social and economic conditions, both Cree and Jamesian. This “extended” area encompasses the Municipality of Baie-James and the nine Cree communities, including Whapmagoostui. Note that the proponent’s analysis of the anticipated economic impacts goes beyond these boundaries.

The “limited” study area means the 36 traplines affected, in six communities: Mistissini (4), Nemaska (10), Waskaganish (8), Eastmain (4), Wemindji (4) and Chisasibi (6). Rupert and Boatswain bays, the mouth of the La Grande Rivière and the immediate area on the east coast of James Bay are included in the limited study area. The latter helps identify specific impacts of project components and their direct impacts on land use by the Crees.

At the request of the review bodies, the boundaries of the study area in this section have been called into question, to make the proponent go into greater detail in the justification, taking into account the existing literature on major biophysical phenomena such as marine current and ice dynamics and the productivity of the environment in James Bay and Hudson Bay.

2.4 SIGNIFICANT CHANGES IN THE PHYSICAL ENVIRONMENT

2.4.1 RUPERT DIVERSION BAY SECTION

2.4.1.1 Increase in area of lakes

When the impoundment slated for December 2009 begins, there will be a difference between the north and south sections of the forebay. In the north, water from the Lemare River will have already
started to accumulate in the diversion bay, while the entire flow of the Rupert River will still be diverted by the diversion structure at KP 314. To avoid backflow problems between the basins and to limit erosion, the impoundment will be done in two steps. First, the water levels in the two forebay sections will be balanced by releasing 127 m$^3$/s in the Rupert River, while the structures that ensure the instream flow in the Lemare and Nemiscau rivers and Kaychischekaw Creek are open. Second, once the forebay levels are balanced, the proponent will remove the temporary plug in the canal-S73 area. Then, the water levels will reach the weir crest of the tunnel and the inflow will be transferred to the tailbay, where the level will rise slowly. The water will afterward reach Eastmain 1 Reservoir.

Once the impoundment is complete, the area of the diversion bays will be as shown in Table 2-13. There will therefore be a progressive transition from a mosaic of 158 km$^2$ of natural bodies of water including lakes, rivers and creeks, to two diversion bays totalling 346.2 km$^2$ (see Map 2-7).

Table 2-13: Areas flooded

<table>
<thead>
<tr>
<th>AREA (km$^2$)</th>
<th>FOREBAY</th>
<th>TAILBAY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooded land</td>
<td>128.1</td>
<td>60</td>
<td>188.1</td>
</tr>
<tr>
<td>Aquatic</td>
<td>100.6</td>
<td>57.5</td>
<td>158.1</td>
</tr>
<tr>
<td>Total</td>
<td>228.7</td>
<td>117.5</td>
<td>346.2</td>
</tr>
</tbody>
</table>

It should be kept in mind that, in accordance with the Boumhounan Agreement, the operating level of the forebay must not change the level of Mesgouez Lake, established at water level 308 m. For this, the diversion bay level must be 306 m for a maximum diverted flow of 800 m$^3$/s. Under these circumstances, the level at the upper end of the diversion bay is 306.4 m, which represents a maximum level, while the drawdown is evaluated to be 2 m. For the tailbay, the drawdown will be 4.2 m in winter and 3.3 m in summer at the upper end of the diversion bay, and 2.7 m in winter and 2 m in summer at the lower end of the diversion bay.

The hydraulic regimes of the two diversion bays will be fairly different. The forebay will be rather lacustrine, with little variation in level and reduced flow velocities not exceeding 0.65 m/s except for a short section below canal S73-4, south of Goulde Lake, where flow velocities may reach 1.5 m/s. The maximum depth will be 24 m at Des Champs Lake, while the mean depth will be around 10 m.

In the tailbay, the steeper slope between the tunnel outlet and the inlet to Eastmain 1 Reservoir means that flow velocities may reach 5 to 7 m/s in Ruisseau Caché. Further upstream, the velocities will be around 1 to 2 m/s. The maximum depth of approximately 19 m will be at Arques Lake and the mean depth will be 8.5 m. The main lakes in the forebay will increase in depth by approximately 8 m. In the tailbay, the level of Arques Lake will rise noticeably by approximately 4 m (see Map 2-8).

The creation of these two diversion bays will flood some river reaches, now characterized as lotic, and change them to a more lacustrine regime. These kinds of fast-flowing water habitats are found particularly in the last 36 km of the Misticawissich River and on the Rupert between KP 334 and 314. In this section, seven rapids will be flooded. Likewise, part of the Nemiscau River (38 km), Lemare River (32 km) and Kaychischekaw Creek (1.5 km) will disappear under the water.
2.4.1.2 Changes in thermal and ice regimes

**Thermal stratification of old lakes**

Under natural conditions, thermal regime downstream of Mesgouez Lake is comparable to that of the region’s major rivers and is not influenced by Mistassini Lake. The rivers found there all behave the same way, i.e. they warm up quickly in the spring starting in mid-May. The temperature remains around 18 to 20°C from mid-June to August, then decreases in the fall and stabilizes around the freezing point.

Lakes deeper than 10 m have a pronounced thermal stratification in summer. The thermocline is about 5 m in depth in early August and gets progressively deeper in the fall. Above thermocline, the water temperature is comparable to neighbouring rivers. Below thermocline, the temperature is higher than neighbouring rivers in winter and lower in summer.

In the course of the year following the diversion bay impoundment, a new thermal regime will be established, depending on water depth and turnover time. Although the latter fluctuates in space and time according to the quantity of inflows supplying the diversion bays and location, the mean turnover time for the forebay will be 25 days. However, in the south basin of the forebay, through which the water from the instream flow of the Rupert River will pass, the residence time will be much shorter, ranging from 8 days during spring flooding, to 20 days in winter. Just upstream of KP 314 on the Rupert River, episodes of thermal stratification will make the water temperature of the instream flow occasionally colder than under present conditions, because the water intake of the spillway is at a depth of about 20 m and the release structure discharges water coming primarily from the deep part of the basin. Therefore, water temperature differences between the surface and the depths of up to 4 to 6°C may be observed in spring, between late May and late June. This temperature difference between the surface and bottom would lessen as and when the deep water is discharged into the Rupert River and replaced by warmer water from upstream.

In summer, this stratification of the south basin would tend to disappear and the water temperature would be comparable to Mesgouez Lake. Nonetheless, the old lakes like RP062 and Des Champs might retain a summer thermal stratification. Thermocline would however be much deeper due to the rise in the water level, determined to be 17 m on average. The presence of this thermocline, and its level, are of great importance because the proponent proposes to re-establish the lake trout spawning grounds in some lakes where they are found under natural conditions, given this species’ spawning and feeding requirements. This matter is covered in Section 5.1. Overall, the lakes located on the main diversion route might lose their thermocline, while thermal stratification in lakes further back, like Cabot and Hore lakes, will be maintained or accentuated somewhat by the slight increase in water level.

In the tailbay, the water turnover time will be eight days with, as in the forebay, a slight thermal stratification. However, the water will be colder, by 2°C in spring, 0.3°C in summer and approximately 1°C in the fall. Thermal stratification may remain in Arques Lake, which is on the main diversion route just below the tunnel, and its depth will increase from 20 to 24 m.
**Freeze-up and break-up dates**

At present, the freeze-up on the Rupert River above the closure point occurs in early December and progresses quickly in places where the flow is slow. Sections where the flow is tumultuous very often remain ice-free throughout the winter. When the diversion bays are impounded, planned for December, the water temperature is expected to be below 0°C, so the newly forming bodies of water will freeze up quickly. Upon completion of the impoundment, the diversion bays will freeze up in accordance with flow velocities. In diversion bay sections where the flow velocity is slow, the ice cover will thicken rapidly in parallel to the progressive flooding of the area.

In the operation phase, freeze-up will occur at the same time as the neighbouring lakes, due to the weak current in the forebay. In winter, some ice-free patches will remain and may produce frazil. This will be the case in particular around canals S73 in the forebay, along canals 4 and 5, and between KP 20 and 25 in the tailbay diversion (see Map2, pocket insert). The ice-free patches of the tailbay will lead to the production of large quantities of frazil, which will cause a water level increase of 1.6 to 2 m in the tailbay, depending on the section, compared to the maximum level in open-water conditions. A lot of frazil will be produced all along the main flow zone.

Ice break-up will occur later in the diversion bays than on the Rupert River. This delay is due to the size of the water mass being warmed by inflows from the Rupert River and the thickness of the ice over a body of water resembling a lake more than a river, especially in the case of the forebay. In the slow-flow zones, the ice cover may remain until mid-June.

**2.4.1.3 Sediment dynamics in the diversion bay**

In the forebay, erosion will be marginal since the local materials are of a type that limits their resuspension. However, when the Rupert diversion occurs, the flow velocities in the tailbay and the type of local materials will lead to erosion from canal 4 up to the arrival of the diverted water in Eastmain-1 Reservoir. The proponent assesses the volume of eroded material to be about 11,100,000 m³. Of this total, 3,800,000 m³ will be deposited further along in the diversion bay, while 7,300,000 m³ will be transported into the reservoir. This massive movement of material early in the commissioning of the diversion will lower the level along the tailbay. The maximum drop in level will be 1 m. The estimated drop in level above the three instream flow release structures is approximately 0.4 m at Nemiscau-1 dam, 0.8 m at Nemiscau-2 dam and 0.7 m at Arques dike.

According to the proponent, the erosion phenomenon in the flow zones was not taken into consideration in establishing the future water levels presented in the impact assessment, when it is indicated that the maximum increase in water level, for a flow of 800 m³/s, will vary from 4.2 to 0.1 m at different points in the tailbay. The retaining structures have been designed to take this phenomenon into account, and this makes them safer. The drop in level was nonetheless considered in the design of the instream flow release structures at the closure point of the Nemiscau River, to ensure adequate and constant flow to the lower part of the river.
2.4.1.4 Change in water quality

Once the Rupert diversion is in operation, the water quality in the diversion bays will depend on the mixing of two types of water, namely water from Mistassini Lake and the Rupert River (type A) and water from the tributaries of the Rupert River (type B). The Rupert River water has a neutral pH, low conductivity and little colour, is low in phosphorus and organic matter, not very turbid and very transparent. The water in tributaries such as the Lemare or Nemiscau rivers has more colour, is just as nutrient-poor and not very turbid, but the pH is more acidic.

After the diversion bay impoundment is complete and the diversion is in service, the water quality might be modified by four phenomena: mixing of water of different qualities, leaching of submerged soils, decomposition of submerged organic matter and an increase in phytoplankton biomass. The mixing of type A and B waters constitutes, in the long term and permanently, the main water quality modification mechanism, because 90% of the water in the diversion bays will be type A and 10%, type B. The other three phenomena will lead to minor short-term changes in water quality and will be quickly mitigated upon stabilization of physical consequences of the impoundment, such as erosion, or chemical consequences, such as the release of nutrients from decomposing vegetation.

According to the proponent, after diversion, the water colour will be much like Rupert River water and all parameters related to organic matter will diminish. On the other hand, the parameters related to mineralization will increase. In bays far from the main flow route and near water arriving from the Lemare, Nemiscau and Misticawissich rivers, however, the water will remain type B. Despite a certain volume of flooded organic matter, the dissolved-oxygen levels will decrease very little and will always remain sufficient for maintaining aquatic life. There will be an increase in total phosphorus, with values reaching up to 17 µg/l in the tailbay the first year, then declining again to 4 µg/l after seven years. This temporary increase will lead to an increase in biological productivity, which will return to a level comparable to the biophysical environment five to eight years after the impoundment. According to the proponent, these changes in physico-chemical characteristics will be below the maximum permissible levels for the various water uses.

2.4.1.5 Main changes in traplines

In the diversion bay section, four traplines in the community of Mistissini and three traplines in the community of Nemaska will be affected. The main biophysical impact will be the flooding of part of the hunting, fishing and trapping grounds of the two communities due to the creation of the diversion bays. Infrastructure such as a workcamp, control structures, dikes, canals and a tunnel will be built along the diversion bays. A network of permanent and temporary access roads to infrastructures will crisscross the section.

The creation of the Rupert diversion bays will change the hydrological regime of the section by engulfing bodies of water of varying sizes, as well as rivers and creeks, and increasing the flows of Ruisseau Caché. The conditions and characteristics of the spawning grounds of various fish species will be modified, making these spawning grounds unusable. The impoundment of huge tracts of land will also cause increased dissolving of methylmercury present in the soil and,
consequently, the absorption and bioaccumulation of mercury in fish will rise. Waterfowl, small animals and large animals will have to adapt to new habitats.

The new bodies of water will change the way the Crees use the area. Some hunting and fishing grounds will disappear and the users will have to change their practices based on the new conditions. They will have to reorganize how they travel and adjust to new navigation and ice conditions. Permanent and temporary camp sites will be flooded. New roads will open up land where until now, depending on the trapline, there have been few, if any, access roads.

Of the four traplines in the diversion bay section, trapline M25 in the community of Mistissini is the most affected. More than 15% of its area will be flooded and many infrastructures and roads will permanently change this practically virgin land. About a dozen birthplaces and burial grounds, as well as 38 permanent and temporary camps, will be flooded.

Close to 5% of trapline M18 will be flooded, and roads, dikes and control structures will change the land. In traplines M26 and M33, 2.3% and 1.5% of the land will be flooded respectively, but no infrastructure or roads are planned by the proponent in these traplines.

Traplines R21, R19 and N25 in the community of Nemaska will also be partially flooded by the diversion bays, namely 1.7%, 0.4% and 0.1% respectively. Other impacts affecting these traplines will be presented in Section 6.4 on the main changes in traplines in the Rupert reduced-flow section.

<table>
<thead>
<tr>
<th>TRAPLINE</th>
<th>TOTAL AREA (KM²)</th>
<th>AREA FLOODED (KM²)</th>
<th>PROPORTION OF TRAPLINE FLOODED (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL LAND</td>
<td>BODIES OF WATER</td>
<td>TOTAL</td>
</tr>
<tr>
<td></td>
<td>TOTAL LAND</td>
<td>BODIES OF WATER</td>
<td>TOTAL</td>
</tr>
<tr>
<td>MISTISSINI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M33</td>
<td>2286</td>
<td>22.13</td>
<td>12.69</td>
</tr>
<tr>
<td>M26</td>
<td>688</td>
<td>8.37</td>
<td>7.40</td>
</tr>
<tr>
<td>M25</td>
<td>1390</td>
<td>103.49</td>
<td>111.40</td>
</tr>
<tr>
<td>M18</td>
<td>1150</td>
<td>37.92</td>
<td>18.52</td>
</tr>
<tr>
<td>Total</td>
<td>5514</td>
<td>171.91</td>
<td>150.01</td>
</tr>
<tr>
<td>NEMASKA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N25</td>
<td>1156</td>
<td>1.16</td>
<td>0.36</td>
</tr>
<tr>
<td>R21</td>
<td>688</td>
<td>8.74</td>
<td>2.79</td>
</tr>
<tr>
<td>R19</td>
<td>1238</td>
<td>3.26</td>
<td>1.60</td>
</tr>
<tr>
<td>Total</td>
<td>3082</td>
<td>13.16</td>
<td>4.75</td>
</tr>
<tr>
<td>Total</td>
<td>8596</td>
<td>185.07</td>
<td>154.76</td>
</tr>
</tbody>
</table>
2.4.2 REDUCED-FLOW AREA (RUPERT) AND WATER-LEVEL MANAGEMENT STRUCTURES

2.4.2.1 Change in hydraulic conditions

This section describes the instream flow regime proposed by the proponent. The analysis of methods used and instream flows will be discussed in Section 5.2.

The proposed regime was established in accordance with the policy on instream flow for the protection of fish and their habitat (Politique de débits réservés écologiques pour la protection du poisson et de ses habitats - R9). As defined in the policy, ecological instream flow means:

*The minimum flow required in order to maintain fish habitats at a level deemed acceptable. This degree of acceptability corresponds to a sufficient quantity and quality of habitats to ensure the normal unfolding of biological activities for fish species living all or part of their life cycle in the disturbed segment(s). The free movement of fish must be ensured by appropriate modulation of the ecological instream flow or by specific developments at impassable sites.*

The Boumhounan Agreement sets a minimum flow as a threshold value for all ecological instream flows. The flow value is equal to at least 20% of the mean annual flow at the closure point, or 127 m$^3$/s. According to the Agreement, the proponent cannot under any circumstances reduce the flow of the Rupert River below the threshold value.

Instream flow regime of the Rupert River

The proposed instream flow regime is synchronized around three periods, corresponding to the biological activities of the main fish species in the Rupert River. The periods correspond to fall and spring spawning, summer feeding and winter egg incubation.

For fish species in general, and species valued by the Crees in particular, spawning occurs in spring and fall. The spawning activity was deemed critical and was the subject of two-dimensional modeling of microhabitats, to better define the instream flows. Walleye, longnose sucker, white sucker and lake sturgeon served as a reference for spring activities, while lake whitefish represented fall spawning. These species spawn in lotic zones and are particularly affected by flow reductions.

Summer feeding, from June to October, was not specifically modeled by the proponent. The presence of structures that raise the water level and maintain lentic habitats, as well as the instream flow set out in the Boumhounan Agreement have been deemed adequate by the proponent. The summer flow was validated by the wetted-perimeter method that analyzes the area of aquatic habitats.

As was the case for the summer feeding flow, microhabitat modeling was not done for the winter incubation flow either. The flow determined in the Boumhounan Agreement was accepted. A subsequent verification of hydraulic conditions was carried out to check that the incubation of lake whitefish eggs proceeded normally.
At KP 314, the site the Rupert River control structure, the instream flow regime will have the following characteristics (see Table 2-15, Map 2-9):

- In spring, the flow will be maintained at 416 m³/s for a fixed 45-day period during spring spawning.
- A minimum flow of 127 m³/s will be maintained during the summer, as stipulated in the Boumhounan Agreement.
- A flow of 267 m³/s will be maintained for a 31-day period in the fall.
- In winter, a minimum flow of 127 m³/s will be maintained for 178 days, as stipulated in the Boumhounan Agreement.

At the closure point, the water released at various instream flows planned in the regime represents 28.7% of the mean annual flow of the Rupert River under natural conditions.
Although this instream flow regime is determined on the basis of only a small number of fish species, the proponent hypothesizes that all the other species in the Rupert River will indirectly benefit from it and none will suffer a major impact. These are minimum instream flows, as the proponent plans to use the control structure for flows entering the Rupert River when the maximum level of the diversion bays is reached and the tunnel will be used at full capacity (800 m$^3$/s).

The instream flow periods may vary by a few days, except in spring, depending on the timing of the ramping from one period to the next. The ramping periods between the proposed flows of the regime have been determined so match natural conditions as closely as possible, to avoid sudden variations:

- Up-ramping from winter flow and to spring flow is determined by the arrival of the high flow at Mesgouez Lake when inflows exceed 450 m$^3$/s. This transition never starts before May 8, to avoid preceding the start of the spawning period. The transition takes place over a five-day period, with six manoeuvres of the regulating gates in the Rupert River control structure.
- After 45 days of spring flow, a nine-day transition is provided for a return to the summer instream flow.
- The summer instream flow ends on October 5 and increases by 140 m$^3$/s in three days to reach the fall instream flow.
- The end of fall spawning is determined by the start of winter freeze-up when the mean daily air temperature goes down to 0°C. This transition begins 15 days after that date and lasts for three days, but cannot start before October 31 or after November 10. The purpose of these limits is to ensure that spawning takes place properly. It is important to point out that the winter instream flow begins before freeze-up, to avoid any collapse of the ice cover that could jeopardize the safety of people using the river.
The Boumhounan Agreement allows for the possibility of 10 hydraulic structures on the Rupert River, to restore the water levels observed under natural conditions. Eight structure sites have been selected by the proponent, in agreement with Cree users. These structure sites are located near declivities (rapids, cascades or waterfalls) corresponding to KP 20.4, 33, 49, 85, 110.3, 170, 223 and 290 (see Table 2-16, Map 2-10 and Map 2 11).

Table 2-15: Instream flow regime for the Rupert River proposed by the proponent

<table>
<thead>
<tr>
<th>SEASON</th>
<th>SPRING</th>
<th>SUMMER</th>
<th>FALL</th>
<th>WINTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOLOGICAL ACTIVITY</td>
<td>Spawning</td>
<td>Feeding</td>
<td>Spawning</td>
<td>Incubation</td>
</tr>
<tr>
<td>TARGET SPECIES</td>
<td>Lake sturgeon, walleye, longnose sucker, white sucker</td>
<td>All species</td>
<td>Lake whitefish</td>
<td>Lake whitefish</td>
</tr>
<tr>
<td>AGREEMENT OR METHOD</td>
<td>Microhabitat modeling</td>
<td>Boumhounan Agreement wetted perimeter</td>
<td>Microhabitat modeling</td>
<td>Boumhounan Agreement hydraulics</td>
</tr>
<tr>
<td>INSTREAM FLOW AT CLOSURE POINT (M³/S)</td>
<td>416</td>
<td>127</td>
<td>267</td>
<td>127</td>
</tr>
<tr>
<td>DURATION (D)</td>
<td>45</td>
<td>91</td>
<td>31</td>
<td>178</td>
</tr>
<tr>
<td>TIMING</td>
<td>High flow in Mesgouez Lake &gt; 450 m³/s</td>
<td>Completion of 45 days of spring instream flow</td>
<td>October 5</td>
<td>15 days after the start of freeze-up</td>
</tr>
<tr>
<td>TRANSITION (d)</td>
<td>5</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CONSTRAINT</td>
<td>Never before May 8</td>
<td></td>
<td></td>
<td>Never before October 31 or after November 10</td>
</tr>
</tbody>
</table>
The hydraulic structures at these sites are designed to maintain the river water levels and promote or maintain navigation and ongoing hunting, fishing and trapping activities. The structures at KP 20.4 and KP 170 have been designed to prevent the Gravel Pit (KP 21.35), downstream of Smokey Hill rapids, and Old Nemaska (KP 187) from being flooded in the case of a 100-year flood.

According to the proponent, the water levels on the Rupert River need to be maintained to achieve many environmental goals. The rock blanket planned at KP 20.4 is to preserve fish migration and the spawning of lake cisco at the Smokey Hill spawning ground. Six weirs will keep the bodies of water at 15 to 47 km in length, over a total of approximately 150 km. A spur will reduce the flow zone in part of the river at KP 290, to maintain the flow further upstream. The role of these hydraulic structures is to maintain a variety of aquatic habitats in which fish may complete their life cycle. They will enable some waterfowl species to use these bodies of water during their migration or breeding. The weir at KP170 will maintain the level of Lake Nemiscau, which is used a lot for dabbling duck and diver breeding, as well as for forage fish.

<table>
<thead>
<tr>
<th>PK</th>
<th>TYPE OF STRUCTURE</th>
<th>APPROXIMATE AREA OF INFLUENCE (KM)</th>
<th>FISH MOVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.4</td>
<td>tapis en enrochement</td>
<td>3.3</td>
<td>Ensures free movement of fish</td>
</tr>
<tr>
<td>33</td>
<td>Weir</td>
<td>15</td>
<td>Ensures free movement of fish through a river branch</td>
</tr>
<tr>
<td>49</td>
<td>Weir</td>
<td>15.1</td>
<td>Impassable natural obstacle</td>
</tr>
<tr>
<td>85</td>
<td>Weir</td>
<td>10.8</td>
<td>Impassable natural obstacle</td>
</tr>
<tr>
<td>110.3</td>
<td>Weir</td>
<td>14.7</td>
<td>Impassable natural obstacle</td>
</tr>
<tr>
<td>170</td>
<td>Weir</td>
<td>44.9 (Rupert) 24 (Nemiscau)</td>
<td>Impassable natural obstacle</td>
</tr>
<tr>
<td>223</td>
<td>Weir</td>
<td>47.3</td>
<td>Ensures free movement of fish through a notch in the weir</td>
</tr>
<tr>
<td>290</td>
<td>Spur</td>
<td>3 (Rupert) 2 (Lemare)</td>
<td>Ensures free movement of fish</td>
</tr>
</tbody>
</table>

Construction of the structures will begin before the filling of the diversion bays and will continue after the diversion is put into operation. During the filling of the diversion bays, temporary structures will be installed to bring the water up to levels comparable to those expected during
operation, except at weirs KP 49, 85, and 110.3 which will be built the following spring. Also, the structure at KP 290 will be completed at the end of the fall following the diversion bay impoundment.

As exposure of the banks or riverbed will change the environment, this is a major issue. Several of these areas are located upstream of Lake Nemiscau. The areas most affected are between KP 220 and 223, and between KP 270 and 280. In some cases, they may even be within the area of influence of a hydraulic structure. This is the case for the section above the weir at KP 223, which will be exposed between KP 240 and 262. The downstream reach will be exposed, especially on the right bank between KP 3 and 15, between 26.5 and 29.5, and upstream of KP 125.

A total of 20 km$^2$ of aquatic habitats will be lost following the partial diversion. Accordingly, the sections not controlled by hydraulic structures will decrease in area by 12.5 km$^2$ and their surface width will decrease by as much as 20%. The remaining lost surfaces will be in areas controlled by hydraulic structures (see Table 2-11). Maximum exposure will occur in summer, in winter, although the flow is the same (127 m$^3$/s), the water levels in the Rupert River will rise due to friction caused by the ice cover.

Area alone does not give the full understanding of the loss or changes in habitats caused by bank exposure. For this reason, the proponent has divided the river into habitat types. These habitats represent flow facies corresponding to the physical characteristics of the river (sills, channel, lake, basin, rapids, cascade and waterfall). Note that a sill is defined as a shoal or declivity with rapid flow, while a channel has a constant depth greater than 1 m. These facies may be subdivided basically in terms of flow velocities (e.g. channel 1, 2 or 3). The lowest figure (e.g. channel 1) corresponds to the highest flow velocities, which are generally associated with a coarser substrate (EI 1.6, MO).

Table 2-17 presents the losses and gains in area for habitat types in some zones of the Rupert River defined on the basis of impassable obstacles, as calculated by Fisheries and Oceans Canada (see Map 2-10). Essentially, these areas are quantitative estimates of environmental impacts, particularly for habitats available for the main species based on their preferences. The different types of channels represent the vast majority of habitats available in the Rupert River. Except for zone 7, corresponding to Lake Nemiscau which, according to the proponent, will maintain its physical integrity, all the other zones will decrease in area.
Table 2-17: Losses and gains in area (ha) for habitat types in zones of the Rupert River

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>ZONE 1 (Before, After)</th>
<th>ZONE 2 (Before, After)</th>
<th>ZONE 3 (Before, After)</th>
<th>ZONE 4 (Before, After)</th>
<th>ZONE 5 (Before, After)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool 1</td>
<td>5.2 7.0</td>
<td>26.3 26.7</td>
<td>0.9 0.5</td>
<td>17.7 13.1</td>
<td>65.7 42.3</td>
</tr>
<tr>
<td>Bassin 2</td>
<td>0.0 0.0</td>
<td>123.5 127.2</td>
<td>0.0 0.0</td>
<td>91.5 80.4</td>
<td>170.0 148.7</td>
</tr>
<tr>
<td>Channel 1</td>
<td>81.8 31.8</td>
<td>48.2 13.3</td>
<td>25.4 0.2</td>
<td>26.6 12.6</td>
<td>62.9 5.6</td>
</tr>
<tr>
<td>Channel 2</td>
<td>520.9 60.2</td>
<td>636.7 18.1</td>
<td>475.4 15.2</td>
<td>227.1 17.9</td>
<td>576.4 43.6</td>
</tr>
<tr>
<td>Channel 3</td>
<td>123.8 471.2</td>
<td>111.5 762.7</td>
<td>31.9 485.7</td>
<td>26.6 214.9</td>
<td>99.7 663.3</td>
</tr>
<tr>
<td>Lake</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
</tr>
<tr>
<td>Rapids 1</td>
<td>47.5 12.5</td>
<td>42.6 20.7</td>
<td>19.5 12.9</td>
<td>38.7 27.3</td>
<td>19.0 15.8</td>
</tr>
<tr>
<td>Rapids 2</td>
<td>27.4 34.8</td>
<td>54.1 51.6</td>
<td>16.1 16.2</td>
<td>46.8 42.7</td>
<td>28.2 22.9</td>
</tr>
<tr>
<td>Sill 1</td>
<td>58.9 0.0</td>
<td>2.0 0.0</td>
<td>0.0 0.0</td>
<td>2.9 0.0</td>
<td>2.4 0.0</td>
</tr>
<tr>
<td>Sill 2</td>
<td>70.4 86.6</td>
<td>1.5 0.1</td>
<td>0.0 0.0</td>
<td>2.6 4.0</td>
<td>1.7 1.1</td>
</tr>
<tr>
<td>Sill 3</td>
<td>6.2 26.1</td>
<td>0.4 2.0</td>
<td>0.6 0.5</td>
<td>1.0 0.0</td>
<td>0.0 0.7</td>
</tr>
<tr>
<td>Total</td>
<td>942 730</td>
<td>1047 1022</td>
<td>570 531</td>
<td>482 413</td>
<td>1026 944</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>ZONE 6 (PK 108 to 170) (Before, After)</th>
<th>ZONE 7 (PK 170 to 216) (Before, After)</th>
<th>ZONE 8 (PK 216 to 300) (Before, After)</th>
<th>ZONE 9 (PK 300 to 314) (Before, After)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool 1</td>
<td>46.9 33.2</td>
<td>5.6 5.3</td>
<td>85.2 55.3</td>
<td>38.4 23.7</td>
</tr>
<tr>
<td>Bassin 2</td>
<td>128.2 126.0</td>
<td>19.4 21.4</td>
<td>229.1 223.6</td>
<td>47.4 48.1</td>
</tr>
<tr>
<td>Channel 1</td>
<td>376.9 16.5</td>
<td>34.6 20.1</td>
<td>176.8 6.0</td>
<td>57.2 3.3</td>
</tr>
<tr>
<td>Channel 2</td>
<td>1541 178</td>
<td>27.0 0.0</td>
<td>684 23.0</td>
<td>255 17.2</td>
</tr>
<tr>
<td>Channel 3</td>
<td>456 1844</td>
<td>1886 1709</td>
<td>3048 2939</td>
<td>44.0 299</td>
</tr>
<tr>
<td>Lake</td>
<td>2476 2170</td>
<td>11424 11540</td>
<td>0.0 0.0</td>
<td>159.9 159.0</td>
</tr>
<tr>
<td>Rapids 1</td>
<td>38.4 15.9</td>
<td>21.2 7.7</td>
<td>10.4 5.4</td>
<td>19.7 11.7</td>
</tr>
<tr>
<td>Rapids 2</td>
<td>96.5 75.5</td>
<td>6.5 13.2</td>
<td>15.0 12.5</td>
<td>10.3 13.6</td>
</tr>
<tr>
<td>Sill 1</td>
<td>10.3 0.0</td>
<td>0.5 0.0</td>
<td>2.1 0.0</td>
<td>0.3 0.0</td>
</tr>
<tr>
<td>Sill 2</td>
<td>4.4 7.0</td>
<td>0.2 0.2</td>
<td>5.3 1.2</td>
<td>0.8 0.3</td>
</tr>
<tr>
<td>Sill 3</td>
<td>0.3 2.5</td>
<td>0.0 0.0</td>
<td>11.4 7.1</td>
<td>1.0 0.6</td>
</tr>
<tr>
<td>Total</td>
<td>2947 2517</td>
<td>13426 13318</td>
<td>4269 3274</td>
<td>635 577</td>
</tr>
</tbody>
</table>
With the exception of zone 8, the area of type 3 channels will increase substantially, to the detriment of type 2 and 1 channels. This change is caused by the reduction in flow velocities. The area of channel habitat types in the Rupert River far exceeds all other habitats.

Zone 8 will be the most exposed, proportionately. The decrease in area is mostly attributable to the loss of type 1 and 2 channels and unlike in the other zones, type 3 channels will not increase.

The main physical changes linked to navigability are associated with the reduction in depth and flow velocities after the diversion of part of the water.

The integration of hydraulic structures in the project, according to the proponent, will maintain the water levels presently observed during summer low flow (August and September) for nearly 150 km. Despite maintaining these levels, flow velocities in the lacustrine environments thus created will decrease about 58% to 75%.

Table 2-18: Change in minimum velocities in areas controlled by hydraulic structures on the Rupert River

<table>
<thead>
<tr>
<th>CONTROLLED AREAS (KP)</th>
<th>MINIMUM VELOCITY (M/S)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRESENT</td>
</tr>
<tr>
<td>20.45 – 24.15</td>
<td>0.54</td>
</tr>
<tr>
<td>33 – 48.15</td>
<td>0.39</td>
</tr>
<tr>
<td>49.2 – 64.5</td>
<td>0.32</td>
</tr>
<tr>
<td>85 – 95.7</td>
<td>0.14</td>
</tr>
<tr>
<td>110.3 – 133.4</td>
<td>0.24</td>
</tr>
<tr>
<td>170.2 – 214.85</td>
<td>0.08</td>
</tr>
<tr>
<td>223.25 – 271.3</td>
<td>0.38</td>
</tr>
<tr>
<td>291 – 292.5</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Water levels and flow velocities will drop in the sections not controlled by these hydraulic structures. A drop in level of 1 to 2 m in these sections will create longer distances between boat docks and Cree camps. Flow velocities will decrease by 0.1 m/s in the slowest environments, to 0.3 m/s in the faster environments (see Table 2-19). The velocities and depths presented by the proponent correspond to the minimum values encountered and reflect the biggest changes for navigation.
2.4.2.2 Erosion and sediment conditions

The erosion and sediment conditions are described in the impact assessment, by segment, based on streambank geomorphology and conditions observed in the field.

According to the proponent, minor changes in bank dynamics will be caused by the diversion. They will occur in slow-flowing segments where nothing is done to maintain water levels. The most sensitive banks are composed of sand or fine sediments. The erosion of more resistant shorelines, composed of till and sand/gravel materials, will be slow and will not contribute significantly to the sediment dynamics.

According to the proponent, erosion of the future banks will occur mostly in the initial years after the diversion. The lower water levels in the Rupert River will cause incision due to headward erosion in some tributaries, at their confluence with the Rupert.

**Upstream segment**

According to the proponent, the upper segment (KP 194 to 314) is dominated by parent rock and glacial materials. The banks are more than 60% sandy sediment, especially downstream of KP 270, but are only eroding for 3% of their total length.

The greatest drop in flow and level (1 to 2.5 m) will occur between KP 293 and the planned control structure at KP 314. The drops in level will lead to the exposure of about 4.5 km² of land. According to the proponent, since the river and its tributaries flow over a resistant substrate made up mostly of till and bedrock, no significant erosion will occur.

One of the largest exposed surfaces (8.5 km²) will be upstream of the area of influence of the weir, from KP 223 to 263. According to the proponent, although most of the exposed surfaces will be silty sand, there will be little erosion due to their low height (under 2 m) and their gentle slope.

---

Table 2-19: Changes in bathymetry and minimum velocities in areas not controlled by hydraulic structures on the Rupert River

<table>
<thead>
<tr>
<th>AREAS NOT CONTROLLED (KP)</th>
<th>MINIMUM DEPTHS (M)</th>
<th>MINIMUM VELOCITIES (M/S)</th>
<th>WETTED AREAS (KM²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRESENT</td>
<td>FUTURE</td>
<td>PRESENT</td>
</tr>
<tr>
<td>5.7 – 20.2</td>
<td>2.5</td>
<td>1.7</td>
<td>0.45</td>
</tr>
<tr>
<td>26 – 31.3</td>
<td>2.4</td>
<td>1.2</td>
<td>0.23</td>
</tr>
<tr>
<td>66 – 84.8</td>
<td>4.0</td>
<td>2.3</td>
<td>0.13</td>
</tr>
<tr>
<td>95.9 – 108.9</td>
<td>2.2</td>
<td>1.3</td>
<td>0.09</td>
</tr>
<tr>
<td>133.7 – 169.3</td>
<td>3.3</td>
<td>1.9</td>
<td>0.13</td>
</tr>
<tr>
<td>215 – 223.3</td>
<td>4.0</td>
<td>2.8</td>
<td>0.28</td>
</tr>
<tr>
<td>271.3 – 289.9</td>
<td>5.2</td>
<td>3.2</td>
<td>0.41</td>
</tr>
<tr>
<td>294.7 – 314.3</td>
<td>3.7</td>
<td>1.6</td>
<td>0.48</td>
</tr>
</tbody>
</table>
The tributaries that flow over sandy or gravel materials will incise very quickly. These are found mainly from KP 219 to 223, and from KP 263 to 290.

**Lake Nemiscau segment**

According to the proponent, the shores of the Nemiscau Lake segment (KP 170 to 194) are dominated by a natural pavement of pebbles and boulders resulting from the evacuation of fine particles and sand by wave action.

The proponent does not anticipate any modification in bank dynamics, because the construction of a hydraulic structure at the Nemiscau Lake outlet will maintain the level of the body of water at present values. In this context, there will be no additional erosion and thus no creation of new sediments.

**Central segment**

According to the proponent, half of the incision-prone materials of the central segment (KP 107.3 to 170) is composed of till and bedrock. Erosion affects less than 4% of the riverside slopes and would deliver less than 500 m$^3$ of alluvial sediments to the river per year. The slope seems to be evolving quite slowly.

A hydraulic structure at KP 110.3, above the large rapids, will keep the water levels near present values up to around KP 125. The water level will drop considerably (1 to 2.7 m) in a succession of rapids between KP 150 and 170. Lower water levels will have very little effect because the banks and exposed areas are mostly coarse material and bedrock.

By incising, a tributary on the left bank at KP 142 may generate substantial sediment volumes. Another tributary, on the right bank at KP 162.8, could possibly become incised.

Limited incision will occur in the Jolliet River (KP 129) because the drop in the Rupert River at this point will be only 0.4 m.

**Lower segment**

The banks in this section (KP 3 to 107.3) are 60% thick silt/clay sediments. This segment is the most erosion-prone, because the river here is often deeply incised in marine clay that is subject to slumping and sliding. The banks in this segment will erode for 12% of their length. Erosion will occur particularly on upper slopes (20 to 55 m) between KP 3 and 15 on the left bank, and between KP 53 and 80, and particularly on both banks from KP 67 to 79. The slope of these sections now account for 70% of the volume of material eroded from banks in lower segment. Changes in bank dynamics will also affect the slow-flowing segments between KP 5.5 and 20.4, KP 26.5 and 29.5, KP 67 and 79, and KP 95.7 and 107.3, plus a short segment of rapids at the downstream end of the segment on the left bank (KP 3 to 5.5).

The segments controlled by a hydraulic structure are approximately 44 km long, or 40% of the length of the lower segment. The hydraulic structures will help reduce erosion.
Some 20 tributaries will have drops in water levels of 0.8 to 1.9 m under summer low-flow conditions. Most of them have sills near their mouth, which will reduce the incision possibilities. However, for a period of at least 10 years, two tributaries between KP 101.5 and KP 107 may send a sizeable sediment supply into the Rupert River.

According to the proponent, the Rupert River now transports 88,000 t/y in the location where the control structure at KP 314 will be built, and suspended sediment is in the vicinity of 210,000 t/y at the river mouth. The concentrations are 4.4 mg/l to 7.6 mg/l respectively, although they may reach 14.6 mg/l at the mouth during spring flooding. Under natural conditions, the river carries 46,000 t/y of granular material.

Under future conditions, according to the proponent, no suspended solids will be transported at the control structure, due to slower flow velocities in the forebay, while up to 80,000 t/y (6 mg/l) of suspended solids will be transported at the mouth. For granular materials, bedload transport will be 11,000 t/y.

Flow regulation, according to the proponent, will be the main cause of the reduction in sediment inputs from the banks. By raising the water level, the hydraulic structures will also help reduce leaching from the banks along 154 out of 273 km of river stretches with a riverine flow.

There will be a local increase in suspended solids, due to runoff from exposed banks and tributary incision, for a period of two to three years after the diversion.

According to the proponent, the impact of suspended solids on water quality will be noticed only downstream of Lake Nemiscau. Upstream, although suspended solids will increase gradually from the diversion bay to the lake, this parameter will not change the type A water quality in the Rupert River. Type A water corresponds to the quality defined by a set of optical, physico-chemical, mineral and other parameters, as mentioned in Section 2.4.1.4. Below Lake Nemiscau, the water will become more turbid, changing from type A to type B, more characteristic of the water in Nemiscau River. There will be a progressive increase of suspended solids, rising from 2.8 NTU to a value between 5 and 10 NTU at the river mouth. The true-colour water quality criteria will increase from 39 to 44 TCU. In the short term, turbidity may also reach a level comparable to that presently seen in the Broadback River.

2.4.2.3 Changes in thermal and ice regimes

On the Rupert River in a natural regime, the first ice forms in late November and remains until May. The ice cover is at its maximum from mid-January to the end of March. The lentic flow reaches over with ice while the fast-flowing sections remain ice-free throughout the winter. The open zones produce large quantities of frazil that is deposited in river pools at the foot of rapids, under the ice, and form hanging dams. Despite a progressive reduction in flow to a winter low-flow level, the combined effect of hanging dams and water friction on the ice increases flow resistance and raises the levels.
The proponent describes the winter conditions of the Rupert River on the basis of data gathered at 19 water level stations where water levels and flows are gauged. The measurements have been used to established relationships between these two components to predict, among other things, the possible exposure of spawning habitats of species that incubate eggs in winter. Special attention has been given to lake whitefish and lake cisco.

According to the proponent, the water temperature below the Rupert River control structure will drop by about 1°C in spring and 0.3°C in summer and fall. No reduction is anticipated in winter. The difference between present and future temperatures will disappear after a distance of 30 to 100 km. The hydraulic structure at KP 223 will extend the water’s residence time by a day, thus helping the temperature return to natural conditions. The other hydraulic structures planned for the lower Rupert will not have a significant effect on temperature.

The ice regime will be practically unchanged in relation to present conditions. The main rapids, around KP 5, 25, 33, 50, 68, 80, 110, 165, 170, 217 and 285, will continue to flow under open-water conditions and will produce frazil that will be deposited at the foot of the rapids. Because of the decline in generating surfaces, the volume of frazil produced will decrease and this will tend to delay the flooding at the foot of the rapids and the water level rise in bodies of water affected by the presence of hanging dams. This is the case for the rapid at KP 281, the location of a lake whitefish spawning ground, whose ice will reach upstream a month later.

The project will lead to a significant increase in the area of the ice cover between KP 168 and 258.2, and between KP 276 and 280.5. In the river sections and stretches developed with hydraulic structures, the flow velocities will be slower and more stable, which will promote faster formation and earlier disappearance of the ice cover.

According to the proponent, in the undeveloped river sections, the ice cover will form at a lower level, ranging from 0.5 to 1.5 m on average. In the developed stretches, the structures and instream flow will keep the bodies of water at levels comparable to current summer levels.

Table 2-20 shows the location of spawning grounds for lake whitefish, lake cisco and brook trout. It also describes the winter ice cover conditions. According to the proponent, the creation of ice cover at the foot or above the rapids after their flooding by the backwater effect will minimize the exposure of spawning grounds. The water levels in some ice-free zones may drop significantly. For example, at KP 216 under average natural conditions, the changeover from fall flow (942 m³/s) to winter flow (344 m³/s) means a 61-cm drop in water level. With the same trends under future conditions, there would be less of a difference, just 27 cm. This difference is explained by less variation between the fall (423 m³/s) and winter (176 m³/s) flows.
Table 2-20: Location of spawning grounds with winter incubation and brief description of future ice conditions

<table>
<thead>
<tr>
<th>SPAWNING GROUND (KP)</th>
<th>LAKE WHITEFISH</th>
<th>LAKE CISCO</th>
<th>BROOK TROUT</th>
<th>WINTER ICE COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Cover due to flooding of rapids</td>
</tr>
<tr>
<td>14-22</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>22-24</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Cover due to flooding of rapids</td>
</tr>
<tr>
<td>24</td>
<td>X</td>
<td></td>
<td></td>
<td>Open water caused by a rapid</td>
</tr>
<tr>
<td>29</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>48</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Open water caused by a rapid</td>
</tr>
<tr>
<td>65</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>79</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>107.5</td>
<td>X</td>
<td></td>
<td></td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>214-215</td>
<td>X</td>
<td></td>
<td></td>
<td>Cover at foot of rapid</td>
</tr>
<tr>
<td>215-217</td>
<td>X</td>
<td></td>
<td></td>
<td>Open water caused by a rapid</td>
</tr>
<tr>
<td>281</td>
<td>X</td>
<td></td>
<td></td>
<td>Cover due to flooding of rapids</td>
</tr>
</tbody>
</table>

1 A patch will remain ice-free all winter around KP 20.4.

According to the proponent, the anticipated changes in winter conditions are the same during construction and operation, because temporary structures will be built, upon the impoundment of the Rupert diversion bays, at the site of several hydraulic structures (KP 20.4, 33, 170 and 223). These temporary structures will result in water levels comparable to the expected operating levels the first winter. The Waskaganish water intake will be submerged at a minimum of about 0.2 m due to the anticipated delay in flooding of the rapids in early winter. The present conditions at the water intake are described in Section 6.3.3.1.

2.4.2.4 Main changes in traplines

Seven traplines in the community of Nemaska and eight traplines in the community of Waskaganish border on the Rupert River in the reduced-flow section. The changes in this section are linked to the reduced flows in the Rupert River below the closure point (KP 314). In this section, the proponent plans to build the Rupert River control structure, as well as eight hydraulic structures, their access roads, and two workcamps.

According to the proponent, the hydraulic structures and the Rupert River control structure, in addition to diminishing the fish habitat, will destroy or affect some spawning grounds due to flow changes (see Section 5.2.1.2). Given their configuration or their siting near impassable waterfalls, the hydraulic structures should not change fish movement. Some tributaries, however, may become hard for fish to get to. Also addition, there is still some uncertainty about the changes
in hydraulic conditions in the Smokey Hill fishing area. This particular point will be discussed in Section 5.2.1.2. In addition, directly downstream of the spillway, an increase in fish mercury levels is to be expected.

Hunting, fishing and trapping will be disrupted during construction of the hydraulic structures. The drop in water levels will cause some hunting and fishing areas to be moved. Lower water levels will also make some river stretches hard to navigate and river travel will have to be adapted to the new conditions. Moreover, some tributaries may become hard to reach by water. As ice conditions will remain much the same, no impact is expected for snowmobile travel. The distance to boat docks at some permanent or temporary camp sites will become longer.

Traplines R21 and N25 in the closure point section on the Rupert River will be affected because they will be subject to the impacts of both reduced water levels and flooding of the Rupert River due to the creation of the diversion bays. The tallymen will have to change their navigation routes and find other fishing sites. The Rupert River control structure and spillway will mark the landscape permanently. In addition to these major infrastructures are the spur at KP 290 and access roads to the structures.

### 2.4.3 LEMARE AND NEMISCAU RIVERS AND ARQUES CREEK SECTION

#### 2.4.3.1 Flow changes

The Lemare and Nemiscau rivers, which are tributaries of the Rupert River, will have an instream flow regime that follows the variations of the natural hydrograph (Map 2-9). For technical reasons, the flow will be stable in winter because the gates that allow water circulation will remain fixed in place from early December to mid-April. Flow regulation will ensure that these rivers will no longer be subject to extreme high flows and severe low flows.

The Nemiscau River will be supplied by the Nemiscau-1 (C-76) and Nemiscau-2 (C-108) dams and a dike at Arques Creek (C-104). Flow control will be managed at the Nemiscau-1 diversion point. The release structures at Nemiscau-2 and Arques Creek have been designed with two penstocks. The first will ensure a minimum flow of 0.8 and 1 m³/s for the two rivers respectively. The second penstock will allow a maximum of 6 m³/s to be reached and will be used to reproduce a spring flood peak.

The Lemare River will be supplied by the instream flow release structure (C-R-22) near dam C-R-21A.

The flow in Kayechischekaw Creek, a tributary of the Rupert River, will be regulated to the value of its mean annual flow (0.4 m³/s). Nonetheless, the restored flow will vary according to the forebay level. The release structure is planned at dike C-R-7-8.
2.4.3.2 Changes in thermal and ice regimes

The current and future ice conditions on the Lemare and Nemiscau rivers and Kayechischekaw Creek are not covered in the impact assessment, as they will not be changed by the proposed instream flow regime.

According to the proponent, the diversion bays will have little or no thermal stratification and, consequently, the water restored in the Nemiscau and Lemare rivers will be practically the same temperature as the water in the diversion bays. The water restored to the rivers will be approximately 2°C colder from May to early June, 0.3°C colder in summer and 1°C colder in fall. Since the differences are small, they will be imperceptible beyond the 20-km mark downstream of the regulation structures. The proponent does not foresee any temperature difference in winter.

2.4.3.3 Main changes in traplines

The regulated flow sections in the Lemare and Nemiscau rivers and Arques Creek run beside or through five traplines in the community of Nemaska. The main change planned by the proponent in this section is building dikes and release structures in traplines M25 and M18 of the community of Mistissini. The total mean annual flow will be restored in each diversion, with due consideration to natural hydrological fluctuations. According to the proponent, the hydraulic structures at KP 290 and 223 will keep the water levels high enough to avoid incision at the mouth of the Lemare River and Rivière à la Marte and allow navigation. The proponent does not expect any impact for the land users, except for a restriction on consumption of fish caught directly below the structures, as they will have higher mercury levels.

2.4.4 RUPERT BAY SECTION

2.4.4.1 Hydraulic changes

According to the information provided by the proponent, Rupert Bay is a vast estuary system covering an area of 825 km². It is characterized by complex hydrodynamic conditions due to its size, shallowness and the combined influence of the tide, weather conditions and fresh water inflows from its four major tributaries, namely the Nottaway, Broadback, Rupert and Pontax rivers. Three oceanographic zones are present: freshwater zone, mixing zone and saltwater zone. The first zone covers the upper part of Rupert Bay, from the mouth of the tributaries to Pointe à l’Ours Noir and Upemuew point. The second zone runs from these points to the widening of the bay, past Saouayane and Goyeau points. The third zone is between the widening and James Bay. Each is distinguished by different tide and salinity conditions.

Overall, Rupert Bay is shallow, as the bottom is 3 to 5 m below the geodetic datum. It is a dynamic environment where isostatic rebound has been present since the last ice age and remains observable over the course of a lifetime. In the last four millennia, the rebound has remained below
0.9 m per century or 9 mm/y. Recent data indicates that exposure caused by isostatic rebound continues to this day at a rate of 4 to 9 mm/y. At that pace, Boatswain and Cabbage Willow bays are predicted to disappear in about 500 years, and all of Rupert Bay would disappear in 1,000 years.

Under natural conditions, the Rupert River has a mean annual flow of 875 m³/s, while the Nottaway River has a flow of 1,161 m³/s and the Broadback River, a flow of 379 m³/s. Upon impoundment of the diversion bays, the mean annual flow of the Rupert River will drop from 875 m³/s to 423 m³/s at KP 0 and the freshwater flow reaching Rupert Bay will be reduced an average of 51%.

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>INSTREAM FLOW AT KP 314 OF THE RUPERT RIVER (M³/S)</th>
<th>FLOWS AT KP 0 (WASKAGANISH) (M³/S)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CURRENT CONDITIONS</td>
<td>FUTURE CONDITIONS</td>
</tr>
<tr>
<td>MID-MAY TO MID-JUNE</td>
<td>416</td>
<td>1210</td>
</tr>
<tr>
<td>EARLY JULY TO LATE SEPTEMBER</td>
<td>127</td>
<td>1020</td>
</tr>
<tr>
<td>EARLY OCTOBER TO MID-NOVEMBER</td>
<td>267</td>
<td>1060</td>
</tr>
<tr>
<td>MID-NOVEMBER TO MID-MAY</td>
<td>127</td>
<td>667</td>
</tr>
<tr>
<td>MEAN ANNUAL FLOW</td>
<td>875</td>
<td>423</td>
</tr>
</tbody>
</table>

The flow reduction will change the water levels in the Rupert River estuary between KP 2.2 and 8, and they will vary according to the tides. To facilitate the discussion of distances and locations, the proponent has set KP 0 at the community of Waskaganish. Currently, the riverbed just below KP 5 and west of Waskaganish is only a few metres deep. The tide is the main factor that influences water levels in the Rupert River estuary. Its influence is felt as far as the first rapids at KP 5.

According to the proponent, once the river is diverted, the weaker current in the Rupert River will enable the Nottaway and Broadback rivers to flow north more easily and cause a slight increase in water residence time (approximately 1 to 2 days) in Rupert Bay above Stag Island. Closer to Waskaganish, the river estuary level will continue to be influenced by the tide. This means that at high tide, the level would be comparable to the present conditions and the effect of the diversion would not be noticeable. At low tide, the water levels will be 60 to 70 cm lower upstream of the village. The duration of the lower level in relation to natural conditions is longer at KP 2.2 than at the village at KP 0, because of the longer influence of the tides. This difference would diminish the further one goes downstream and, at KP 8, the drop in level at low tide would not be more than a few centimetres. The depth of the channel, at present 5 to 6 m, will therefore change to 4 to 5 m.
The current velocity will be permanently reduced by 30 to 40 cm/s upstream of Waskaganish during the ice-free period. This reduction would be less and less noticeable at the channels north and south of the Rupert River mouth, west of Waskaganish.

### 2.4.4.2 Change in current regime

As mentioned earlier, the strength of the current in the Rupert River and its hydrodynamic influence on water circulation in the bay will be reduced. This new situation will lead to a general movement of fresh water to the northeast, particularly when the bay is ice-free. Under ice cover, these phenomena will be less pronounced, due to the slowing of velocities caused by water friction on the ice and the natural reduction of flows in winter.

According to the proponent, the banks are stable, except for the banks at KP 4.5 and at Waskaganish where stabilization work had to be done. The shoals at the river mouth are not the result of erosion phenomena, but are rather remnants of the Tyrrell Sea and not, therefore, a delta. In addition, the sediment supply from the river will decrease 65%, thus reducing the risks of silting in the navigation channel across from the village. However, given the low slopes of the banks on either side of the flow channel from KP 2.2 to 8, an additional area of 425 ha will be exposed at low tide, particularly on the left bank, where the foreshore already grows considerably in size at low tide to a distance of 1.5 to 2.5 km. There will therefore be an increase in area of the zone exposed by the tide after partial diversion of the river.

### 2.4.4.3 Movement of freshwater/saltwater interface

Section 2.4.4.1 mentions that the bay is divided into three zones. In the freshwater zone, the water is permanently fresh. In the saltwater zone, the salinity ranges between 10% and 20%. In the mixing zone, the freshwater-saltwater interface moves, depending on the weather conditions. At present, in open-water conditions, the freshwater-saltwater interface does not move upstream of the Pontax River mouth. Under ice cover, the saltwater intrusion remains further downstream, due to the slowing of the tidal wave caused by friction with the ice.

Under future conditions, the reduced flow in the river will make the salinity intrusion limit (0.5 ppt over at least 6 hours) move 5 km upstream, causing a slight drawback of the freshwater zone and a slight increase in salinity between Stag Rock and Stag Island (see Map 2-12).
Since these changes are near the mouth of the Pontax River, it was checked whether the latter would be affected by the saltwater intrusion into the bay. Under current conditions, at the points selected for a model simulating the salinity, currents and water levels, the simulated salinity did not exceed 0.5% at the river mouth below Jolly Island. Under future conditions, the proponent’s modeling of currents and salinity indicate that salinity could reach spot values of 3% at the edge of the shoals. However, salinity at the modeling point nearest the mouth will generally be between 0.5% and 1%. The current of the Pontax River mouth is, and will always be, subject to tidal currents such that it slants to the south or the north according to the tide regime, without reversal. It thus helps push the salinity isocontours to open water, thus protecting the river mouth.

### 2.4.4.4 Main changes in traplines

Seven traplines in the community of Waskaganish border on Rupert Bay. There is one trapline on either side of the river estuary between KP 0 and 5. The main source of change affecting these traplines is the flow reduction.

The proponent does not anticipate any change in the freeze-up and break-up periods or ice thickness in Rupert Bay. In the estuary, freeze-up will occur slightly earlier in the season, but the reduction of frazil produced by the river upstream of KP 5 will be delayed until the freeze-up of the KP 5 rapids zone.

According to the proponent, although the river’s turbidity may be slightly greater and the water levels lower, drinking water quality will not be compromised for village residents, as a water treatment plant will be built.

The proponent does not expect any impact on the spawning functions of fish below the first rapids. According to it, the lower water levels and slower currents in the estuary should promote the spread of low marshes and aquatic beds, which would have a positive impact on the fish habitat and the section’s use by waterfowl.

The bay, its shores and many islands are visited frequently, in all seasons, by families that own traplines and members of the community of Waskaganish. The proponent does not anticipate any impact on activities in the bay, whether for fishing, hunting, berry-picking and educational and cultural activities, or for boat and snowmobile travel.

The estuary and islands are used by the community of Waskaganish for recreation and ceremonies, in addition to fishing and waterfowl hunting. According to the proponent, the drop in water levels in this section will not lead to changes in these activities except for fishing in the zone right below the first rapids. The estuary users will have to adapt to the new variations in the water levels.
2.4.5 INCREASED-FLOW SECTION

2.4.5.1 Flow changes

The increased-flow section extends from Eastmain 1 Reservoir to La Grande 1 reservoir. It is characterized by the many changes that have already taken place throughout the region due to the construction and operation of the La Grande complex and Eastmain-1 Powerhouse, including the reservoir impounded in fall 2005. At present, the water in this section comes from the Eastmain River via the Eastmain 1 Reservoir and the tributaries of Opinaca reservoir (see Maps 2-13 and 2-14). This is what the proponent considers to be the baseline conditions for the Eastmain-1-A and Rupert diversion project. Since the impoundment of Eastmain 1 Reservoir, the mean annual flow in the Boyd-Sakami diversion system before 1980 has multiplied by a factor of 48.8 at the Lake Boyd outlet, and by 5.9 at the Sakami Lake outlet. Table 2-22 illustrates the range of monthly flow levels for the different periods of the year, under baseline conditions, at various points in the increased-flow section.

Table 2-22: Range of monthly flow levels (2004) (m³/s)

<table>
<thead>
<tr>
<th>BELOW EASTMAIN-1</th>
<th>SARCELLE</th>
<th>SAKAMI LAKE OUTLET</th>
<th>BELOW ROBERT-BOURASSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>429.4 - 745.3</td>
<td>497.5 - 1,094.8</td>
<td>537.5 - 1,387.2</td>
<td>2,194.4 - 3,978.1</td>
</tr>
<tr>
<td>(May-October)</td>
<td>(March-June)</td>
<td>(March-June)</td>
<td>(May-January)</td>
</tr>
</tbody>
</table>

It should be noted that the minimum and maximum flow values do not all correspond to the same months, according to the metering points. For instance, the minimum monthly value observed below Eastmain-1 dam is in May, while its counterpart below the Sarcelle site is in March. This situation is explained by the fact that management of the Opinaca reservoir levels and Eastmain 1 Reservoir levels is not synchronized. This is also the case for Robert-Bourassa reservoir, for which a minimum flow in May and a maximum flow in January are given. This situation is attributable to how the hydropower station is managed.

After the Rupert diversion is put into operation and until the commissioning of Eastmain-1-A powerhouse – which the proponent calls the transitional conditions – the flows through the entire section will increase.

Table 2-23: Range of monthly transitory flow levels (m³/s)

<table>
<thead>
<tr>
<th>BELOW EASTMAIN-1</th>
<th>SARCELLE</th>
<th>SAKAMI LAKE OUTLET</th>
<th>BELOW ROBERT-BOURASSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>672.4 – 1,320</td>
<td>768.9 – 1,636.8</td>
<td>814 – 1,800.9</td>
<td>2,519 – 4,541.4</td>
</tr>
<tr>
<td>(April-October)</td>
<td>(April-October)</td>
<td>(April-October)</td>
<td>(May-January)</td>
</tr>
</tbody>
</table>
It should be noted that, unlike in the current situation, the minimum and maximum flow values will occur during the same periods of the year along the entire flow route, from Eastmain 1 Reservoir up to Robert-Bourassa reservoir. Subsequently, Robert-Bourassa generating station will be managed separately from the structures further upstream. According to the proponent, in the time period between the start of operation of the Rupert diversion and the commissioning of Eastmain-1-A powerhouse, an average of 254 m³/s of water will be flowing down the Eastmain-1 spillway, i.e. more than half of the inflow from the Rupert diversion. According to the construction schedule provided by the proponent, this situation will last for about three years.

Under future conditions, that is after the commissioning of Eastmain-1 powerhouse, the minimum and maximum flow values will vary little from the transitory situation with only the Rupert diversion in operation. Table 2-24 illustrates the range of monthly flow levels expected when all the planned project structures are in operation. It must be kept in mind, however, that spot flows may be higher than the values presented here. For instance, the Sarcelle site could have a flow of 2,770 m³/s, of which the turbine flow is 1,305 m³/s.

| Table 2-24: Range of future monthly flow levels (m³/s) |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| BELOW EASTMAIN-1 | SARCELLE | SAKAMI LAKE OUTLET | BELOW ROBERT-BOURASSA |
| 576.2 – 1,300.8 (April-October) | 673.4 – 1,640 (April-October) | 742 – 1,805.6 (April-October) | 2,490.3 – 4,512.2 (May-January) |

2.4.5.2 Hydraulic changes

Once the Eastmain 1 Reservoir is impounded, the headwater levels will fluctuate between 274.11 m and 283.11 m, representing a drawdown of 9 m. This drawdown will remain the same for the diversion of the Rupert River and operation of Eastmain-1-A powerhouse. However, the drop in water level to its minimum, at the end of winter, will be faster and the minimum level will be reached more frequently.

In the lower reaches of Eastmain River, up to Opinaca reservoir, the river level right below the generating stations will rise approximately 50 cm and then return to the levels currently seen about 3 km downstream of these structures. The flow velocity in this portion of the river may increase 30% to 90%, according to the turbine discharges. The changes will be sudden and daily, as Eastmain-1 and Eastmain-1-A generating stations will generate peak power at some times of the year.

At Opinaca reservoir, the headwater levels are set by the JBNQA and are currently established at between water levels 211.84 m and 216.41 m. They will remain unchanged under future conditions, with the commissioning of the diversion and Eastmain-1-A powerhouse. The mean annual level will rise approximately 50 cm, while remaining within the range of current levels. December is when the greatest difference will occur between the current level, with inflows from Eastmain 1 Reservoir, and the future levels, with the Rupert diversion and the two generating stations in operation at the outlet of Eastmain 1 Reservoir. It will be about 55 cm.
At the outlet of the Sarcelle powerhouse tailrace channel, the simulated flow velocities indicate that they will be lower than those currently observed at the outlet of the control structure. They would decrease from approximately 2.2 m/s to 1.4 m/s. A little further downstream, where the proponent plans to create replacement spawning grounds for many fish species, the flow velocity will increase and reach 2.4 m/s or more.

Below Sarcelle powerhouse in the Boyd-Sakami diversion system, the flow velocities are quite variable. Under current conditions, Boyd Lake has generally low flow velocities, except in a few narrow zones where they reach about 1 m/s. Due to the steep slope, the velocity may reach 5 m/s in the Boyd River, which links Boyd Lake to Sakami Lake. Sakami Lake has the same profile as Lake Boyd, with low velocities, except at specific points where the lake narrows. Lastly, in the Sakami River, the velocities are around 4 m/s. Under future conditions, most of these velocities will increase in narrow passages or where the elevation changes abruptly.

The Rupert diversion and the commissioning of Eastmain-1-A powerhouse will lead to a moderate increase, of approximately 65 cm, in the water level of Boyd Lake. In the Boyd River, the increase of 54% in the mean annual flow will flood some buffer strips and islands that are now permanently exposed, between KP 101 and 106. Further downstream, flooding because the riverbed is deeply incised.

In Sakami Lake, there will be a moderate increase in water level of 45 cm and a reduced drawdown in the ice-free season. The maximum estimated increase in water level is 15 cm above the highest historical level. However, it is lower than the maximum level established by the agreement. In the Sakami River, with the flow increasing 46%, slight flooding will occur between KP 7 and 14 during the highest flows.

At Robert-Bourassa reservoir, the drawdown is currently 7.62 m and will remain much the same. The difference will reside in a more marked drop in level in spring and summer. In La Grande 1 reservoir, the mean level will rise some 30 cm under future conditions, but the maximum level will be the same because the design flow for La Grande-1, Robert-Bourassa and La Grande-2-A generating stations will not be modified.

### 2.4.5.3 Changes in thermal and ice regimes

Under current conditions, Eastmain 1 Reservoir freezes over from the first half of November until May. With the lowering of the water level in winter, the ice cracks along the banks, and sinks to the bottom. Between Eastmain-1-A Powerhouse and Opinaca reservoir, the ice cover on the Eastmain River forms and disappears continuously, because of the temperature of the water leaving Eastmain 1 Reservoir and daily flow variations. The ice cover is thus unstable and inaccessible to snowmobilers. Opinaca reservoir essentially follows the freeze and thaw periods of Eastmain 1 Reservoir and snowmobiles can cross its ice cover.

In the Boyd-Sakami diversion system, under current conditions, the calm zones freeze up quickly, like the neighbouring lakes. On the other hand, the Boyd and Sakami rivers remain ice-free all winter and produce large quantities of frazil that accumulate at their mouth, at the Sakami Lake
inlet (KP 92 to 84) and near Robert-Bourassa reservoir (KP 11-1). The water level increases can then be as much as 5 m. Under the combined action of the increase in temperature and the greater flow at the Sarcelle site, the ice melts early in the spring. At Robert-Bourassa reservoir, the ice forms in early December and melts in mid-June. In the river stretch between Robert-Bourassa generating station and La Grande 1 reservoir, the river flows ice-free all winter. In La Grande 1 reservoir, the ice cover forms and thaws at the same rate as large bodies of water nearby under natural conditions, but some ice-free patches subsist and the ice is thin.

According to the proponent, under future conditions, with the Rupert diversion and the commissioning of Eastmain-1-A Powerhouse, the flows will increase an average of 54% in the increased-flow section. In Eastmain 1 Reservoir, freeze-up will occur slightly earlier, but overall the conditions will be similar to current ones. In the Eastmain River, the ice cover will be a bit more extensive, but the constant fluctuations in hydraulic conditions will maintain the inaccessible character of this riparian section. Generally, the ice conditions in Opinaca reservoir will be identical to current conditions and are deemed safe except at Wabamisk Narrows, at the reservoir inlet, where open zones will be seen, as is now the case. It is expected, however, that these openings will enlarge under future conditions.

Under future conditions, the ice cover on the lakes in the Boyd-Sakami diversion system will be identical to those under current conditions. However, the ice cover will form later and disappear earlier than on the Rupert diversion bays. The fast-flowing sections will always be ice free and will produce slightly more frazil that would be transported further downstream by the increased flow. For instance, at the outlet of the Boyd River, the frazil ice dune will move 1 km downstream. The water levels will remain practically unchanged, with a maximum increase in level of 0.45 m at KP 91 of the Boyd River, which corresponds to a major narrowing point. At the mouth of the Sakami River, the inverted frazil dune will also move downstream, which will cause a bit of obstruction to the flow and cause a general drop in water level of about 1.5 m lower than the current conditions below KP 11.

For snowmobilers, Sakami Lake will be accessible on average six days later and Boyd Lake, four days later. In spring, they will become inaccessible at practically the same dates as under current conditions. The area of the ice-free sections will increase, especially in the segment between KP 100 and 106 of the Boyd River, which will no longer be safe for snowmobiling.

As for Robert-Bourassa reservoir, the freeze-up will continue to occur late and the ice regime of La Grande 1 reservoir will remain unchanged. The winter regime and ice cover usability of these two reservoirs would thus be identical under current and future conditions.

### 2.4.5.4 Erosion and sedimentation

Generally, the increased-flow section is characterized by a succession of large bodies of water that act as sediment traps for materials eroded upstream. Eastmain 1 Reservoir thus serves as a sedimentation basin for the suspended solids carried by the Eastmain River. Since the flows through the riparian segment linking to Opinaca reservoir are comparable to high flows under natural conditions, the erosion phenomena will not be significant. The same will apply
in Opinaca reservoir and the Boyd-Sakami diversion system, where massive erosion was seen after the commissioning of the Eastmain-Opinaca-La Grande diversion (EOL) in 1980. The substrate exposed by the massive flow increase became erosion-resistant. It will be the same for Robert-Bourassa reservoir.

La Grande 1 reservoir is the part of the increased-flow section with the most erosion. Between KP 37 and 95, the banks are sandy or silty and the increase in water level to the height of particularly sensitive material horizons. Wave action and the freeze/thaw cycles have caused and still cause erosion and landslides that can be major. The most erosion is found between KP 65 and 89. Unlike the Boyd-Sakami diversion system, erosion is still very active despite the age of the reservoir.

Under future conditions, erosion phenomena will not reoccur in the section between Eastmain 1 Reservoir and below the Sarcelle site, except for a deepening of Wabamisk Narrows at the entry to Opinaca reservoir. However, along the Boyd-Sakami diversion system, additional volumes of material pulled from the banks will be transported further downstream with the increase in flow. Table 2-19 indicates the volumes in question, their origin and the place where they will be deposited.

### Table 2-25: Volumes of material eroded and deposit locations along the flow route

<table>
<thead>
<tr>
<th></th>
<th>BOYD LAKE</th>
<th>BOYD RIVER</th>
<th>SAKAMI LAKE</th>
<th>SAKAMI RIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLUME ERODED (M$^3$)</td>
<td>200,000</td>
<td>850,000</td>
<td>2,700,000</td>
<td>820,000</td>
</tr>
<tr>
<td>DEPOSIT LOCATION</td>
<td>In the lake, below KP 118</td>
<td>Sakami Lake</td>
<td>In the lake, below KP 85</td>
<td>Robert-Bourassa reservoir</td>
</tr>
<tr>
<td>% OF VOLUME IN THE RECEIVING BODY OF WATER</td>
<td>0.05 %</td>
<td>Not applicable</td>
<td>0.05 %</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

In La Grande 1 reservoir, project operation will cause a 14% mean flow increase but will not change the maximum turbine flow. According to the proponent, bank erosion will continue at the same rate as now, because water level variations and flow velocities will not be changed by the commissioning of the Rupert diversion and Eastmain-1-A powerhouse.

#### 2.4.5.5 Main changes in traplines

Five Cree communities will be affected by changes in the increased-flow section. In each of the communities of Eastmain and Wemindji, four traplines will be affected by increased flows in Eastmain-1 and Opinaca reservoirs, as well as in Boyd Lake and Sakami Lake. In addition to these traplines right on the shore of the bodies of water, two traplines, one in each community, will be affected by the potential operation of borrow pits and the improvement of a permanent road. The two traplines (VC33 and VC28 in the Eastmain and Wemindji communities respectively) are not included in the 36 traplines identified in the proponent’s impact assessment. One trapline
in the community of Mistissini will be affected by the increased flow in Ruisseau Caché and one trapline in the community of Nemaska will be affected by flow changes in Eastmain 1 Reservoir. Lastly, six traplines in the community of Chisasibi are border on the Robert-Bourassa and La Grande-1 reservoirs and La Grande Rivière in sections affected by the increased flow.

The region encompassing Eastmain-1, Opinaca, Robert-Bourassa and La Grande reservoirs plus the Boyd and Sakami diversion lakes has undergone major changes caused by the diversion and the flooding of rivers and large tracts of land in the last 20 years. After the diversion bay impoundment, flows will increase along this entire route and the influence of increased flows will be relatively major, depending on the size of the body of water. The flow will change on the Eastmain River between the Eastmain-1 spillway and the head of Opinaca reservoir. Between KP 218 and 203, from the spillway to the generating stations, the flow will be reduced. The flow will increase between the generating stations and the head of Opinaca reservoir. The main impact anticipated by the proponent in this section is a minor rise in water levels, caused by the increase in flows.

Two new hydropower generating stations will be built, namely Eastmain-1-A beside Eastmain-1 Powerhouse, and a powerhouse at the site of the present Sarcelle control structure. A weir and a canal will be built at the mouth of Sakami Lake and two new workcamps (Sarcelle and Sakami Lake) will be added to the existing Eastmain workcamp in the increased-flow section. The Muskeg–Eastmain-1 permanent road will extend Nemiscau–Eastmain-1 road as far as Muskeg substation. A 315-kv transmission line from Eastmain-1 Powerhouse will supply Sarcelle powerhouse. In addition, rock blankets will be installed, mainly on the south shore of the La Grande Rivière, to stabilize these shore sections and reduce the granular load in the river.

A slight loss of fish habitat is anticipated below the tailrace canals of each generating station and spawning grounds may be affected. An increase in fish mercury concentrations is to be expected in Eastmain 1 Reservoir and the Eastmain River.

Navigation will remain difficult on the major bodies of water of Opinaca reservoir, Lake Boyd and Sakami Lake. However, the current will become even stronger in incised passages or where the elevation changes in Ruisseau Caché, the Eastmain River, Wabamisk Narrows and the Boyd and Sakami rivers, between KP 133 and 128, necessitating the users to adapt to the new navigation conditions. According to the proponent, there will be no major changes for snowmobiling, except in the sections where ice conditions are already unstable, as they will become even more unstable. Minor changes to navigation and ice conditions will not affect the users of Robert-Bourassa, La Grande and the La Grande Rivière reservoirs, as the conditions will be much the same.

Lastly, throughout the section, some fishing and goose hunting sites will have to be moved. The main fishing sites affected by the increased flow are on the Eastmain River and below the Sarcelle control structure. A goose hunting site at the location the proponent plans to use for the Sarcelle workcamp, will be unusable during the construction activities. It will be restored upon completion of the work.
2.4.6  LA GRANDE RIVIÈRE ESTUARY AND JAMES BAY COAST SECTION

The proponent deems it is not necessary to describe the transitional conditions for this section, as the hydrological and hydraulic regimes will be the same as under future conditions. This section will therefore present only the current and future conditions, as described by the proponent.

2.4.6.1 Hydrological and hydraulic changes

The La Grande Rivière estuary extends for some 40 km downstream of La Grande-1 dam. The mean annual flow in this section is estimated at 3,287 m³/s. La Grande-1 and Robert-Bourassa generating stations are meant to operate in peak periods, which are accompanied by significant flow fluctuations. This aspect was documented in an analysis conducted between January 2000 and December 2002 (current conditions). A summary is provided in Table 2.4.6.1.

<table>
<thead>
<tr>
<th>VARIABLE CONSIDERED</th>
<th>CURRENT CONDITIONS</th>
<th>FUTURE CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean annual flow</td>
<td>3287 m³/s</td>
<td>3736 m³/s</td>
</tr>
<tr>
<td>Minimum flow (950 m³/s)*</td>
<td>2% of the time</td>
<td>&lt; 1% of the time *</td>
</tr>
<tr>
<td>Flow &gt; 3,300 m³/s</td>
<td>50% of the time</td>
<td>67% of the time *</td>
</tr>
<tr>
<td>Reaching of design flow (5,950 m³/s)</td>
<td>3% of the time</td>
<td>Idem</td>
</tr>
<tr>
<td>Daily variation &gt; 430 m³/s</td>
<td>98.5% of the time</td>
<td>Idem</td>
</tr>
<tr>
<td>Daily variation &gt; 870 m³/s</td>
<td>90% of the time</td>
<td>Idem</td>
</tr>
<tr>
<td>Daily variation &gt; 1,700 m³/s</td>
<td>50% of the time</td>
<td>Idem</td>
</tr>
<tr>
<td>Daily variation &gt; 2,600 m³/s</td>
<td>10% of the time</td>
<td>Idem</td>
</tr>
<tr>
<td>Minimum water level at Chisasibi</td>
<td>0.25 m</td>
<td>0.45 m**</td>
</tr>
<tr>
<td>Maximum level at Chisasibi</td>
<td>2.50 m</td>
<td>2.70 m**</td>
</tr>
</tbody>
</table>

*: Graphic estimate based on Figure 14-2 of the impact assessment
**: Estimate based on the mean annual flow (impact assessment)

After the Rupert diversion begins to operate, the mean annual flow in the La Grande Rivière estuary will increase approximately 450 m³/s, or 14%. The design flow of La Grande-1 will not be modified and will remain at 5,950 m³/s. According to the proponent, the hourly variations in flow will be the same under future conditions as under current conditions, although based on a mean flow increased by 14%. The upper limits (design flow) and lower limits (minimum flow required to counteract saltwater intrusion at the Chisasibi water intake) of the hydrological regime will remain unchanged.

The flow in the La Grande Rivière estuary has more influence over low-tide levels than over high-tide levels. A stage-discharge relation integrating the effect of the tide and the wind for the period of January 2000 to December 2002 (current conditions), indicated that during this period, the level of the body of water at Chisasibi varied between 0.25 and 2.5 m and exceeded
1.2 m 50% of the time. The proponent estimates that the 14% increase in the mean annual flow of the La Grande Rivière estuary following the Rupert diversion will lead to a moderate increase in water level of 0.45 m below La Grande-1 generating station and 0.2 m at Chisasibi. The increase in the flow velocity in this section will be equal to or less than 0.1 m/s, or less than 10% of the present mean velocity. Given that the daily variation in flow will not be changed, the daily variation in water level at Chisasibi will be maintained within the present range.

Bank stability and sediment dynamics

Since the development of the La Grande complex in 1975, the mean annual flow of the river has practically doubled. This increase has been accompanied by a disturbance in the high and low flow periods, a decrease in the differences between mean monthly flows and greater variability in daily flows. The increase in mean annual flow has caused an increase in bank erosion in the estuarine section, particularly on the left bank. Erosion is currently affecting banks that were previously stable, and recent observations indicate that this phenomenon is still evolving. The banks of the La Grande Rivière section between KP 9.7 and La Grande-1 dam are subject to erosion along a distance of 26.8 km. A big difference is noted between the left and right banks, with erosion occurring on 69% and 15% of the banks respectively. Except for 2.7 km of stabilized banks below La Grande-1 dam and in front of the village of Chisasibi, erosion on the left bank is observed to be practically continuous. The unstable slopes upstream of KP 24.5, and between KP 17 and 21, are subject to the combined action of slumps and landslides. Bank erosion along the delta section (KP -3 to 9.7) has not been systematically monitored and there is no background data on the volumes eroded. Aerial photographs of these slopes from 1969 to 2002 do not generally show significant differences between changes in the banks under natural conditions before development and after the start of operation of the La Grande complex. These findings prompt the proponent to conclude that bank dynamics in the delta would be more influenced by James Bay (tides and waves) and isostatic rebound than by the hydrodynamics of the La Grande Rivière.

Eroding banks in the riverine and delta segments of the La Grande Rivière respectively generate 50,000 and 84,000 m³ of material per year. These volumes represent annual inflows of 64,000 m³ of sand and 70,000 m³ of fine particles, or the equivalent of 100,000 t of sand and 100,000 t of fine particles. In total, the La Grande Rivière is therefore estimated to transport 200,000 t of fine materials a year into James Bay. These inflows are made up of fine particles from bank erosion in La Grande 1 reservoir and the estuary. A substantial quantity of these fine particles would settle beyond the outer sandy delta of the La Grande Rivière in the channel between Loon Archipelago and Stromness Island a little further north. These unconsolidated sediments would be rearranged by storms and would form into piles of various strata.

The increase in flow caused by the partial Rupert diversion creates a risk of more erosion than at present but, according to the proponent, it will be difficult to differentiate between the erosion caused by the diversion and the present erosion. The proponent plans to install granular blankets along about 9 km of shoreline, to reduce some of the sediment load of the La Grande Rivière, especially around the Chisasibi water intake. According to the proponent, the expected increase in flow velocities will not be enough to significantly change the rate of movement of the sand banks toward the west of the delta. The increase in the mean annual flow of the La Grande Rivière will however lead to enlargement of the flow area of the channels near the river mouth.
Water quality
Under current conditions, the summer water temperature will remain lower than the temperature in bodies of water under natural conditions. This is due to the fact that it is drawn from the first 25 m of the water column in Robert-Bourassa reservoir and the residence time in La Grande 1 reservoir is not long enough for its temperature to change and get warmer. Since 1980, temperature has been fairly constant the length of the river with just a slight rise near its mouth. Dissolved-oxygen saturation, slightly below the level in Robert-Bourassa reservoir, rises going downstream, probably because of reoxygenation in the rapids. Water from Robert-Bourassa reservoir is clearer than before the hydropower developments due to sediments being trapped in the reservoirs, but gradually becomes more turbid due to inflows of fine particles from bank erosion, slumping, landslides and surface runoff. These factors may also result in a slight, temporary rise in water colour, pH, bicarbonates, conductivity and total phosphorus.

According to the proponent, the main sources of water quality change in the estuary after the Rupert River diversion will be linked to the increase in flows and minor residual erosion of banks after the installation of granular blankets. However, some changes in water quality parameters related to the suspension of fine particles (e.g., turbidity, colour, pH, bicarbonates and total phosphorous) will be associated with the effectiveness of the granular blankets. Given that these measures are to reduce bank erosion and the quantity of suspended fine particles, there should be a slight improvement in water quality in front of the village of Chisasibi.

Ice regime
The freeze-up of the La Grande Rivière estuary generally takes place in the third week of December. An ice bridge forms at the river mouth from which the ice cover gradually extends upstream, built up partly from ice floating downstream. During the winter, the position of the complete ice cover may vary between KP 10 and 25, depending on turbine flow and air temperature. The ice cover in the La Grande Rivière estuarine section is not considered safe for snowmobiling because it is not strong enough and openings may quickly appear should turbine flow or air temperature increase. The snowmobile routes that provide access to the James Bay coast in spring are located about 5 km offshore from the mouth of the La Grande Rivière. The ice breaks up between late March and mid-April.

Along the James Bay coast, freeze-up occurs in December. Landfast ice is 15 to 20 cm wide and about 1 m thick in late February, increasing to 1.2 m in April. It starts to melt between late April and early May, to disappear completely in June.

According to the proponent, the additional flow caused by the partial Rupert diversion will shift the complete ice cover slightly downstream in the La Grande Rivière estuary and make openings slightly larger and more frequent. As is not the case, the ice cover will not be safe for snowmobiling. At the mouth of the La Grande Rivière, the conditions for access to James Bay by snowmobile will remain substantially the same under current conditions.

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1 According to Map 17-8 in the impact assessment, the snowmobile routes that provide access to the James Bay coast in spring are located rather about 1.5 km offshore from the mouth of La Grande Rivière. Point to be clarified at a later date.
2.4.6.2 Increase in mean plume area in the La Grande Rivière

Winter plume
The proponent defines the freshwater plume as having 20 ppt salinity. The winter plume, measured after La Grande-2-A generating station came into service, ranged between 3,200 and 3,500 km² for a flow of 4,600 m³/s (February 1993) and between 2,100 and 2,800 km² for a flow of 4,400 m³/s (February 1995). These figures illustrate the wide variability in plume area, attributed to wind action on the ice-free zones and consequent mixing of fresh and salt water. The presence of large stretches of ice-free water would accentuate the mixing of fresh surface water and underlying salt water, leading to a reduction in area of the La Grande Rivière winter plume. Under current conditions, the coastal limits of the La Grande Rivière winter plume are generally between the south point of Dead Duck Bay and Attikuan Point. These geographical reference points correspond to a linear distance of approximately 40 km south of the mouth of the La Grande Rivière (Dead Duck Bay) and 60 km to the north (Attikuan Point). According to modeling done by the proponent, the maximum size of the La Grande Rivière winter plume would be 3,430 km², for a flow of 5,000 m³/s and complete coastal ice cover. This value falls within the natural variation of the plume size of 3,200 and 3,500 km² measured in 1993. The proponent therefore concludes that the increase in area of the winter plume caused by the Rupert diversion will remain within the range of current variations.

Summer plume
Based on observations in 1983, the La Grande Rivière summer plume primarily extended northwest for a maximum distance of some 30 km. A secondary lobe south of the river mouth extended some 10 km westward. The plume’s fluctuating outer limit was located not far from the drop off the coastal shelf. Unlike the winter plume, it was not possible to establish a link between the flow of the La Grande Rivière and the minimum and maximum limits of the summer plume, or measure its area. The proponent deems that winds and atmospheric pressure variations play a much greater role in mixing water masses than does La Grande Rivière flow and the area of the La Grande Rivière plume varies much more in open-water conditions than under ice cover. It therefore concludes that the increase in mean monthly flow of 450 m³/s caused by the Rupert River diversion will not lead to any measurable change in the summer plume.
PART II

Viewpoints of stakeholders participating in public hearings
3 GENERAL COMMENTS, MAIN QUESTIONS AND ISSUES REGARDING THE PROJECT

Introduction
In assessing the project, the two review bodies jointly held public hearings on the project’s social and environmental impacts, as well as on its acceptability. Public hearings offer all concerned individuals, groups and organizations an opportunity to better understand the project and its repercussions, as well as to submit their opinions and the results of their analyses to the review bodies in an impartial setting. Their purpose is to enable review bodies to receive, through direct exchanges, the public’s opinions and comments regarding the project and its impacts, and to thereby improve their understanding of the issues involved. They also represent an occasion for the proponent to present its project and provide any further details, should need be.

The public hearings were held between March 15 and June 9 in the Cree communities of Mistissini, Nemaska, Eastmain, Wemindji, Waskaganish and Chisasibi, as well as in Chibougamau and Montréal. It bears noting that several sessions were held in each of the cities and communities visited. Each session consisted of two main parts, namely an information period and a consultation period. During the first part of each session, the proponent was asked to explain the primary project elements and to answer questions from the public. Members of the review bodies were also entitled to ask questions at this time. During the second part, persons, groups and organizations were invited to share their concerns with the review bodies and the proponent, as well as to express their opinions on the project and its impacts. Participants had the option of delivering verbal accounts or submitting briefs.

Sections 3.1 to 3.6 present a summary of the main comments and concerns of the populations of the 6 Cree communities involved, while sections 3.7 and 3.8 summarize those of the stakeholders from Chibougamau and Montréal. It should be noted that this document does not cover requests for specific details from members of the review bodies, nor does it include the information presented by the proponent.

For each of the 6 Cree communities, the summary of the opinions expressed during the public hearings was divided into three main sections, namely general comments, questions asked of the proponent, and the primary concerns voiced by the Crees with regard to the Eastmain-1-A Powerhouse and Rupert Diversion project. General comments and questions asked by participants usually went beyond the mere project being studied, but it was considered important to report the population’s opinions as faithfully as possible, given that they accounted for a significant part of the hearings.

Notably, before presenting the actual summaries of the public hearings held in the Cree communities, it should be emphasized that numerous Cree presentations consisted of testimonials as to their close ties to the land and to natural resources, the importance of divinity in their lives, their traditional way of life and traditional values such as respect, sharing and mutual aid. They also reiterated on many occasions their wish to be consulted during all phases of development projects on the James Bay territory, and their desire that their traditional knowledge be systematically taken into account by the proponent and government policymakers. Furthermore, some parts of their accounts, while not constituting a major portion of any hearing, are worthy of mention, given that
they are representative of the concerns of some Cree communities. These elements include the cumulative impacts of climatic changes, other forms of power generation, relations with Hydro-Québec, and the methodology adopted for collecting data and conducting environmental assessments.

Summaries of public hearings in Cree communities were prepared from transcripts of the testimonies (VAP1 to VAP13 and VAP31 to VAP43). During these hearings, the majority of Cree participants spoke in their own language, and transcripts were drawn up on the basis of the French translations provided by professional interpreters at the hearings. It thus consists of a French translation of an English translation of comments made in the Cree language. The summaries also include a number of quotes, some of which have been edited for greater clarity and understanding, as well as to keep the text somewhat briefer. Extreme care was taken, however, to not change the sense or meaning of the comments made by members of the public.

It is also important to specify certain details as to the form of the public hearing presentations held in the Cree communities as well as those held in Chibougamau and Montréal. First, in the Cree communities, unlike what occurred in Chibougamau and Montréal, most participants opted to speak rather than submit briefs to the review bodies. There was also a significant difference between the types of comments and concerns brought forth by stakeholders. In fact, the Crees expounded at length on the impact of hydropower projects on their culture and traditional lifestyle, as well as on the fauna in the James Bay territory. Stakeholders in Chibougamau and Montréal focused instead on the issue of regional and provincial economic spin-offs from the project, comparing hydropower generation and other power sources, with due consideration given to environmental impacts. Lastly, the Crees mainly spoke on their own behalf, alluding to past experiences as a result of hydropower projects, and illustrating how they view their own future and that of their communities within a development framework. This was not the case in Chibougamau and Montréal, where most stakeholders represented various organizations and interests, including associations in the construction industry, environmental groups and government authorities.

The analysis of the Cree community public hearings involved an in-depth reading of all the transcripts from the 27 sessions. This exercise made it possible to systematically group personal comments in categories, in an effort to understand their meaning as best as possible. While they were at times specified during this reading, these categories correspond to the various topics included in the sections covering general comments and primary concerns for each of the 6 communities. Particular attention was paid to the frequency of convergent topics, i.e., those which were most often brought up during the hearings in Cree communities. However, various groups and discrepancies were identified, so as to ensure a clear and representative view of the issues raised by the Cree population. The use of quotes aims to support the analytical work and should not be construed as a substitution for said activities.

The analysis of the Chibougamau and Montréal public hearings was conducted using the transcripts from the 16 sessions held in these cities (VAP14 to VAP16 and VAP17 to VAP30) and from reading the briefs submitted to the review bodies. The summaries of stakeholder comments, questions and concerns during the hearings were also prepared according to the frequency of convergent themes.
3.1 COMMENTS, QUESTIONS AND CONCERNS BROUGHT FORTH IN MISTISSINI

Public hearings were held during 3 sessions at the Mistissini Youth Centre (March 15 and 16, 2006).

3.1.1 GENERAL COMMENTS

Before considering the actual summary of public comments and concerns, it bears noting that for many members of the Cree community, the hearings represented an opportunity to speak of the major phases of their lives. This being said, participants on a few occasions expressed more or less the same viewpoints. Their comments concerned not only the impacts of hydropower projects on the Bay James territory, but also the project being assessed. The comments were grouped into three major categories: social problems, psychological effects and project justification.

Social problems related to development projects

Numerous people believe that hydropower projects over the past three decades in the Bay James territory are directly responsible for various social problems, which were practically non-existent in Cree communities until then. The representative of the CBHSSJB (Cree Board of Health and Social Services of James Bay) claims to not be fully convinced that the project’s benefits for the entire Québec population will exceed its negative impacts on Cree communities. In her opinion, a number of major individual and community problems are directly linked to hydropower development projects. Crees notably began eating less fish, in accordance with the 1970s guidelines regarding the restricted consumption of fish caught downstream of dams and in the reservoirs because of the higher mercury levels. This decreased consumption of a Cree staple, along with inactivity due to the modernization of communities, resulted in greater instances of obesity and diabetes among the Cree population.

Subsequent to various major hydropower project construction sites, as well as the recent Eastmain-1 project, the CBHSSJB has noted other major problems among the Crees, such as alcohol and drug abuse, two conditions that can sometimes lead to child neglect, violence, sexual assaults and vandalism. For example, a resident stated that the income earned from jobs related to the Eastmain-1 project provided a certain number of individuals the financial means to purchase alcohol or drugs: "There are instances of alcoholism and drug addiction because people now have money, which they can spend to buy alcohol and drugs," (VAP1, p. 73). A significant surge in the number of deaths due to transportation and drowning has been noted since 1985, possibly caused in part by the opening of the territory concerned by hydropower projects.

Lastly, job creation within the framework of such projects can result in greater inequities among families and within communities, hence generating social classes differentiated by economic factors (such as income). According to a participant, the Eastmain-1 project has had negative impacts because it generated additional income for certain Cree families: "[...] some people don’t share the money offered by Hydro-Québec, thereby causing fights among members of a same family as well as between
families," (VAP2, p. 38). Such social inequality can notably coincide with a drop in the importance of traditional skills.

**Psychological effects**

The other major issue included in comments involves psychological effects, which were addressed by a number of people. These individuals attested to feeling profoundly sad and hurt, and to having experienced a feeling of loss at the thought of the project’s impacts on their territory, notably given their strong ties to the land and the latter’s significance to their way of life: "[…] we are here today to express our profound sadness and the pain of our elders at the thought of the loss we will undergo," (VAP1, p. 97). For some residents, this feeling of loss is specifically linked to the flooding of land: "When you flood these sites, it’s not only the land that’s covered in water, but also our memories that are flooded," (VAP3, p. 66). The CBHSSJB shares this opinion:

"The project will represent enormous losses for the Crees, the loss of the land on which their people hunted, the loss of the landscapes that we have woken up to for thousands of years, the loss of camps and lands and traditional cemeteries […]. Despite being compensated for by various programs, these losses will still be felt. A period of mourning will be inevitable. Traditional ceremonies will need to be held to help people deal with their loss and bereavement, and while the psychological effects cannot be measured, they are manifestly obvious in the daily lives of numerous communities," (VAP2, p. 47).

**Project justification**

Given the significant value of the Rupert River to the population, some participants used various arguments to question the project justification. Some wished to know the actual power requirements of Québec, along with additional details as to the eventual sale of power produced by the project to outside markets. Others queried whether the production of alternative power sources such as wind energy and cogeneration had been sufficiently considered when assessing the rationale for the project.

In another vein, the Neeposh family, whose traplines (M25) are in the zone that will be most impacted by the project, expressed their dismay and sadness at the thought of the losses they would be subject to once the project was completed. They nonetheless insisted on mentioning that they did not disagree with the Eastmain-1-A Powerhouse and Rupert Diversion project. One of them mentioned, in fact, that it was important that the Government of Québec acknowledge his family’s decision to cede a part of their trapline for the good of the Cree community, Québec society and future generations (VAP1, pp. 103-104).

**3.1.2 QUESTIONS FOR THE PROPONENT**

During the three public hearings, a few brief requests for additional details on various topics were made. While the majority of participant statements within the framework of these requests, often specific, do not allow for in-depth analysis, they nonetheless illustrate concerns that merit to be communicated as accurately as possible. Among the topics raised:
3.1.3 PRIMARY CONCERNS REGARDING THE PROJECT

Various concerns regarding the project were raised by participants. These involved the significance granted to traditional knowledge, the fear that other hydropower projects would follow this one on the territory, the impact on fish, the drop in sport fishing activities and the safety of the dams being operated.

Acknowledgement of traditional knowledge in monitoring and follow-up programs
Numerous Crees were concerned by the significance and actual consideration that would be granted to their traditional knowledge in the development and execution of Hydro-Québec’s monitoring and follow-up programs. Some of the community’s residents sought reassurance that once the project received the green light, relationships would be maintained between the proponent and Cree communities, notably to ensure that they would continue to have access to relevant information and that their concerns would be given due consideration. Others emphasized that they had not been appropriately consulted by the proponent in the past, and wanted their traditional knowledge to be further taken into account in the future, notably during follow-up studies in the event of project construction. In this regard, one of them stated:

“We want to be present when decisions are made regarding follow-up studies and how these will be conducted. We’ve been disappointed by Hydro-Québec and the SEBJ too many times, when we were told we would be able to have our say, only to finally realize that we were not participating as we should have,” (VAP1, p. 112).

Someone else specified that it was mainly consultants hired by Hydro-Québec who failed to take traditional Cree knowledge into account: "I’m familiar with Hydro-Québec and the SEBJ, and they have good intentions on occasion, but those they hire, other consultants, these other groups have a different opinion where Crees are concerned. They don’t understand the Cree people, and they don’t listen to them […]" (VAP3, p. 70).

The fear that other hydropower projects would follow on the territory
Several Crees emphasized their fear that other hydropower projects would be constructed in the James Bay territory in years to come. This being said, they sought assurances from the proponent that Mistissini Lake’s integrity would be preserved. For example, a tallyman wanted Hydro-Québec to reassure the population that the project would not have an impact on the lake. The Chief of the Cree Nation of Mistissini effectively summarized the concerns of community members in this regard:
The residents of Mistissini are now expecting the lake to be entirely preserved in its current state. They hope, moreover, that the lake will constitute one of the main features of the park that we are building on our territory. Some community members, however, remain concerned, fearing that the lake will one day be affected by the hydropower project. Our people want reassurances that this will not happen," (VAP1, pp. 88-89).

Impacts on fish
Strengthened by their experiences from the construction of past hydropower projects, several persons stated their concerns regarding the project’s impact on fish and the effectiveness of some of the proposed mitigation measures. These concerns ranged from fears regarding the impact on spawning grounds to an interest in fish mercury levels. Initially, various participants requested additional details regarding the effect on spawning grounds, notably those of sturgeon and lake trout. They were notably sceptical concerning the success rates for the creation of spawning grounds in other areas, and asked for specific examples - with good results - elsewhere in Québec.

Another source of concern for participants involved fish mercury levels in the Opinaca and La Grande reservoirs subsequent to the Rupert diversion. More specifically, participants feared that flooding of the Rupert diversion bays would channel mercury to the Opinaca and La Grande reservoirs and increase fish mercury levels. This concern appeared particularly important in light of the fact that fish mercury levels in the Opinaca and La Grande reservoirs are decreasing, nearing the levels of nearby natural environments.

A drop in sport fishing activities
According to an outfitter, the project could well create a drop in sport fishing activities, given the negative perception of a certain number of future customers. Despite the fact that the company in question is located 150 km upstream of the planned Rupert dam, such a situation has apparently already occurred during various promotional activities:

"[...] the problem is that nowadays, the Rupert River is really hard to sell as a fishing destination. [...] We need to fight to convince prospective customers to come fish on the Rupert. We’ve even heard some of them say: “We’ll go see this river one last time,”" (VAP1, pp. 48 and 53).

The safety of dams at the Eastmain-1, Opinaca, La Grande-2 and La Grande-1 reservoirs
Various participants mentioned worrying about the safety of the dams of the Eastmain-1, Opinaca, La Grande-2 and La Grande-1 reservoirs. In fact, they fear that dams in increased-flow sections, built several years back, are not designed to receive a greater water volume. In this regard, one of the participants asked a clear question of Hydro-Québec representatives: "Are you ready [...] to receive all of this additional water with equipment that is 30 years old?" (VAP2, p. 20).
3.2 COMMENTS, QUESTIONS AND CONCERNS EXPRESSED IN NEMASKA

Public hearings were held during 5 sessions at the Nemaska Sports Complex (March 21 to 23, 2006).

3.2.1 GENERAL COMMENTS

The vast majority of residents took advantage of this occasion to speak of their lives in general and of their close ties to the land and the Rupert River. They unequivocally view land and water as an essential "life-blood" that provides a vital space and is home to various sources of sustenance. Participants also explained how they once used to and still today practice their traditional activities. Based on personal examples, they often cited situations that enabled them to learn these ways (socialization process), and spoke of the changes to their way of life over the past 30 years. However, they did not all clearly attribute these changes to hydropower projects, with the exception of a few persons who observed a direct link between the hydropower projects and lifestyle changes:

"Our life has changed. Things are not as they were during my father's time. Now, instead of using snowshoes, we drive snowmobiles. We move around with snowmobiles instead of using sleigh dogs. Major changes have happened to our way of life since the signing of the James Bay and Northern Québec Agreement. Our life has changed," (VAP6, p. 79).

Alternative project solutions

Other than the various presentations regarding the practice of traditional activities, the main comments voiced by the public bore on the proponent's assessment of various alternative solutions for the project. Various Nemaska residents notably believe that the proponent has not sufficiently focused on assessing alternative solutions for power generation in the James Bay territory. Wind energy is among the alternatives these participants would like to have seen further explored. In this regard, some people disagreed with the proponent's statement that the wind sector could not adequately replace this project, from both a technical and economic perspective. The Chief of the Nemaska First Nation is of the opinion that the wind sector on the James Bay territory would have fewer environmental impacts and would be more socially acceptable to the population:

"I also believe it would have fewer environmental impacts in our territories that the diversion project [of the Rupert River]. I also think it would be more socially acceptable, as well as a highly interesting option for diversifying the types of development in the region," (VAP7, p. 66).

In another vein, a community member proposed another solution, namely the erecting of dams or generating stations on sites that are already widely used for hydropower power generation. He offered the following example:
"I know we spoke of wind energy, but when I looked at the map and saw where they [the proponent] had built [the powerhouse] LG-2A, I asked myself what was stopping Hydro-Québec from using the water it already had and erecting LG-3A or LG-4A instead of destroying another river. This represents another solution. The water is already there. Like at the Robert-Bourassa reservoir, there’s LG-2, and they built LG-2A," (VAP7, p. 87).

3.2.2 QUESTIONS FOR THE PROONENT

Participants also asked general questions, on a wide range of topics. Mostly voiced to elicit additional details from the proponent on various topics, these questions also reveal certain concerns, hence the importance of commenting on them:

– the distinction drawn between the Eastmain-I project and the Eastmain-I-A and Rupert diversion project;
– the percentage of the Nemaska territory that would be flooded;
– total project costs, including the amounts allocated to preliminary activities (among them impact assessments), works concerning project components and the related infrastructures, mitigation measures (including funds), interest rates and inflation;
– the transfer tunnel between the downstream and upstream diversion bays (water flow, possibility of wood debris and fish passing through the tunnel);
– programs for measuring fish mercury levels and the effects of mercury on consumer health;
– dam safety.

3.2.3 PRIMARY CONCERNS REGARDING THE PROJECT

The analysis of the reports on the public hearings in Nemaska illustrated around ten or so concerns, shared by various persons.

Jobs

Nearly all of the residents spoke of the planned jobs during the project construction phase, noting that these would be temporary in nature. In fact, they discussed the growth phase during construction, followed by a slowdown once operations begin, better know as the 'boom and bust' phenomenon, which impacts the employment and economic activity sectors of a community during the construction of a project. According to the CBHSSJB (Cree Board of Health and Social Services of James Bay) representative, people in the region are very familiar with this phenomenon: "Lots of work during the construction period, then a drop during the [dismantling of] operations (VAP4, p. 96).

Numerous residents consider this growth and slowdown cycle all the more important in light of the Crees' difficulty reconciling their traditional activities with paid jobs, specifically in the case of young people, who do not have access to a hunting ground and who are looking for means to support their needs and those of their families. Residents thus frequently asked the question: "What will happen once the construction work is completed?" (VAP4, pp. 82-83). In fact, such a scenario represents a dilemma for numerous residents: to obtain a paid job and risk abandoning their lifestyle, or to learn traditional forest activities and lose out on significant income.
opportunities. Also, once someone has worked for a given period on project construction sites, including hydropower projects, it would appear more difficult for them to resume their traditional activities. The comments of a resident aptly summarize an opinion shared by certain other community members: "What happens if all of a sudden there are no more jobs? What will happen to our youth, who has no solid foundation in the traditional methods of living off the land?" (VAP5, p. 101).

It was also emphasized that the project will impact a section of the territory where it will henceforth be impossible to engage in traditional activities. According to certain Crees, this makes taking a stance that much harder: "And these are, as I have mentioned, hunting grounds and were these territories left untouched by development activities, our future would remain essentially as it is today," (VAP7, p. 10).

**Water quality in the Rupert River**

Numerous participants were worried about the project's impacts on the quality of the water of the Rupert River. This is notably one of the primary concerns raised during the public hearings in Nemaska. Most people are convinced that the water quality in the Rupert River will be permanently affected by the project works, despite the proponent's replies in this regard. Some Crees questioned the impact of dynamiting and the presence of numerous works on the quality of the river's waters. It was also mentioned that several Crees now drink water from the river, without needing to first treat it in any way. Participants fear that people will stop drinking the water, estimating it to no longer be potable as a result of the turbidity caused by changes in the flow of the river and its tributaries:

"The quality of the drinking water in the Rupert River and Nemiscou Lake is presently excellent. It can be drunk by simply dunking a cup or glass directly into the river or lake. [My] family is greatly worried about the water quality, because of turbidity if the project goes ahead," (VAP5, p. 67).

**The features of streams and bodies of water near the Rupert River**

A few people voiced concerns and opinions regarding potential impacts on the streams and bodies of water near the Rupert River, such as Champion Lake and its tributaries and the Nemiscou Lake and River. Initially, these concerns addressed the natural water levels people wish to maintain for Champion Lake and all of its tributaries, including the Pontax River. In fact, participants wanted to be reassured that water levels would not be affected as a result of project authorization, and it was indicated that "more accurate studies should be conducted with regard to this lake [Champion] and the supply sources for the water spilling into the lake," (VAP7, pp. 94-95).

Concerns also addressed maintaining the natural water levels of Nemiscou River and Nemiscou Lake, as well as the impacts on fish habitats in these environments. According to one of the speakers during the public hearings, several of the existing fish habitats in Nemiscou River and Lake are considered good fishing grounds, and she "couldn't even begin to imagine that some of these habitats could disappear," (VAP7, p. 103). This person does not believe that the project will not have an impact on water levels and the various fish habitats.
The ecological instream flow regime

The ecological instream flow regime was the topic of some publicly voiced concerns and requests for explanations. More specifically, participants asked the proponent to explain the notion of "mean annual flow" or "MAF" (29%), the way in which variations in instream flow are calculated, and the techniques used to enable seasonal variations throughout the year. The proponent explained that instream flow variations had been determined, among other ways, by taking into account the various life cycles of the fish living downstream of the Rupert dam, and with a view to ensuring they would find themselves in "acceptable habitats". Despite these explanations, it was brought up that natural water level variations should be taken into consideration from one season and one year to the next, by notably considering average precipitation.

Global warming

Several participants voiced their thoughts on global warming. While others wondered what impacts this phenomenon could have on the environment within the framework of the project, others feared that the latter would contribute to the phenomenon. Some Nemaska residents believe that global warming could bring about a rise in water levels and temperatures over the course of the next several years or decades. Some were concerned by the phenomenon, wondering whether it could have a negative impact on the fish in the reservoirs created by the project:

"We anticipate that global warming will lead to temperatures well above normal. Will this have an impact on the movement of fish in the reservoir? Will they migrate somewhere else? [Will they] go elsewhere in search of food?" (VAP5, p. 31).

Others consider hydropower projects as belonging to the group of projects that contribute to global warming, and feel that the project's environmental impact assessment should have lent greater weight to this reality. One person noted that:

"Developments across the planet are affecting the environment, the atmosphere. There's the greenhouse gas effect. All of this contributes to global warming. Your development activities, including hydropower projects, are a dangerous game. Personally, as an individual, I declare that hydropower initiatives are not green for the simple fact that they pollute, they flood, and they inundate the environment," (VAP6, p. 66).

Road safety

Some people felt that increased traffic in the territory, notably by those hailing from southern Québec, combined with development works, would largely contribute to the deterioration of existing roads and to increased accidents. More trucks on the roads only serve to make people more insecure as regards to road safety. One person claiming to be concerned with the project's impacts on road safety asked the proponent to make the necessary improvements to the highway infrastructure to ensure driver safety:
"Hydro-Québec must give serious thought to the condition of roads, if only paving the roads. [...] Current conditions are serious, and we need only think of how often our windshields would crack with a larger number of trucks travelling on our major road. There are so many trucks. Why we ourselves almost had an accident with a truck, because of the dust in the air. [...] I don't like the road conditions, not one bit. And even less so if we take the dust into account," (VAP6, pp. 60-61).

The fear that other hydropower projects would follow on the territory
A number of participants fear that other hydropower development projects would be implemented on the James Bay territory over the coming years. From the perspective of certain participants, there are currently other interesting sites that could be suitable for the development of hydropower power generation. This being said, they recommend limiting the scope and number of development projects in order to optimize the preservation of natural environments: "We need to put an end to this, otherwise we will kill the Earth," (VAP7, p. 89); "All of our rivers will eventually disappear," (VAP7, p. 13).

Impacts on fish
Various people, including a tallyman and members of his family directly concerned by the project, claim to be specifically worried about the potential impacts of the Rupert River diversion on the river’s fish populations and spawning grounds. In this regard, some people expressed dissatisfaction with the studies on fish, and had hesitations regarding the selection of spawning grounds. According to them, the selection of spawning grounds was done with no real consideration given to the traditional knowledge of tallymen. Others were worried that the number of fish would decrease significantly: "What I want you to grasp is that subsequent to the diversion, I don't know whether we'll still have this many fish," (VAP7, p. 137).

Psychological effects
While Nemaska residents were fewer to speak up about their sadness and sense of loss related to the eventual Rupert River diversion, a few persons did take advantage of the hearings to underscore the degree to which they were affected by the project. One of the tallymen, in fact, indicated that even though "nothing is happening, I only need to think about what could happen to this river, how it could be impacted, and it affects me. It's affecting my mental health, because it will change how I live," (VAP4, p. 81). Another resident supported this potential psychological impact: "I'm extremely sad about the possible diversion of this river where we have spent our entire lives and which taught us so much. [...] I'm affected because I can foresee the loss of this river," (VAP7, pp. 113-114). The notion of trauma was also brought up as a way of describing feelings about the project.

3.3 COMMENTS, QUESTIONS AND CONCERNS RAISED IN EASTMAIN
Public hearings were held during 3 sessions at the Eastmain Sports Complex (April 4 and 5, 2006).
3.3.1 GENERAL COMMENTS

The comments and concerns of the residents of this community regarding the project being assessed were made with due consideration given to the impacts and changes ensuing from the hydropower development of the La Grande Complex and more specifically, the projects having impacted the Eastmain River since the early 1980s. Within this specific context, the comments expressed by certain participants draw a link between the impacts of the Eastmain River diversion and the anticipated impacts in the event of the diversion of the Rupert River (for example, impacts with regard to the water quality, the fauna, feelings of loss and traditional culture). In this regard, two Cree participants expressed the following viewpoints, shared by many other residents, as regards to the changes they observed subsequent to the Eastmain River diversion:

"Before, people used to go fishing [in the Eastmain River]. They would cast their nets, and gather drinking water. Children would swim in the river. [...] This is something that our neighbouring community [Waskaganish] will need to deal with. [...] There will be less fishing in the Rupert River, in front of their community, directly in front. [...] I’ve seen photos of the Eastmain River, the river’s astounding colour. If you ever visit our community during the summer or spring, you’ll see that the water’s not all that clear. You can see that it in fact has a brownish tint. [...] People today rarely go to the Eastmain River, even though it’s just next door. I never see the elderly or young children canoeing on the river, because it’s, well, the water is dirty and you can’t fish there any longer. As a young person, I wanted to share my feelings about the slow death of the Eastmain River," (VAP9, pp. 49-51).

"I also want to speak about the Eastmain River. Now the gates have been closed and it’s shut down. I’m sure the community of Waskaganish will feel like we felt if this project goes forward. [...] The situation today is that there is only deep water in the very middle of the river, and everything is dry where we used to go boating, there are trees where we used to paddle, because the river dried up with the dams. The river’s no longer wide and free like it once was, and this is what the community of Waskaganish will see and feel. They will see and feel the same things we experienced, and undoubtedly be able to watch the dirty water move upstream. It will happen, we lived through it. It won’t be possible to fish where fish were once abundant, and the community of Waskaganish will feel this way. They won’t be able to fish where they used to, where they once let out their nets [...] the people of Waskaganish will feel the same effects we did," (VAP10, pp. 14-15).

3.3.2 QUESTIONS FOR THE PROPOONENT

As regards to the project being studied, those present asked the proponent a few brief questions on various topics, among them:

– terrorism, the safety of installations and emergency measures;
– changes to the natural features of the Rupert River;
3.3.3 PRIMARY CONCERNS REGARDING THE PROJECT

A number of residents of the community of Eastmain share various concerns regarding the impoundment of diversion bays, the effects on fish, jobs and archaeological inventories, the safety of the works and the psychological effects. Below is a summary of the concerns voiced during the public hearings.

The impoundment of diversion bays

Residents had two major issues with regard to the impoundment of diversion bays, namely the impacts on fauna and personal safety. Several people were convinced that the creation of major bodies of water (such as reservoirs and diversion bays) would have major repercussions on land animals and birds. The majority of these persons questioned the actual scope of the impacts on animals as a result of changes to the territory and flooding of the land:

"The animals who move, travel or migrate in specific patterns must behave differently due to a changed geography, and this since the impoundment of these reservoirs. […] We have no idea how these species will be affected. […] Will animals and birds die? " (VAP8, pp. 49-51).

Some residents were increasingly upset by a possibly higher mortality rate among caribou, moose and beavers during the filling of the diversion bays. One of them notably mentioned his concern regarding land animals that he hunts, asking for details regarding the measures that will eventually be taken to minimize the impacts on these species: "What will Hydro-Québec do to avoid negatively affecting or destroying all of these animals, especially moose, caribou and beavers, who were living in their natural habitat before the territory was flooded?" (VAP8, p. 56). Others fear that the diversion bays will be a disturbance for bird migration corridors. In fact, one of them asked "...will the migration patterns of birds and other species be affected by an increase in water capacity and volume in inland areas," (VAP9, pp. 55-56).

Different people on numerous occasions claimed to believe that the impoundment of diversion bays should not be done in late fall or early winter, because at this time, many small animals, including beavers, have already built their shelters for the winter. Flooding of the diversion bays would drown these animals. Referring to the Eastmain-1 project, a resident asked "Why were the gates closed at this time, when it was starting to get cold and animals were preparing to spend winter in their dens? A better moment could have been chosen, namely one that took into consideration the wildlife habits and habitat," (VAP10, pp. 28-29).
Lastly, to ensure personal safety, a few residents sought reassurance as to the advance notice the proponent would give tallymen and community members before proceeding to the impoundment of diversion bays: "I wanted to express my concerns regarding the moment chosen to close the gates of the [dams]. And I wanted to reiterate that you must make sure you allow enough time for warning people and for taking the necessary measures," (VAP10, p. 58). Along the same lines, it was suggested that the proponent develop an appropriate communication plan, taking into account distinct features of the Cree population, including language and the practice of traditional activities in the forest at certain times of the year.

**Impacts on fish**

A few Crees were extremely worried about the project’s impacts on fish in the Rupert River, particularly sturgeon, which is a species that bears great importance to the Crees, not only as food but also in a cultural sense. In their opinion, a drop in the river’s flow could negatively impact water quality, which would subsequently affect sturgeon:

"Even if the flow is less [instream flow release], the fish would still be affected. Water is necessary to the fish’s survival. The sturgeon is considered as the wisest fish of them all. Changes in the colour of the water also represent significant damage. Sturgeon is the most sacred of fish for the Cree people. We have the utmost respect for the sturgeon. [...] I do not want a diversion of the Rupert River. The fish will be the species most impacted by this diversion of the Rupert River. I support the people of Waskaganish who are against this diversion. The life of the fish will be changed forever. And they will see the difference," (VAP, pp. 84-85).

On the other hand, and despite his fears with regard to the Rupert diversion’s impact on fish, another resident believes that the hydraulic structures built on the Rupert River will make it possible to limit the impacts on fish habitats and, as such, on the species themselves. In this perspective, he considers that the impacts on fish, and thus on sturgeon, will be less significant than those resulting from the hydropower works on the Eastmain River. Hence:

"In our case it was too late to have these sills built on our river [Eastmain]. On the Rupert River, I believe that it should be brought up, these sills must be erected before the river is dammed, notably to mitigate the impact on fish and their habitats, giving them - as well as beavers - a better chance to survive. We don’t want what occurred to us to happen to the Rupert River. And I know there are sectors that have died and where there are no more fish, especially sturgeon," (VAP10, p. 62).

The Chief of the Eastmain First Nation feels that the proponent failed to adequately study the impacts on Eastmain River sturgeon, notably as a means of assessing the possible repercussions of the diversion of the Rupert River. He states: "We believe that Hydro-Québec paid too little attention to the relationship between the diversion of the Rupert River and sturgeon in the Eastmain River," (VAP8, p. 113).
Jobs
The issue of the manpower needed to build and operate hydropower projects and jobs likely to be created within the framework of this project elicited various responses from the public. In light of past experience with the Eastmain-1 project, a tallyman asked the proponent to explain how Hydro-Québec would be awarding contracts. In his opinion, rules for awarding contracts do not favour those tallymen whose lands are directly impacted by the project. He emphasized the discrepancy between the proponent’s announcement regarding jobs to be created and the actual number of jobs obtained by Crees: "There were a number of discussions regarding jobs for Crees and even training. But realistically speaking, I don't see any results," (VAP8, p. 83). In the same breath, this participant claims to want the Crees and the proponent to work together in favour of permanent employment: "As Cree individuals, we need jobs over the longer run. […] Duration of employment is important, and must not consist of short-term contracts," (VAP8, pp. 77 and 91).

In another vein, the Chief of the Eastmain First Nation wants a partnership to be developed between the proponent and the Crees of Eastmain and Wemindji for the construction and operation of the Sarcelle powerhouse. These job opportunities for Crees from both communities would allow them to gain relevant experience in the construction of hydropower projects. He did not, however, provide any further details as to the type of partnership:

"Construction of the Sarcelle project could be a major opportunity for these two communities [Eastmain and Wemindji], as well as for other communities, to gain hands-on experience in the construction and operation of hydropower projects. The analysis of the Eastmain-1-A project and the diversion of the Rupert River must adequately consider how Cree peoples and the communities of Eastmain and Wemindji will be able to benefit from the Sarcelle powerhouse within the framework of this project (construction and operations)," (VAP8, p. 110).

Archaeological inventories
Certain Crees described the value they ascribe to archaeological inventories attesting to the presence of Natives on the James Bay territory over the past several centuries. Today, these remains serve to transmit knowledge of traditional Cree methods from one generation to the next. According to a resident, archaeological digs "are done to find artefacts that could offer proof of how we lived in the past, and to allow archaeologists to interpret our way of life," (VAP10, p. 12). The main concern of Crees is what will happen to artefacts uncovered during the archaeological inventories and digs planned as part of the project:

"[…] the elders have always taught us that the items we find belong to us, because they were made by our [ancestors]. And I want to [know] what will become of all of these items found in our ‘backyard’. I know that presently they are all hidden away in museums and research laboratories across Québec," (VAP8, p. 70).
Crees overall share a wish to preserve the artefacts discovered during archaeological digs, and would like to see them displayed on the territory of Cree communities: "I want these elements from our 'backyard' [artefacts] to come back to us, to our communities, for good, rather than to stay on shelves in museums and research laboratories across Québec," (VAP8, p. 71).

The safety of the works
A few people are concerned with the safety of the future Rupert River dam and the facilities currently surrounding the Eastmain-1 Reservoir. For example, despite information on dam safety provided by the proponent, the Chief of the Eastmain First Nation wants the population to be adequately informed as to the various safety mechanisms and the monitoring program. He also wants the review bodies to submit all relevant recommendations to provincial and federal authorities during the environmental assessment process:

"We've heard what Hydro-Québec had to say regarding the safety of such a dam [Rupert], and we feel confident following their presentation. However, dam safety remains an issue, and we are waiting for Hydro-Québec to inform our community as to the results of its inspections. We are also expecting the review committees to provide relevant advice as well as direction in this regard," (VAP8, pp. 111-112).

In addition, by relying on the idea that the diversion of the Rupert River would bring about a change in the operational level of the Eastmain-1 Reservoir, there is fear that the works surrounding this reservoir may not have been designed to hold the additional water supply.

Psychological effects
In light of past hydropower development projects, a few residents expressed their sadness and sense of loss regarding the major changes to the natural environment of the sites and to their traditional activities, mainly because of the land surfaces that would be flooded were the project to be constructed. The expression "a wounded people" was also brought up to illustrate the psychological effects of the various hydropower projects, with the hope that such impacts would not this time affect the tallymen whose traplines are directly concerned by the project or the Crees living nearby:

"I hope that the past experience of trappers, hunters and members of this community [Eastmain] will not be repeated for those who will be affected by the diversion of the Rupert River. […] We are a people that has been harmed by the diversion of these rivers and these mega-projects," (VAP9, pp. 64-65).

3.4 COMMENTS, QUESTIONS AND CONCERNS BROUGHT FORTH IN WEMINDJI

Public hearings were held during 3 sessions at the Wemindji community centre (April 11 and 12, 2006).
3.4.1 GENERAL COMMENTS

Before embarking on a detailed consideration of the concerns of Wemindji residents with regard to
the project, it bears noting that they used the public hearings as a forum for expounding at length
on the impacts they are currently facing following the hydropower development activities at the
La Grande complex. They mainly focused on impacts ensuing from the flooding of hunting grounds
and traplines: a drop in the number of fish and their quality; the opening of the territory by means
of access roads; the risks of boating accidents due to wood debris in bodies of water; and,
the hazards associated with snowmobiling across the thin ice of lakes and reservoirs.

In light of these comments, the Chief of the Wemindji First Nation, much like other members of the
community, took advantage of the opportunity to make various suggestions regarding improvements
to the quality of life of residents. While the proposals are not necessarily directly linked to the
concerns regarding the project under study, mentioning them remains important. They notably
concern the construction of access roads to certain hunting and fishing grounds as well as on
various recreation sites; the paving of some roads, including that of Sarcelle; the clean-up of wood
debris in the Boyd and Sakami lakes and the Opinaca reservoir; the development of a communi-
cation plan regarding the safety of the Sarcelle control structure; and, ice conditions. They also involve
the introduction of a secondary-level history course on the various agreements struck between
the Government of Québec and the Cree communities.

3.4.2 QUESTIONS FOR THE PROONENT

The Crees asked various questions regarding the project being assessed, with the aim of obtaining
additional details on specific topics of interest. The topics included:

- reasons explaining why the Wemindji First Nation did not sign the Boumhounan
  Agreement;
- alternative project solutions;
- differentiation between the two review bodies (provincial and federal);
- the impacts of the Eastmain-1 Reservoir and of diversion bays planned in Canada geese
  migration corridors;
- the cumulative impacts of hydropower development and mining projects on the James
  Bay territory;
- the impacts of the flooding of diversion bays on the beaver population;
- greenhouse gases and climatic changes.

3.4.3 PRIMARY CONCERNS REGARDING THE PROJECT

A number of Crees share various concerns with regard to water levels, water quality, the safety of
the works, impacts on fish, job creation and the consultation of Crees.

Water levels downstream of planned diversion bays

Increased water flow downstream of diversion bays subsequent to the diversion of the Rupert River
is worrisome for the Crees. Generally speaking, they are questioning the actual increase in water
levels of Boyd and Sakami lakes, notably under the James Bay and Northern Québec Agreement: "Will there be an increased flow? How will the water level be prevented from increasing? What will stop it? Are water levels in the Boyd and Sakami lakes at their maximum, or will they continue to rise?" (VAP11, p. 51). In fact, numerous people do not believe that increased flow will not lead to an increase in the water levels of reservoirs and lakes. The proponent was also asked whether it would seek input from Crees in monitoring water levels.

Several tallymen are concerned by the flooding of prime hunting grounds and traplines, due to a possible increase in water levels downstream of diversion bays. Based on past experience, one of them recaps what others had mentioned previously:

"If I understand correctly, the water levels in the reservoir [Opinaca] will rise. So where will I hunt then? Most of my traps will be below the water level. My traps will be directly impacted by dams and reservoirs. I have many concerns as to my hunting camps, which will also likely be affected by the rising water. This is why I wanted to speak up today," (VAP13, pp. 7-9).

One person in turn expressed concern over the flooding of burial sites during the impoundment of diversion bays: "I would like to speak of reservoirs and their repercussions on our burial sites, which are now underwater. I know that the proposed project will once again flood certain burial sites," (VAP12, p. 11).

The water quality of the bodies of water downstream of the diversion bays and the Rupert River

Several residents expressed concern over the water quality of the Eastmain-1 and Opinaca reservoirs and Boyd and Sakami lakes. Some of them believe that increased water flow subsequent to the diversion of the Rupert River will create increased turbidity in the zones located downstream of the planned diversion bays, which could generate changes to the water quality. One of the tallymen, for example, is wondering if he will be able to keep drinking the water on his trapline in the Sakami lake sector:

"Will the turbidity impact our water, and will we still be able to drink it? Will there be any changes in water quality? I think this information is important, particularly if I’m likely to drink the water flowing on my hunting grounds. […] This is something that worries me, the quality of the water on my trapline, and wondering whether my family will be able to drink it," (VAP12, p. 14).

Some people were convinced that water quality of the Rupert River would be permanently altered by the diversion. According to one of them, even with an instream flow release, the decreased flow speed would have a negative impact on water quality: "This river we’re talking about [the Rupert] is very powerful. Any diversion to its waters will definitely have an effect on water quality. Presently, it has a rapid flow, and because the river is powerful, it self-cleans itself, in a way," (VAP13, p. 5).
The safety of the works

In the event of the project’s construction and an increase in the downstream flow of diversion bays, several individuals emphasized that they would worry over the safety of the numerous works in place as well as the future consequences of any event outside of the proponent’s control, such as an earthquake or terrorist attack. This fear was often brought up with regard to the residents of Chisasibi, the closest community to the hydropower facilities of the La Grande Complex: “I’m extremely perturbed for the people of Chisasibi [...] if an unexpected event were to occur at La Grande Complex, what do you think would happen to them, the residents of Chisasibi?” (VAP13, p. 23). For some, this trepidation is exacerbated by the fact that members of their family live in the sector in question:

“What will happen if there’s a disaster at one of the dams, it alarms me, because I have family members living in Chisasibi,” (VAP12, p. 61).

Impacts on fish

First, many Crees fear that an increase in water flow downstream of the planned diversion bays, after the diversion of the Rupert River, will worsen the current impacts on fish populations (and especially the sturgeon). They have observed a decrease in numbers of fish, caused, they believe, by past hydropower projects:

“I’m not against the new agreement [Boumhounan], but I have seen first-hand the types of impacts we should expect if there is a diversion of the river [Rupert], because I’ve lived through it. I’ve seen the impacts on fish [...]. The sturgeon suffered the most, and each year, we note the water quality and can tell that the sturgeon population has dropped,” (VAP11, p. 104).

Secondly, some people mentioned being alarmed by the project’s possible impacts on natural sturgeon spawning grounds currently found in the Rupert River:

“Were this river to be diverted, I’m sure the impacts would be just like for the other rivers. [Residents of Waskaganish] will of course lose their spawning grounds. Further upstream in the Rupert River, there was another spot where we fished for sturgeon. This spawning ground where we caught sturgeon will disappear if there is a diversion,” (VAP13, p. 16).

Still with regard to sturgeon spawning grounds, a resident inquired whether the sills erected on the Rupert River could constitute obstacles, i.e., prevent the sturgeon from reaching their spawning grounds. He made the following comment:

“I’d like to speak about the planned sills on the Rupert River. We all know that the Rupert has excellent sturgeon spawning grounds. I don’t know how many sills are planned, but I’m wondering whether they’ll create barriers for the sturgeon?” (VAP13, p. 47).
Lastly, some Crees feel that the project will cause fish to be less tasty, both in high-flowing and low-flowing sectors. They think the same will hold true for other traditional game: "With the proposals for diversion of the Rupert River, I'm sure that game, our traditional food, will lose much of its flavour. And at one point, it won't be edible. I'm talking about fish, beaver. These are the project's repercussions," (VAP13, p. 62).

**Jobs**

Some Crees alluded to the fact that the project could create jobs for their youth, and that these could be combined with participation in traditional activities. Others, however, emphasized that Crees are always under-represented among the workers hired by Hydro-Québec and that the jobs they do get are generally temporary, lasting during the construction phase only. In order to remedy this situation with an eye to generating permanent jobs, the Chief of the Wemindji First Nation suggested that a Native Affairs division be created at Hydro-Québec, and mandated to develop and implement hiring strategies for Crees during hydropower projects: "I don't know if one of the recommendations I supported was introduced; it involved creating a Native division to ensure greater efficiency and sustainability," (VAP11, p. 92).

He also asked that every effort be extended to provide training for young Crees, as a means of enabling them to eventually hold specialized jobs:

"We believe that the review bodies and committees should consider the importance of education for youth, notably to allow young Crees to benefit from job opportunities in the area of natural resources development. This would take planning. For such positions, our youth need schooling in mathematics and science, as well as environmental studies, physics, chemistry and biology," (VAP11, p. 85).

Otherwise, given that there is still much wood debris in the Eastmain-1 and Opinaca reservoirs created during the construction phases of various hydropower projects, several Crees reminded the proponent that this waste was still problematic and that it should develop clean-up measures. The proponent could, for example, award contracts for the removal of this debris: "It might be a good idea to mandate us to remove all this waste; some of our youth could thus obtain jobs for cleaning up these areas," (VAP12, p. 17). Moreover, removing this debris would make travel easier and safer.

**Ongoing consultation of the Cree people**

The Crees reiterated their dismay that they were not consulted by the proponent and not invited to share their traditional knowledge. They acknowledge that there is a discrepancy between their traditional knowledge and science. In their opinion, the proponent believes the second is superior to the first. In this regard, one of the tallymen commented:

"One thing I hope will happen is that once the project is completed, traditional knowledge will be valued in the same way as scientific knowledge is. I feel as though traditional knowledge is not given its due, specifically as regards environmental impacts," (VAP12, pp. 27-28).
We thus understand that the Crees would like to be consulted at every project phase (construction through to operations). This is a critical aspect of consultation, notably to ensure that their concerns are given due consideration and that project impacts and the effectiveness of mitigation measures are assessed by taking into account their points of view: "It's because if authorization is given to go ahead with the project, all Cree communities should be met with, through an ongoing consultation process (during and after the construction phase)," (VAP12, p. 55).

3.5 COMMENTS, QUESTIONS AND CONCERNS EXPRESSED IN WASKAGANISH

Public hearings were held during 6 sessions at the Waskaganish meeting place (May 30 to June 2, 2006).

3.5.1 GENERAL COMMENTS

Before discussing the concerns put forth by residents of the community of Waskaganish, it bears reiterating that the Crees explained on numerous occasions their strong ties, love and respect for the Rupert River. For most of them, in addition to constituting a means of transmitting traditional knowledge from one generation to the next, this river helps keep the Crees in good physical condition, having both a physical effect (through the supply of traditional food) and an impact on their psychological well-being, with many claiming that it provides solace in the most difficult of times. The two participants who reported on these ties to the Rupert River made the following statements, evoking sentiments shared by most Waskaganish residents:

"What touches me the most is the spiritual support the river gives me. Even during very trying times in my life, I've always gone near the banks of this river to gaze out at the flowing water and the mountains. And I've always told myself: no matter what happens to me, the river will always be there, the same as always. It will flow slowly but seriously, as much of a fixture as the moon. This thought has always been a great comfort," (VAP31, p. 84).

"The Rupert River is what we call Washasibi. It represents numerous values that are dear to our people. It reminds us of the Earth around us, the beauty that was created for our children to reap the benefits of; it feeds and enriches us. We are made stronger as a result of our spiritual connection to the land. Thus, we can practice our culture, our traditions, hunting, fishing, trapping, all of the activities that we are still doing today," (VAP34, p. 37).

From this perspective, numerous Crees proclaimed their opposition to the project. They consider that in addition to altering specific features of the Rupert River which are favourable to the survival of animal species, the project will also flood various lands where tallymen now trap traditional game. There is hence a risk inherent in the project whereby life in the communities could become more

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1 For example, canoe brigades in July of each year offered around twenty youngsters an opportunity to follow the old Fur Trade Route on the Rupert River. Led by experienced trappers, this one-month canoe outing is a valuable activity for community members from various generations.
difficult. Some residents believe that we must collaborate to preserve natural resources as much as possible, specifically given that they are the very foundation of human life:

"Thus, if we want to support the economy as a way of ensuring life on earth, we must treat our natural resources with care, so that they will remain in good condition. We cannot merely exploit these resources over the short term, as this will cause them to eventually disappear altogether. [...] These natural resources must be preserved, for the survival of our species depends on them. We know that the planet is home to destruction on a daily basis. If the Rupert is diverted, Québec and Canada will only be continuing to contribute to this erosion of our natural resources," (VAP31, p. 88-89).

3.5.2 QUESTIONS FOR THE PROPOONENT

The proponent was asked a wide range of questions during the sessions held by the review bodies. Most of these hailed from one single person, but are nonetheless worthy of note:
- project justification and the choice of the Rupert River for power generation, as well as variants in the Eastmain-1-A project and the Rupert diversion;
- alternative power sources (rather than hydropower generation), notably with regard to production costs and environmental impacts;
- safety measures implemented at the mouths of water intakes of hydropower powerhouses;
- the interbasin transfer, notably for the Rupert and Eastmain rivers, of fish species and their parasites;
- the stability of the banks of the Rupert River, in light of its clay soil, and the ensuing safety of residents in the event of a landslide;
- water turbidity and the presence of algae in the Rupert River because of the planned sills.

3.5.3 PRIMARY CONCERNS REGARDING THE PROJECT

The public hearings offered Waskaganish residents an opportunity to express a good number of their concerns. Many of these were grouped under more general themes.

Changes in traditional lifestyle
The majority of Cree residents acknowledge that their way of life has radically and rapidly changed over the last several years. Traditional activities such as hunting and fishing, which were once the cornerstone of their communities’ sustenance, are now more and more infrequent: "While people continue to hunt and trap, there are fewer people doing it," (VAP36, p. 28). Some feel that these changes in lifestyle are a result of the growing population, the opening up of the territory and increased access to wildlife resources for a greater number of people, and increasing job opportunities due to development projects on the James Bay territory. The Crees have ascertained that they are extremely nostalgic and sad because of these changes, with the ensuing impacts on their way of life, which is at the very heart of their culture.
Many people fear that the Eastmain-1-A project and Rupert River diversion will equally contribute to a drop in traditional activities and changes in the Cree lifestyle: "One day, I would like to bring my grandchildren here, to show them where I’m from and to have them see people with a lifestyle that is in such close sync with nature. But, I’m afraid that this very lifestyle will wither away, much like the flow of the river [Rupert]," (VAP31, p. 85). According to many Crees, the various changes in the river within the framework of the project will result in the loss of a key component of their culture, essential to teaching a traditional way of life to future generations:

"I was 18 years old when I first rowed on this river, with my parents. We were in Nemaska and there were no planes or other motors, only our oars. This is what I’m trying to teach our youth, it’s what we’re attempting to show them. And what will the future hold, in ten or twenty years, when we want to show young Crees this river? [...] if the river is not exactly as it once was, it is parcelled or split up, it seems that the people’s traditional culture will be destroyed and compromised," (VAP33, pp. 100-101).

In addition, a few residents mentioned on more than an occasion that they feared the project would permanently destroy certain fishing sites they had been using for many years and which were an integral part of their traditional way of life: "If we lose the river, we will also lose these fishing sites where people used to set up their fishing nets. We'll lose them forever," (VAP32, p. 74). Of these sites, Smokey Hill is undoubtedly one of the most important to Crees, both from a cultural and historical perspective. Because of its rapids, it is also valued for its sheer beauty. Some residents are apprehensive about the loss of this traditional fishing site: "There's a possibility that we could lose Smokey Hill, a very important fishing site for the community," (VAP34, pp. 61-62). Someone else specified that the project could alter the water quality of the Smokey Hill rapids, and thereby have an indirect negative impact on the number of fish at this site:

"I’m very troubled, because I fear for the future of Crees if we lose Smokey Hill. What worries me is that this water will change, will be altered, and there won’t be as may fish, and they won’t swim by Smokey Hill. Those fish who come to Smokey Hill, they’ve been there for a long time and we'll likely lose this site, Smokey Hill, and lose our fishing site because of changes in the water," (VAP32, p. 71).

In another perspective, a certain number of Crees wished to emphasize that the changes to their way of life had - despite everything - been beneficial in some ways; for example, it's easier for them to meet the needs of their families. According to them, it used to be harder to eat well in the past. Now, it's simpler, what with food available in grocery stores. They also own various consumer products, much as those found in North American society. Also, the transportation methods they now use to hunt, trap and fish make accessing these resources significantly simpler. A resident notably stated:
"You know, our ancestors often had very little to eat, why sometimes they only had broth. Life is simpler now, and people have fewer problems feeding their children. I went through exactly such times myself. On numerous occasions, I would get up two hours before the sun rose to head off in search of food for my family. I was often gone until ten in the evening, when I would bring home what I had found to concoct a meal. It was hard. I know that life in the past was not easy by any means. People then had it much harder than we do now," (VAP32, pp. 64-65).

**Means of travelling**

Numerous Crees are very upset with the new travelling conditions implied by a partial diversion of the Rupert River. The majority of Crees claimed to use the Rupert River mainly as an access road leading to various traplines in the region. According to them, the two main reasons they fear the new travelling conditions are increased difficulty navigating in the river’s estuary and future ice conditions (particularly in the spring and fall). They are concerned that problems due to the river’s current condition will only be exacerbated by a diversion. These problems are tides, winds and channels, as well as isostatic rebound, which makes boating in the estuary less safe and more difficult. For example, one of them claimed that:

"As regards navigation, I would like Hydro to specify what it means when they claim that the water level will be at 1.4 m, I think, at least that’s the figure I believe I heard yesterday. Does this represent the water level at low or high tide? Because in these parts, when the south wind is blowing heavily over the Rupert River, water leaves the bay and the water level at the mouth of the Rupert makes navigation difficult, even dangerous, and more so at night," (VAP32, p. 26).

In addition, many of the territory’s users dread ice conditions in the spring and fall, particularly when hunting or fishing. The opinions of two residents accurately summarize the concerns shared by other Crees in this regard:

"How will ice be affected at the mouth of the river? What will ice conditions be like in the spring and fall? Will it be dangerous? Where will we be able to cross? In springtime, until when will we be able to travel on the ice at the river’s mouth? This is where we hunt in the spring, along the banks, at the river’s mouth, and near the bay," (VAP33, p. 107).

"When there’s less water, like at the mouth of the river, the ice is sometimes very thick and the water level, very low. So, we can’t know what will happen in the spring, when the ice starts to break. So what will occur in the spring is a mystery," (VAP34, pp. 58-59).

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Finally, to ensure safe access to the hunting grounds and traplines north of the Rupert River, a resident suggested that the proponent undertake to erect a permanent bridge connecting the two banks. According to him, this solution would be less costly for the proponent - and safer - than using helicopters in the event of possible impacts affecting ice conditions:

"With spring and all that it entails, namely ice and the related concerns regarding the safety of members of the community, I recommend that a bridge be built before the first rapid on the Rupert [at around KP 5] and that a secondary route be developed in a location that would allow us to access the north from Rupert Bay, this for people who hunt and trap in this zone. Using helicopters in the spring and fall would be too costly in terms of remedial works, while an access road and bridge would be much wiser over the long term, as well as being safer for the community. [...] the immediate construction of this bridge and a secondary route to Waskaganish, to be done as part of remedial programs," (VAP31, pp. 101-102).

**Impacts on wildlife**

A high percentage of the Cree residents having expressed an opinion during the hearings feel that the project will have a major impact on most of the animals living in or frequenting the zones impacted by the project, including the Rupert River. In their opinion, the primary impacts will include fewer animals and the relocation of populations to unaffected zones. Some people have observed important changes among animal populations subsequent to past development projects on the James Bay territory, and believe that this project will only result in increased pressure on wildlife:

"We know that there are fewer animals, and fewer and fewer of them along the river’s banks. [...] I always use the banks of the Rupert River and I’ve noticed that moose have also been affected by these changes. Once upon a time, many years ago, the beaver population was growing. I’m very aware of how wildlife is impacted, how it reacts to development within the territory. There are some things we’ll lose, never to have again," (VAP32, pp. 75-76).

Others spoke of the deforestation work that will eventually be necessary as part of the project. This work, in their opinion, will have a major impact on birds and caribou, by decreasing their natural habitat: "What will happen as regards to the forest must also be considered, its impact on birds. [...] The boreal forest, we know that this is an area where caribou are even more at risk than are other species," (VAP34, p. 8). This viewpoint was corroborated by another resident, who is of the opinion that caribou have adopted new migration corridors subsequent to other hydropower development projects, and that this may happen again with this project, notably because of the creation of upstream and downstream diversion bays. This resident then gave his vision of where things stood:
"We were reassured on a number of occasions that there would be no effect on wildlife. So then, why did caribou migration patterns change drastically over the past five years? My trapper friends in Mistissini used to see caribou all winter. Now, there's never a caribou in the area. Caribou are now going to Nemaska and even venturing into the villages. The former village of Nemaska is sometimes filled with caribou, a phenomenon that has never been seen before. The same is happening at the top of Champion Lake. There never used to be caribou there, and now there are plenty. The reason, as far as I can tell – and I’m no scientist -, but my impression is that all of our lakes [reservoirs] created in the North are lacking moss, or lichen, or what’s there is not of a good enough quality. And, given that the ancient site where they used to feed is flooded, caribou are relocating. Moreover, they seem to love roads, and follow roads whenever they see any! That’s why there’s been a shift in migration patterns," (VAP33, p. 50).

Finally, some Crees believe that fish in the Rupert River will be significantly affected once the project is operational. Among other reasons, the dewatering of feeding areas has been cited: "If the project goes ahead, everyone will be impacted, along with wildlife and fish. Fish have a source of food now, but if the project is completed, this will change. Fish will not look for food in the same spots, but rather, will seek out new sources, given the dewatering of their usual feeding grounds," (VAP36, pp. 11-12). Moreover, according to a young Cree, changes in the quality of the river’s water will kill off fish. "This river is very quiet, with fish and animals. If the dam is built, don’t you think fish, animals and birds will be affected by the water quality? Do you think the water will remain unchanged? [...] I don’t want to see fish dying in the river, and ending up on its shores, belly up!" (VAP33, pp. 87-88).

**Water quality in the Rupert River**

Generally, Crees believe that the decreased flow of the Rupert River, once the project is underway, will affect water quality and water levels. Wary of future impacts on the river’s water quality, residents fear that salt water will enter the Rupert estuary at high tide. One individual voiced his worries as follows: "This means that subsequent to the diversion of the Rupert, we can expect salt water to advance closer to the Rupert River estuary," (VAP34, p. 60).

Also, some people expect other negative repercussions as a result of changes in water quality and levels. They are thinking of the impacts on drinking water and leisure activities for children. In this regard, a resident indicates that her children often play in the river, and wonders whether they will be able to continue doing so:

"I can tell you that children play in the river during the summer. [...] There are also winter games where all types of activities are organized on the river. In the future, will our children be able to continue playing as they now do on the river? I don't think so. I don't think this has been considered, and I don't believe anyone has given any thought to children's activities in the zone and territory. [...] the children keep asking us the same questions. Where will they play? Or, where will they go fish? Those are the questions that keep coming up, time and again. If the project is authorized," (VAP36, pp. 92, 97).
Jobs and training

Many Crees agree that training is now essential to enjoy the best possible employment conditions. This was not the case in the past, when traditional activities were sufficient to allow them to meet their needs. A Cree student explained her view of the situation: "Jobs in the future will require advanced learning. We need to learn to hold a job, and can't find a job just like that nowadays [...]" (VAP36, p. 4). Furthermore, faced with relatively new social realities such as a rapid increase in communities and a drop in traditional activities, Crees consider that a growing number of paid jobs are necessary, particularly for youths. One resident emphasized:

"Here in Waskaganish, we need work, jobs, we certainly need jobs. Around four hundred children will graduate from high school, and jobs will need to be created for them [...]. There are not enough jobs for people to stay in Waskaganish and work. In Waskaganish there is no growth, no job creation," (VAP31, p. 104).

Given these new circumstances, some Crees view the project being assessed in a positive light, despite the challenges facing them (language, Cree school grades, cultural differences between Native and non-native workers). In their opinion, the project could represent employment opportunities for members of Cree communities. They hope that these will not merely be temporary jobs, during the construction phase, but rather, jobs that will extend to the facilities operations phase:

"As regards employment, jobs will become available and remain so after the project. [...] I only ask that the jobs continue to exist once there has been progress on the project. [...] my request involves our people having access to jobs in the future," (VAP36, pp. 24-25).

Permanent changes to the Rupert River and psychological effects

A number of people are concerned at the thought of the Rupert River being permanently altered. Some Crees claim to be troubled that the Rupert River will no longer be natural, intact, yet fail to specify the changes ensuing from the diversion, with the exception of the fact that the river will be overly dry and its bank exposed to excess flooding: "[...] if the river is harmed, we won't be able to change that. The harm will be irreversible and we will lose all that is in the river, and be left powerless to recover what was there prior to the changes," (VAP32, p. 72). Another resident speaks of the aesthetic value she feels the river brings, noting that she is likely to lose this if the river’s appearance is altered: "I've been able to note the beauty along its shores. And of course, once the project is completed, the river will look different than it once did," (VAP33, p. 104).

Cree comments on changes to the river generally incorporate a profound sadness and a sense of loss, both individually and as regards the community: "Everyone who uses the river and has a trapline suffers. Even I suffer, I can tell you that. I know that portages will never be the same, they will never be the same," (VAP36, pp. 78-79), or yet still, "The diversion of the Rupert River will represent an important loss for the community," (VAP34, p. 40). Young Crees seemingly share these feelings, as underscored by one of the residents:
"Certain youth in the community to whom I’ve been speaking already feel the loss of this river," (VAP35, pp. 35-36).

Social impacts

Like other Cree communities, the community of Waskaganish is currently experiencing major social problems that many are blaming on recent development projects in the James Bay territory. The main social problems involved are often related to alcohol and drug abuse, which subsequently creates other problems, among them domestic violence, child neglect and attempted suicide. Many Crees believe that the project may well magnify these problems:

"We can already see, observe the costs [of development projects]. When we observe the social problems in the community: drug abuse, alcoholism, neglect, abuse... Thus, this is the [social] price of adaptation that we will find ourselves paying. We anticipate, moreover, that these problems will be exacerbated if the diversion of the Rupert River continues," (VAP34, p. 43).

In addition, it is worth highlighting that the Chief of the Waskaganish First Nation has indicated that the project had already noticeably impacted the community's social fabric and individual health, specifically given the opposing stances adopted by residents, combined with the resulting stress, unease and uncertainty. Comments in this regard were expansive:

"I can ascertain that the diversion of the Rupert River is a mega-project that constitutes a threat to our social fabric and well-being, notably due to the lack of consent and acceptability. Our community is split by this issue, and even persons are confused. This creates a lot of confusion, with a decided impact on community health and well-being," (VAP34, pp. 40-41).

Tourism potential

According to some, the natural features of the Rupert River are the foundation for all of this region's promotional tourism activities. In fact, according to the tourism coordinator of the Waskaganish First Nation: "When we promote our products, we talk about the Rupert and its natural beauty. We market it to tourists, and it sells. It's an excellent point for winning over customers; the river's beauty is unequalled, absolutely natural and untouched," (VAP36, p. 53). According to the Chief of the Waskaganish First Nation, if the project were authorized, the work on the river - with its resulting decreased flow - would reduce the region's tourism potential and as such, possible economic spin-offs for the community. He notably recommended that the region's tourism potential be comprehensively evaluated, by specifically considering the attraction of the Rupert River, and this prior to the two governments reaching a decision as to the project:

"Otherwise, all of this potential will be lost [] subsequent to [the] diversion. Who would want to bother visiting a series of ponds? And to boot, dead ponds, lifeless and smelly, instead of a powerful northern river that has been flowing for thousands and thousands of years. So before accepting this project, we must complete a study to determine the region's tourism and ecotourism potential," (VAP34, p. 48).
The Cree Outfitting and Tourism Association (COTA) representative noted that the Rupert River currently attracts a certain number of tourists from the United States, a clientele it fears would lose interest in the region were the project to be given the green light. Furthermore, even if outfitters and sport fishing currently constitute the region’s main tourist attractions, the COTA representative believes that the project is an excellent opportunity for the proponent to participate, among others, in the development of ecotourism products and services that could contribute to the growth of a sustainable economy for the sector, while notably promoting traditional Cree culture. For example, were the project to be completed, COTA would ask the proponent to set up a fund of $1 million a year for tourism development. This fund would be available to COTA upon the project’s completion, notably to develop various training programs on Cree culture, and this as a means of promoting the potential of the Rupert River.

The fear that other hydropower projects would follow on the territory
Residents made a few allusions to a fear that were the project authorized, the proponent would plan other hydropower projects on the James Bay territory. One stated, for example: "[...] I don't believe it, when they say they won't touch the Broadback and Nottaway [rivers]. In the James Bay and Northern Québec Agreement, it was agreed that these rivers would be developed, and I can't see them not being touched," (VAP33, pp. 103-104). Another resident expressed the wish, without much believing in it, that there would be no other hydropower projects over the next few years, stating that at a certain point, development has to stop:

"I don't think this is the last [hearing] were we'll talk about rivers, dams and such, but I wish that at some point we could just say: "OK, we are at this point, it's over, we can't take any more." [...] I wish there could be an end to these projects, but once they start with the Rupert River, I think they'll forge ahead with other projects. It's project # 1-A, and don't forget that there are twenty-six letters in the alphabet." (VAP33, pp. 52-53).

3.6 COMMENTS, QUESTIONS AND CONCERNS BROUGHT FORTH IN CHISASIBI

Public hearings were held during 2 sessions at the Mitchuap Centre (June 6 to 9, 2006).

3.6.1 GENERAL COMMENTS

The Crees of Chisasibi spoke on several occasions of their ties to the land, divinity and their traditional way of life. They also evoked the transmission of knowledge from one generation to the next, another element they consider essential to their well-being. They also spoke almost exclusively about the major changes that the Cree society has undergone over the past thirty years, since the beginning of hydropower mega-projects on the territory (notably, the La Grande Complex project, executed in the 1970s and 1980s). Despite the fact that some changes were advantageous to Cree communities, generating among others improved overall health conditions and a greater pool of paid jobs, nearly all of the Crees brought up the negative impacts they had been forced to deal with, both personally and as a community. One of the residents offered a clear summary of this dichotomy between
negative and positive aspects, through an analysis of the repercussions of hydropower development projects:

"Over the years, I noticed a multiplication of changes. Our standard of living improved tremendously and a greater amount of money was circulating among people and families. Yet, this also brought its share of problems: alcoholism, drug abuse, it's easy to get drugs here nowadays. People lost their sense of self over time. Life became increasingly materialistic. We own trucks, ATVs, but we've let our traditions fall to the wayside, because of money. This is the outcome of the La Grande project and of the money received subsequent to the James Bay and Northern Québec Agreement. Of course, there was also the emergence of the Cree Board of Health and Social Services, as well as major economic spin-offs over the years. Which I see as a positive thing. Unfortunately, these developments were not without their share of physical, mental and emotional problems," (VAP41, pp. 50-51).

In view of the comments regarding social and cultural changes, illustrated by numerous personal experiences and examples from the community, eight main categories of impacts were created: flooding of the territory, traditional lifestyle, social problems, psychological effects, wildlife resources, drinking water, ice and travelling conditions on the La Grande Rivière, and problems communicating with the proponent.

**Flooding of the territory**

The creation of reservoirs as part of the La Grande Complex hydropower project has flooded a vast trapline area, with ensuing problems for tallymen (damaged fishing nets and accident risks due to floating debris underwater or in the reservoirs). The flooding of land where Crees once hunted and trapped has had the notable repercussion of limiting tallymen's access to wildlife resources harvested as sustenance for their families. In this regard, one of them indicated that in addition to having ruined his equipment, "the water has destroyed most of our traplines. Since the flooding, we've lost a good part of our supply resources, and believe me, I don't want our territories to be flooded, I don't want any more flooding," (VAP37, pp. 83-84). Basing himself on his own experience, he mentioned that he wanted to ensure that other tallymen would not be similarly affected:

"I hate to think that others who risk seeing their territories flooded will live through such a situation. [...] if they were to one day realize that like me, their territory no longer brings them anything, think of their loss, for they subsist thanks to this land," (VAP37, p. 85).

Several Crees indicated that burial sites had been submerged when there was flooding of the territory due to the hydropower facilities of the La Grande Complex. The majority of them have a hard time with the thought of these sacred sites now under water: "What actually hurts the most is what's submerged. There are burial sites, for example, at LG-2," (VAP42, p. 54). A few persons
underscored that one or more members of their family are buried at these sites, and they are bitter that no one notified them when the lands were flooded:

"There was a cemetery there, where my father was buried. My mother was buried elsewhere. When these two sites were flooded, I had no idea the burial sites would end up submerged. I was very upset by this. I saw water levels rise above the burial sites. And these are not the only burial sites that I'm aware of where this has occurred, there are others," (VAP38, pp. 102-103).

The fact that these sites are now underwater makes it harder to identify these persons and hold commemorative ceremonies, as noted by a resident: "Our elders spoke of burial sites, and the burial ceremonies they took part in. They spoke about burial ceremonies for their children. This is now but a souvenir, everything submerged by water," (VAP41, p. 87). Some Crees hence wished for various means - such as monuments in memory of those buried on land that had been flooded - to mitigate the impacts of the flooding of burial sites: "Personally, I want them [members of the community of Chisasibi] to see their ancestors whose tombs have been flooded. Their burial sites have all been flooded, they're now underwater," (VAP42, p. 33).

**Traditional lifestyle**

The Crees repeatedly reiterated the major changes to their traditional way of life since the onset of major development projects, particularly that concerning the hydropower facilities of La Grande Complex. They indicated that in the past, most Crees hunted, fished and trapped to meet their needs, as well as those of their family and community. These means of sustenance were passed on from one generation to the next, and with values such as sharing and mutual aid, considered a cornerstone of Cree culture. They notably had special knowledge of how to use the natural resources in their environment. According to many Crees, these resources have decreased over the last decades, and today’s youth are less and less aware of them:

"Changes to a river’s environment imply altering the way of life of animals, fish and waterfowl, and even more specifically, the lifestyle of people living on the territory. We can today see the effect this has on our youth. [...] and, we knew how to benefit from the wisdom of the elders, our grandfathers, our grandparents, and the Crees exploited every part of their territory, a land the Creator has made available to them. They used all of the territory’s resources. Canoes were built of birch bark. Those were the good old days. Now, all of that’s a thing of the past," (VAP41, pp. 79-80).

The disappearance of certain hunting and fishing grounds due to flooding of the territory, infrastructure construction and changes in the flow of the La Grande Rivière, combined with a growing population in the community of Chisasibi, have brought about a significant drop in traditional activities and a greater reliance on paid jobs, material goods and money. Various examples were offered by residents to depict the changes to their traditional way of life. The Cree Nation Youth Council representative notably made the following comments on these changes: "A great deal of our territory has already been destroyed, and we are left with no other choice than to buy our food.
We use money. Hydro-Québec promised long-term jobs for Crees, because we lost our traditional lifestyle. Now we need money to earn a living," (VAP42, p. 23). Hence, several young Crees were opposed to the Eastmain-1-A and Rupert diversion project. Others also indicated that the availability of motorized means of transportation had altered the sense that Crees once gave to the land:

"Many people here today once travelled, and in the past, people moved about on their own, not by mechanical or other means. Regardless of the distances covered, people would travel, for example, on foot. But now, people are more dependent on equipment, means of transportation, vehicles. Even here, we use machines to travel. This means that we lose contact with the earth. Communication suffers and solutions need to be found, especially as regards to our youth," (VAP38, pp. 91-92).

Among the traditional fishing sites impacted by La Phase 2 of the La Grande Complexe hydro-power project, Premiers Grands Rapides was mentioned by Crees, who noted that it no longer existed since the construction of the LG-1 generating station. Considered a gathering place of great importance to the community, and a site where they could stock up on fish, a parallel was drawn between this site and Smokey Hill on the Rupert River:

"At the time, Chisasibi had a site that could be compared to Waskaganish’s Smokey Hill. Our site was called Premiers Rapides, and it was where LG-1 now stands. Obviously, this site no longer exists, given the dam that was erected there. We could go fish there, and catch healthy cisco, which were good to eat. Now the fish is full of mercury," (VAP40, p. 59).

Given the loss of this traditional fishing site, some Crees suggested that appropriate compensation could involve building a road linking the community to the island of Fort George. The Chief of the Chisasibi First Nation emphasized that the construction of the La Grande-1 powerhouse at these rapids had one of the most momentous effects on the community, given the site’s historical value. He summed it up as follows:

"One of the major impacts of these changes was the construction of the LG-1 generating station, at the first rapids on the Chisasibi River [Grande Rivière]. This site was primordial to the people of Chisasibi. For centuries, many centuries, it was the site of fishing activities, a very important fishing ground for our people. The site disappeared, and fishing in the area is now only a memory," (VAP43, p. 157).

Social problems

The public hearings offered Chisasibi Crees a forum for reiterating that their community was presently experiencing numerous social problems. They mostly attribute these problems to the La Grande Complex hydropower project, which in addition to destroying territories where they once engaged in traditional activities, also promoted an opening of the James Bay territory, which among other things facilitated access to Occidental culture and values. The Crees hence experienced major changes in their way of
life, along with the loss of traditional values. Many believe that these rapid cultural changes contributed to the emergence of varied social problems. The Crees personally spoke of negative effects that can at times be related to acculturation, i.e., the changes to an existing culture through contact with other, different cultures. A young Cree specifically alluded to this process: "There are so many youngsters who feel angry, they feel lost because they have no cultural identity to fall back on, because of the delayed impact of lifestyle changes," (VAP41, pp. 95-96).

The main social problems cited involved alcohol abuse, drug abuse and suicide. According to numerous people, the presence of alcohol and drugs on the James Bay territory is directly linked to the opening of the territory and the emergence of construction sites necessary for the project. According to a doctor based at the Chisasibi hospital: "I believe that most of the people here agree that the changes occurred following the building of the dams and major roads. This literally opened up the territory to southern influences: alcohol, drug trafficking," (VAP41, p. 57). As was alluded to by other residents, the Cree Nation Youth Council representative claimed that alcohol and drug abuse generally led to other problems, such as compulsive gambling and child neglect. According to him:

"Over the years, we have seen the emergence of numerous social problems. We are now watching these problems grow, yet are at a loss as to how to fight back. We've dealt with suicides, lots of drug abuse and alcoholism, and now we're at grips with a pathological gambling problem. A lot of children are neglected by their parents because of drug and alcohol abuse. Their parents are looking to hide from their problems, at times resorting to suicide as a final solution. Some of us don't see our parents for months on end," (VAP42, pp. 25-26).

As regards to suicide, a community worker for the CBHSSJB (Cree Board of Health and Social Services of James Bay) noticed a significant increase in attempted suicides over the last few years. Others feel that although suicide is considered taboo in Cree culture, everyone should be able to speak openly about it, as a first step towards jointly finding solutions. One young person did just that, by sharing her personal experience with addiction, a problem that experts claim is now too frequently seen in the community:

"I was born after the projects were completed, and now, all that happened because of the LG project, if you ask me whether it had a negative impact, well I'm proof of that. I'm a prime example. I fought alcoholism, drug abuse, and I tried to kill myself more than five time," (VAP41, p. 95).

Other social problems were also mentioned. First, a certain number of residents mentioned the appearance over the last few years of mould and parasites in their dwellings, also alluding to the fact that there is overpopulation in these lodgings. According to the CBHSSJB social worker, these social problems did not exist when the community was located on the island of Fort George:
"The issue of dwellings - I’m well-positioned to understand it - results from a situation where there are simply too many people, with consequences that include the disintegration of families. There are also dwellings that have been invaded by parasites or worms. These worms and parasites were not a problem when we were living on the island of Fort George. And now, it’s one more problem we need to deal with. We’re living in infected homes," (VAP40, p. 68).

Some people also mentioned the marital problems resulting from Crees holding down jobs on hydropower project construction sites. Some of them at times drink too much alcohol and they neglect their families, notably by visiting them less often than before or by failing to financially contribute to the household’s needs, which can lead to separation. Using the recent example of the Eastmain-1 project, the CBHSSJB community worker was able to shed additional light on the situation:

"As regards EM-1, we feel the impact because we must heal the families. Families come to us because of a separation, and people have no more money to feed their family because a worker at EM-1, for example, is not sending money home to his wife. When on leave, moreover, these workers go elsewhere rather than home. So, families come to us for help and support," (VAP40, p. 71).

**Psychological effects**

We must first emphasize that numerous people gave extremely moving speeches during the hearings. This being said, the Crees explained that the flooding of traplines and burial sites, combined with changes to their traditional lifestyle and values since the 1970s, led to various psychological effects. They consider these to be losses, the direct result of the industrial development of societies, and are both sad and nostalgic: "Progress is fine and dandy, but it leads to suffering. It leads to suffering, and there’s nothing anyone can say to comfort you, nor can you tell me you’re not thinking about it. So what will you do to replace all that’s been lost. Because today, we’re deeply affected," (VAP43, p. 131).

In considering the various sources of psychological effects, many evoke the 1980s referendum by the community which led to the move, for safety reasons, from the island of Fort George to the actual site at Chisasibi. Many people feel that this move was one of the great traumas experienced by residents as a result of the La Grande Complex hydropower project. They still find it difficult to talk about this era, and feel that they have not yet completely healed:
"A number of communities were relocated over these past years, but the most important was that of Fort George, when the community moved to what is now known as Chisasibi. The relocation and the manner in which it occurred are closely linked to the LG project and Hydro-Québec's stated intent to increase the river's flow, as previously explained. We don't feel that the community has fully recovered from this move. The scars are still numerous and deep, and we think they will persist for a long time," (VAP43, p. 175).

Some Creehighlight that in certain ways, the community’s relocation was not carried out as it should have been. They were extremely affected by the destruction of personal residences and property. In their opinion, they were not allowed enough time to get ready for the move:

"They took our homes, they moved them, and then they levelled the ground where they used to stand. The elderly still remember it. They still recall objects of value that were there and which they didn't have time to bring with them, because people were not given enough time to gather all of their things before leaving. [...] We were urged to move quickly. How can anyone expect this relocation to have had no effect on us, to not have profoundly hurt us inside? Nobody knows the depth of our suffering," (VAP41, pp. 88-89).

Impacts on wildlife
The main impact on wildlife, as perceived by the Cree and for which they blame the La Grande Complex project, concerns changes to the migration corridors of geese: "Today, geese are not following the same paths in the same way, because of all the infrastructures," (VAP41, p. 82). If geese are not flying the same routes as they used to, where Cree used to hunt, there will be an impact on this traditional activity: "In speaking of goose hunting in the spring, geese are no longer along the shore, as they used to. Before, geese were plentiful, but now, they keep to the interior [of the territory]. It’s not because there are fewer geese, but because their migration corridors are modified," (VAP40, p. 34). The Chief of the Chisasibi First Nation gave an example of hunting for the red-throated loon, which no longer frequents the same sectors because of changes in the La Grande Rivière:

"[the] red-throated loon is a duck that followed the ice, and which we used to hunt. It was fairly abundant, and can still be found quite easily, although we no longer hunt it because of changes to the river since the dam [LG-2] was built. The ice now melts very quickly, and as mentioned earlier, this is a bird that follows the ice. In late April, there is no ice left in the river, so the duck doesn’t stop, it just flies by. This is not the case of an endangered species, it's simply that it no longer stops where it used to," (VAP43, pp. 167-168).

As regards to the impact on fish, certain Cree feel that hydropower projects have brought about a drop in the populations of species found in the La Grande Rivière as well as causing diseases among certain species and rendering them inedible. One of the residents believes that fish are no longer
physically the same as they were and also taste different since the creation of the La Grande Complex reservoirs:

"Since the reservoirs were created, the fish taste different. Before the reservoirs were built, no one ever said I shouldn’t eat too much fish. Since their construction, the reservoirs, I’m told how much fish I’m allowed to eat. Prior to this, I used to throw out my nets and catch fish, but now I notice that fish are not the same, they look different. They’re very fatty, but not very tasty. Before the advent of the reservoirs, I used to eat fish whenever I felt like it. Now, I set out my nets less often than before, because the fish tastes funny," (VAP38, p. 102).

**Drinking water from the La Grande Rivière**

Some residents have mentioned that they used to drink water from the La Grande Rivière directly, without it being processed or treated in any way. Since the work involved in the La Grande Complex project, many of them no longer directly drink the water from the La Grande Rivière, nor that from the water treatment plant installed for the community’s needs. One person claimed to only drink bottled water. Crees explained that the difference in taste and the use of certain products to treat the water were responsible for their refusal to drink water from the treatment plant. Statements made by one Cree aptly recapped the situation of another community member:

"The water was pure enough that we could drink it directly from the river. But today, that’s impossible, it must be treated with chemical products so as to meet recommended standards. Some community members, especially the elderly, won’t drink this water, even treated water. We’re told they don’t like the taste, especially since we have high percentages of residual chlorine in our systems. Had the James Bay project never been initiated, I believe the water from the La Grande Rivière would still be pure enough to drink without needing treatment," (VAP42, p. 36).

**Ice and travelling conditions on the La Grande Rivière**

Following the La Grande Complex project, several Crees observed major changes in the ice conditions on the La Grande Rivière. Generally speaking, they fear for the safety of individuals, notably when travelling on the La Grand Rivière, given that the water does not freeze like it used to, nor is the ice as thick as before, and this since the increase in flow. One person mentioned that new ice conditions increased the risk of drowning:

"The river never fully freezes over. In fact, several people disappeared for this reason, because the river doesn’t freeze over completely. That’s another issue I’d like to discuss, we need to consider that this represents a risk and a hazard to people venturing out onto the ice. Many people have lost their lives, and children go out on the ice, so we should examine this very carefully," (VAP40, p. 27).

Certain Crees mentioned that travelling over the ice had become more difficult, be it on foot or aboard snowmobiles. This results in limited access to the territory. A tallyman made the following comments about travelling via snowmobile: "[...] snowmobiling is very complicated, especially for
youngsters. Our elders taught us how to manoeuvre across the ice, but today, with the dams that have been built, there's open water where we don't expect it and overall conditions are more difficult," (VAP41, p. 31). Another resident supported these comments, but with regard to travelling on foot:

"There are still difficulties hindering us from travelling easily to certain traplines. Before the construction, we could cross the river at any time with no risk. We could even cross on foot if we wanted. We could cross straight over from the village. Now, this is impossible. We can't cross in a straight line anymore, and can't even walk in a straight line on the ice, we have to be transported. This is an overview of our experience since the construction," (VAP41, pp. 42-43).

The issue of the safety of people navigating on the La Grande Rivière and the La Grande complex reservoirs was also raised. The Chief of the Chisasibi First Nation observed that following the flooding of the territory needed to create the reservoirs, there is still evidence of surface wood debris, which represents a real hazard to people travelling across the territory:

"[...] and we feel that river navigation is now unsafe because of floating tree trunks, even floating trees. It's hard for us to use the reservoirs to travel or hunt, hence they constitute a significant impact on our use of the land for trapping, hunting and fishing," (VAP43, pp. 163-164).

Problems communicating with the proponent
On numerous occasions, Crees reported communication problems between the proponent and the Cree population, particularly during past hydropower projects on the territory. Some of them notably claimed to appreciate this consultation process:

"I'm very pleased that you are here. This is surely an omen of the start of an excellent initiative. You are speaking with people, telling us your intentions and listening to our opinions. This hearing is the last phase, and we were not really aware of what was happening. We did not know that Hydro-Québec was planning to intervene on our river, which is odd, given that Hydro-Québec knows that this is our territory," (VAP41, p. 81).

3.6.2 QUESTIONS FOR THE PROPOINENT
The public asked the proponent a series of questions on a number of topics, among them:
- environmental follow-up program for fish;
- mitigation measures aimed at preserving the twenty-two species counted in the Rupert River and maintaining fish populations;
- the water flow and water levels of the La Grande Rivière and the Robert-Bourassa reservoir subsequent to the diversion of the Rupert River;
3.6.3 PRIMARY CONCERNS REGARDING THE PROJECT

Despite the fact that viewpoints expressed by public hearing participants mostly bore on the perceived impacts of past hydropower projects, some trepidation was voiced regarding the Eastmain-1-A and Rupert diversion project. These concerns involved the safety of dams and related works, the erosion of rivers and landslides, the impacts on wildlife, ice and travelling conditions, fish mercury levels, jobs and training and potential as regards Native arts and crafts.

Safety of dams and related works

The safety of dams and related works, as it pertains to the project being assessed, is no doubt the primary concern of Chisasibi residents. Their community being located downstream of the La Grande Complex hydropower structures, the Crees are already feeling a great deal of insecurity with regard to an eventual catastrophe leading to infrastructure destruction. Were the Eastmain-1-A and Rupert diversion project to be executed, it was emphasized that the additional volume of water in the Robert-Bourassa and La Grande 1 reservoirs would increase residents’ insecurity and stress levels: "Personally, I always wonder whether we’re safe here. I continually ponder whether the increased flow of the river could change things," (V AP41, p. 55). There was also frequent mention of the uncertainty regarding events that could irreparably alter the infrastructure and the concrete impacts of such a situation on the community:

"I would now like to talk a bit about the dams themselves. I know all sorts of measures and inquiries have been done, but regardless of what we do, there will always remain an element of risk, regardless of the measures taken, risk and danger to the population, because no one can predict what will happen, and if something happens, no one can stop it," (VAP38, pp. 88-89).

Often-cited events that could damage dams and related works include exceptional precipitation, terrorist acts and earthquakes. The Crees consider terrorist acts and earthquake as elements that will eventually occur and which no one will be able to control. Several people stated that they had dreamed that their community had disappeared following the destruction of the dams. They are constantly worried, with the resulting impacts on mental health, which ultimately affects their quality of life. One of the tallymen alluded to terrorist acts as well as earthquakes:
"We now know there are terrorist threats, which only confirms my doubts. No one can tell us with certainty, we know this because of our dreams, the Creator already knows. The Creator knows that if something is meant to happen, it will. And the odds are that you won’t even see it coming. In years past, there were earthquakes, which people would ignore. Experts tell us that we shouldn’t expect earthquakes, but I’ve been told that there already were earthquakes, although no one had anticipated it. And at the time, there were no means of forecasting or predicting earthquakes. And no one will know, and it will happen. The dams will break, and we will be brought out to sea. If this occurs in the cold season, we will be destroyed, it will happen one day," (VAP38, p. 30).

Given such insecurity, where fear and stress are omnipresent in the community, residents are split as to whether the community should move to a safer location. Some fear that the community will be relocated anew: "Some people talk about relocating us again, I’m not too fond of that idea," (VAP38, p. 32). Many other people, meanwhile, hope that the option of relocating the community for safety reasons will be given serious thought:

"I’ve been to the area where the dams [are] built[s], I’ve seen LG-4, LG-2, LG-3, LG-1 also, which is the closest, and I thought long and hard about them. I thought about the children, because when I talk about this, I always think of the children [.]. I think our children should be moved elsewhere, because the danger is simply too great for them. It was discussed at the start of the project, and I feel that funds should be earmarked for such an initiative, to enable relocating the city [...]. Hydro moved us once, and I can’t see why it couldn’t be done a second time," (VAP38, p. 34-35).

**Erosion of rivers and landslides**

With the increased flow of the La Grande Rivière due to hydropower projects, residents have noted ongoing erosion of the river’s banks, punctuated by more significant episodes, notably in winter. Recent instances of erosion were notably reported. According to a few Crees, if the Eastmain-1-A and Rupert diversion project is executed, the flow of the La Grande Rivière will increase. They fear that instances of erosion will be magnified over the coming years. One of the tallymen explained this widespread apprehension among community members:

"[...] we are not in agreement with the diversion of the Rupert River. [If] it happens, the water level will fluctuate, with a subsequent impact on the banks. The river [La Grande] will flow faster, and this will cause erosion. We know that once the diversion is completed, there will be a much more rapid flow, causing erosion. [...] we’re not very excited, we don’t want, we don’t want that because all we’ll have will be erosion, which happens often nowadays. We’ve already experienced that, erosion," (VAP38, pp. 30-32).

Closely linked to river erosion, landslides are also a major concern to some Crees. They feel that increases in the water level and flow of the La Grande Rivière during the operating period will up the risk of landslides. This corresponds, among others, to one of the concerns voiced by the Chief
of the Chisasibi First Nation: "... a question on landslides likely to occur during the winter. In summertime, it’s not really a problem, but we know very well that it can happen in the heart of winter, which will be an additional risk if the diversion goes forward," (VAP39, p. 5).

**Impacts on wildlife**

As regards the impacts of the Eastmain-1-A and Rupert diversion project, the Crees are all generally concerned with a potential drop in the various animal populations, notably geese, fish and beaver. One resident notably inquired: "Will there be fewer prey, based on the percentage decrease of the river [Rupert] at the time of the diversion?" (VAP42, p. 32). Some expressed their anxiety with regard to the guaranteed harvest levels provided for in the James Bay and Northern Québec Agreement. As underscored by the Chief of the Chisasibi First Nation, cumulative effects of other hydropower development projects on the James Bay territory have left people all the more scared with regard to the diversion of the Rupert River:

"For us, the impacts of previous projects, and then we [would] add 80% of another river, this would be a major impact, in addition to those which already exist, on the ecosystem and marine life, on eelgrass, etc. Plus, there are all those fish in the bay, as well as migratory birds [...]" (VAP39, p. 12).

**Ice and travelling conditions on the La Grande Rivière**

Since the La Grande Complex project, the Crees have noted important changes in the ice conditions of the La Grande Rivière, which makes travelling in the spring, summer and winter, notably by snowmobile, less safe and more difficult. They worry that these problems will be exacerbated if the Eastmain-1-A and Rupert diversion project is executed. One of the tallymen also claimed to be anxious about the frequency and size of ice jams, which could cause flooding: "[...] I’m afraid of ice jams due to too much ice in the river. And this is Hydro-Québec’s fault, regardless of what happens," (VAP38, p. 32).

The Crees navigate on the La Grande Rivière, some of them up to the shores of James Bay, to trap. If the project being assessed were to be constructed, they fear that their movements would be hindered by an increase in La Grande Rivière’s water level and flow subsequent to the diversion of the Rupert River. They are also querying the possible long-term impacts on navigation:

"People trap along the shores of James Bay to the north and south of the river’s mouth, and there are [already] impacts. And if I’ve properly understood, there are more impacts to come. I also don’t think there was an adequate study on the impacts on the bay, the shores, mitigation measures. Will measures be taken, and will there be additional risks when travelling or moving about, long-term risks for example, which have not been identified but will crop up fifteen or twenty years from now?" (VAP39, p. 12).
**Fish mercury levels**

Following the La Grande Complex project, guidelines on fish consumption due to increased mercury levels resulted in the Crees significantly decreasing the amount of fish they ate. Many among them concluded that the fish were toxic and should not be ingested: "And we were told there would be a day when we could no longer eat fish. On the island [Fort George], however, we ate fish at nearly every meal," (VAP40, p. 69).

Crees mostly requested explanations as to factors leading to increased fish mercury levels, the impact of mercury on the public’s health, and recommendations for consumption once the project would be underway. Some confessed fearing that they would be told to cease eating any fish caught in the La Grande Rivière or the La Grande-1 reservoir: "If the diversion of the Rupert River gets the green light, will we hear the same thing all over again? Will we live through the same situation as we did in the 1980s, where we were restricted from eating fish from the La Grande Rivière or elsewhere in the reservoir?" (VAP41, p. 67), or yet still, "I’m sure it’ll boil down to mercury, we won’t be able to eat this, we won’t be able to eat that. And I’m willing to bet that this is what you’ll tell us: “no, you can’t eat fish”" (VAP38, p. 27).

**Jobs and training**

In the sense that Crees must now increasingly rely on paid jobs, notably because of a growing population, some have emphasized that the jobs generally available within the scope of hydropower projects are temporary in nature and limited to the construction phase. Once these contracts are over, the Crees’ economic situation is even more precarious. The Chief of the Waskaganish First Nation believes that this situation will recur with regard to the project being studied, and would like to see more permanent jobs for Crees: "The project will only create a few jobs for a few years, but what will happen after that? I insist, we don’t want jobs, we want careers. [...] sustainable employment, not just a few positions that will only last a couple of years," (VAP43, pp. 14-15).

It is relatively well-known that Crees must successfully face a number of challenges to obtain paid employment, including mastery of the French language and prior education. Participants put forth a number of suggestions to remedy these problems. It was recommended that fluency in French not be mandatory to hold a position, for according to certain people, this attribute does not necessarily take into consideration actual skills: "The mastery of French as a second-language, particularly spoken French, is a must to work for Hydro-Québec. We know very few persons who can boast that French is their second language, yet a good number of them could nonetheless perform the jobs in question," (VAP42, pp. 27-28). Comments also suggested that the proponent should prioritize jobs for youth.

On the other hand, even if the relevance of training programs is acknowledged, it was indicated that these would likely be of greater benefit if given directly in the communities. In fact, some people find it difficult to leave their family and friends to go study, for example in Rouyn-Noranda, Val-D’Or or Montréal. This obviously hinders their performance and may even lead to their dropping out:
"Finally, I’m really glad there are jobs, but I don’t appreciate that our youth need to leave the community in order to obtain the training necessary to hold these positions. Everyone who leaves does not always successfully complete their study programs. Check the statistics and you’ll see. It’s hard when you grow up in an environment with an incredible support structure, only to find yourself alone, in southern Québec, with no more such mechanisms. Even our school, despite the heavy criticism heaped on it, helps our youth graduate. Once they’re in the south, at college, things are not the same," (VAP40, p. 17).

**Potential as regards to Native arts and crafts**

According to the Cree Native Arts and Crafts Association (CNACA) representative, the project could have a negative effect on the availability of certain raw materials such as moose pelts and birch bark, which are often found near bodies of water and are necessary to manufacture typical Cree arts and crafts. For this association, the project incorporates a risk to the production of arts and crafts, and could even limit economic spin-offs due to fewer purchases by visitors to the region. Lastly, in order to avoid a negative perception of Cree arts and culture among the population, it was asked that the proponent work with the association to market this activity sector. It was notably suggested that the proponent create an arts and crafts development and mitigation fund.

### 3.7 COMMENTS, QUESTIONS AND CONCERNS BROUGHT FORTH IN CHIBOUGAMAU

Three public hearings on the Eastmain-1-A and Rupert diversion project were held at the Club de Golf de Chibougamau (April 25 and 26, beginning at 7:00 p.m., and April 27, beginning at 9:00 a.m.).

The opinions expressed during the Chibougamau hearings originated mostly from people from the James Bay region, and included 5 presentations by institutions and municipalities. Other regions also voiced their comments and concerns: Abitibi-Témiscamingue, with two presentations from institutions, and Saguenay-Lac-Saint-Jean, also with two presentations from institutions as well as two from regional engineering firms. A presentation by the Association de la construction du Québec included an analysis of the project from a provincial perspective. There was also a presentation outlining the Cree position, put forth by the Cree Board of Health and Social Services of James Bay, and a presentation by Révérence Rupert, a private organization.

The main concerns brought up during the Chibougamau public hearings mainly involved the positive economic impacts of the project, and consequently, the strong social benefits for Chibougamau, the Nord-du-Québec region, the population of James Bay, and contractors. The issue of project spin-offs was often raised, notably to emphasize the project’s importance for the region and its inhabitants.
3.7.1 COMMENTS

During the public hearings in Chibougamau, comments were made with regard to the following topics:

- the economic reality of the Nord-du-Québec region, and the potential economic benefits of the project;
- the economic spin-offs and role of hydropower projects in replacing traditional core industries in the Nord-du-Québec region;
- a determination of the tourism potential of the Nord-du-Québec region;
- development of alternative power sources, notably wind power, to complement hydropower;
- the awarding of contracts to contractors from the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions;
- the installation of permanent Hydro-Québec offices in the Nord-du-Québec region, notably in Chibougamau, an area impacted by the project being studied.

The following points constitute an analysis of the concerns regarding the social, economic and environmental impacts, as expressed by speakers during the public hearings on the Eastmain-1-A and Rupert diversion project that were held in Chibougamau.

3.7.2 CONCERNS RAISED

Potential economic impacts

Participants were increasingly focused on economic impacts, as highlighted by the various comments and concerns brought forth by presenters in this regard.

JOB SECURITY IN THE NORD-DU-QUÉBEC AND NEARBY REGIONS

Job creation and job security are at the heart of the preoccupations related to the project’s economic impacts. As far as can be deduced, all other economic development components of the project will be dependent on its employment creation capacity; this is a concern for companies located in the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions. In the Nord-du-Québec region, it is estimated that jobs will not be directly related to the project, but rather, considered as originating from the tertiary sector (for example, services offered by small companies such as bookstores and flower shops) and possibly resulting from the project’s substantial economic spin-offs. The entire region’s economy, stakeholders claim, relies on the Eastmain-1-A and Rupert diversion project.

TOURISM POTENTIAL

Tourism is a potential source of economic activity for the Nord-du-Québec region. According to the brief submitted by the James Bay regional conference of elected representatives (CREBJ), people come to the region for recreational activities, among them fishing and hunting. This represents revenues of $34 million per year and 300 jobs. Furthermore, “there is an astounding underdeveloped tourism potential, nearly not developed at all [in the region]” (VAP14, pp. 142, 15-17). In evaluating this potential, it bears remembering that the Nord-du-Québec region is home to three co-existing cultures: the Crees, people from the James Bay region and the Inuit. Culture and natural resources, combined with the appeal of hydropower facilities, constitute the offering likely to be of interest to visitors.
In its brief, the Chibougamau economic and tourism commission declared that the Eastmain-1-A and Rupert diversion project could notably have a positive impact on the tourism industry in the Nord-du-Québec region, inasmuch as Hydro-Québec plays a major role in improving regional infrastructures so as to facilitate this tourism development, notably "…the construction in Chibougamau of an interpretation centre for all of the power generation and transportation equipment on the James Bay territory," VAP15, p. 81, 1-2).

A REGIONAL DEVELOPMENT OUTLOOK

Hydro-Québec Production adopted a regional development perspective when awarding these contracts, which contributed to ensuring economic spin-offs for the more remote regions such as the Nord-du-Québec region, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean. A good number of stakeholders repeatedly stated that the project proponent must continue to award contracts to companies from those regions where the project is being executed. The economy of the Nord-du-Québec region, given the lack of diversity, is entirely dependent on forests and mines, wherefore this region must be the first to benefit from economic spin-offs from the Eastmain-1-A and Rupert diversion project.

In order to maximize positive economic impacts from the project, some stakeholders asked that the value of contracts reserved for bidders from the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions be raised from $1 to $5 million. This request was submitted with the hope of increasing economic spin-offs to these regions, and directly attests to the ability of regional contractors to meet the proponent’s requirements.

HYDROPOWER AS AN ALTERNATIVE TO TRADITIONAL REGIONAL INDUSTRIES

Hydropower is hailed as an industrial option for regions such as Nord-du-Québec and Abitibi-Témiscamingue. Historically, cities in these regions were built around natural resources, i.e., forestry, mining, exploration and harvesting sites. They have thus greatly suffered from the economic uncertainty of the past few years, and witnessed a slump in activities subsequent to the closing of major plants. To compensate for these closings, it was recommended that the Government of Québec "...oblige its crown corporation to follow its example, by notably regionalizing its administrative headquarters as well as its decision-making and operating poles," (VAP15, p. 70.1-5). Numerous stakeholders noted that Hydro-Québec must open offices in the Nord-du-Québec region to better enable the creation of permanent jobs in the region concerned by the project and to allow for providing local contacts and building sound relationships with the region’s contractors. This would also have the added benefit of decentralizing decision-making, notably away from the major urban zones. Moreover, contractors would find themselves in a position to optimize the expertise developed during the project, using it to bid on international initiatives and thereby offering additional economic opportunities to the region.

THE BENEFITS OF AN INFRASTRUCTURE TO FUTURE GENERATIONS

Infrastructure improvements, notably the reconstruction of the route du Nord, which heads north from Chibougamau, to serve as an access road to the project site and the La Grande Complex, will favour the economic and tourism development of Chibougamau. The representative from the
Chibougamau economic and tourism commission (CETC) emphasized why these improvements were necessary: "That the route du Nord be rebuilt in its entirely, so as to meet the necessary safety standards and constitute a safe, permanent and comfortable link for transporting persons and goods between Chibougamau and the works at the Eastmain-Rupert complex," (VAP15, p. 77, 8-13). He added that future generations from the James Bay region would therefore be able to benefit from an improved infrastructure on which they could depend and which could support future development.

**Potential social impacts**
Social impacts are linked to economic impacts, so much so that the two are sometimes confused. In terms of the public hearings in Chibougamau, social impacts mostly refer to the regional identify of people from the James Bay region and the health of Crees.

**REGIONAL PRIDE**

According to the mayor of Chibougamau, Mr. Donald Dubar, if the inhabitants of Chibougamau are to remain in the region and ensure the city’s survival, it is critical that they hold jobs. To assess the region’s potential, Mr. Guy Hétu, general manager of the James Bay regional conference of elected representatives, presented the results of a survey illustrating that 80% of college and university students would return to their native region if they were able to find work. This information was presented in order to promote job creation among youth and to prevent the continued exodus of inhabitants from the region, in compliance with the Nord-du-Québec region’s plan for sustainable development and the maintenance of a viable economy, as expressed by the representative of the James Bay regional conference of elected representatives (CREBJ).

Residents told the review bodies that their region offered an exceptional quality of life. They indicated wanting to live in their regions and enjoy the lifestyle and natural resources offered. The availability of jobs, however, was the one determining factor that would impact such a decision to return or remain. While their ties to the land are recent, this does not in any way prevent them from harbouring great pride in their region. They believe that their role revolves around helping the region to develop, and paint a bleak picture of a province without its lands to the north or the natural resources typical of the region.

**HEALTH PROBLEMS RELATED TO MERCURY LEVELS**

Health problems concerning acceptable mercury levels are a problem for the Cree communities in question, which have historically relied on fish as a source of food. According to the CBHSSJB representative, regulating fish consumption is far from easy, and the Crees do not always fully understand the guidelines in this regard. From another perspective, thanks to public notices regarding fish mercury levels and recommendations that certain fish not be eaten, "...young adults are eating practically no fish at all, with the result that they have very little problems related to mercury levels, which are generally higher among the elderly, who tend to eat more fish," (VAP14, p. 56, 6-14). According to the Cree Board of Health and Social Services of James Bay, there is a direct connection between development projects, including hydropower projects, and the health of the Cree population. A statement was made in this vein: "...major development projects engendered cultural changes with regard to food, which has led to relatively serious health problems among the [Cree population]," (VAP14, p. 57, 7-11).
Potential environmental impacts
During the public hearings in Chibougamau, environmental impacts were less frequently addressed than were social and economic impacts.

**DIVERSION OF A VIRGIN RIVER**

Arguments regarding the environmental impacts of a diversion of the Rupert River were expressed as anxiety about the diversion of a river that is both virgin and still in a natural state. The brief was mostly founded on a feeling of loss with regard to the river, primarily due to its historical importance and recreational potential. During his address, the representative from Révérence Rupert emphasized that the project only represents a short-term solution to current economic needs, and suggested that the proponent consider wind power as an alternative energy source. He also mentioned that the best way of avoiding environmental impacts was to forego diverting the river’s waters. This argument was repeated on several occasions during the question and consultation periods.

**THE RUPERT GENETIC LINE BROOK TROUT**

A Chibougamau citizen expressed his concern over the loss of the habitat of the Rupert genetic line brook trout, which is classified as a unique species. The following question was asked: "If the proposed project is accepted, what changes will the species have to survive once the works are completed?"

**3.8 COMMENTS, QUESTIONS AND CONCERNS EXPRESSED DURING THE MONTRÉAL PUBLIC HEARINGS**

Public hearings on the Eastmain-1-A and Rupert diversion project were initially held at the Dom Polski Centre (week of May 1 to 5, 2006), then at the Montréal Convention Centre (May 16 and 17, 2006). The first week of public hearings mostly involved presentations on a wide range of concerns, with time provided so that review bodies could hear testimonials on three specific themes: fish and other biophysical elements, the Hudson Bay and James Bay regions, and health and other social aspects. During these presentations, federal departments outlined their perspective as to project impacts and responded to questions from the public and the review bodies.

Overall, 67 presentations were heard during the seven days of public audiences. During this same period, 14 people asked questions of the proponent, via the review bodies.

Of the 67 presentations:
- 27 were from entities with an interest in the commercial and economic spin-offs from the project, supported by contractors, engineering firms, consulting firms and municipal and provincial boards of trade;
- 6 were from bodies concerned with environment issues, for example environmental groups, research groups, non-governmental agencies and civil society groups;
- 8 were government organizations, notably municipal administrations and federal departments;
– 8 were entities representing the interests of Natives (among these were 6 presentations from Cree individuals, the Grand Council of the Crees (Eeyou Istchee)); 1 presentation was from the Nunavut inter-institutional working group (comprised of various stakeholders, who each spoke in turn) and 1 from the Metis Corporation of Québec and Eastern Canada;  
– 2 presentations were made by Québec citizens.

### 3.8.1 COMMENTS

The public made comments during the question periods included in the public hearing agendas. These comments fell in a variety of categories, as listed below.

**Economic impacts:**
– development of energy efficiency programs as an alternative to hydropower projects;  
– the cost of power generation in terms of justifying the proposed project;  
– energy efficiency causes and effects;  
– the relationship between Hydro-Québec Production and Hydro-Québec Distribution;  
– a balance between power generation and the interconnection of Québec's power grid to other countries in similar situations;

**Social impacts:**
– the impacts of the study under consideration on human health;  
– the provisions of the Agreement Concerning a New Relationship, known as the Paix des Braves, with regard to project acceptance;  
– a comparison of the social and economic impacts of wind power and hydropower power;  
– a feeling of loss among Cree communities, notably regarding hydropower projects;

**Biophysical impacts:**
– the project’s impact on the Rupert genetic line brook trout;  
– the cumulative impact on the environment of the project being assessed and other hydropower development projects;  
– changes in the river’s temperature and flow, and subsequent effects on the lake sturgeon’s habitat;  
– the river water quality once diversion structures are built;  
– mercury contamination and its downstream migration;  
– an explanation of the methods adopted to identify spawning grounds;  
– impacts on the diversion of warm water towards higher latitudes, impacts that this may have already had on Northern territory ecosystems and the marine ecosystems of James Bay and Hudson Bay;  
– traditional Cree knowledge and the mapping of culturally importance and environmentally sensitive zones.
3.8.2 CONCERNS EXPRESSED

The concerns expressed can be grouped under three themes: potential economic impacts, potential social impacts and potential environmental impacts. Within these broad categories, sub-categories can be determined to better analyze the primary points raised.

Social impacts are usually grouped together with economic impacts so that we can speak of socio-economic impacts. However, to ensure that this analysis is as clear as possible, we have treated them separately. The two nonetheless remain linked.

Potential economic impacts
A large number of stakeholders emphasized the potential economic spin-offs of the Eastmain-1-A and Rupert diversion project. However, the Union québécoise pour la conservation de la nature (UQCN-Nature Québec) insisted that the project could possibly result in a decreased value of the Rupert River, notably for local residents who depend on it for food and tourism. The following points are excerpted from the hearings and considered as potential economic impacts.

Project justification
As regards project justification, the argument put forth by many of the people in favour of the project is based on it being necessary to ensure a stable, low-cost source of power. As explained by the Canadian Hydropower Association, hydropower is a stable power source with fairly low operating and maintenance costs that allow it to constitute a cost-efficient source of energy. Pôle Québec Chaudière-Appalaches declared that hydropower was an important factor in Québec’s historical development, and has become an economic generator. In its opinion, the project being assessed will help Québec cope with its significant debt.

Industrial benefits of the project being assessed
The project being studied is considered a means of directly and indirectly improving the quality of life of the province’s residents. This opinion is supported by a good number of companies and entrepreneurs. From the standpoint of industry, presentations underscored the importance of hydropower development projects to the creation of well-paid, specialized jobs. SGS, Fernand Gilbert Inc., the Québec Electric Industry Association and the FTQ (Fédération des travailleurs du Québec) all insisted that the Eastmain-1-A and Rupert diversion project was particularly critical to keeping technicians and engineers in Québec. They added, moreover, that it would guarantee specialized jobs for the next 5 to 10 years.

According to the Canadian Hydropower Association, again from the viewpoint of industry, the Eastmain-1-A and Rupert diversion project is critical for both Québec and Canada, as it will contribute to maintaining jobs in the turbine and component manufacturing sector, as well as in the area of engineering. The association adds that it would find it hard to understand were Québec and particularly, Hydro-Québec Production, which enjoys a global expertise in hydropower projects, to avoid benefiting from this expertise and offering a sustainable development opportunity to the province.

According to Québec Manufacturers & Exporters, the Eastmain-1-A and Rupert diversion project can easily represent growth of $4.2 to $6.1 billion dollars for the Québec manufacturing sector.
It is thus a key factor in enabling Québec manufacturers to remain competitive on the global market. This viewpoint is also shared by the Aluminium Association of Canada, which declared that the project would ensure an available power supply at a fair price. This association stated that given the additional quantity of electricity generated by this project, development of the aluminium industry in Québec would be possible, up to around $4 billion. It maintained that this would ultimately result in more jobs as well as regional economic development.

Eeyou Communications Network considers the project being assessed as an excellent method of integrating fibre optic to Hydro-Québec’s transmission lines. This could generate positive impacts and mitigate the less favourable effects involving the need for independent methods of offering optic fibre to Cree communities. Eeyou Communications Network maintained that this technology could create diversified alternative jobs to members of Cree communities.

**Regional economic spin-offs**

On a more regional basis, the project is welcome, notably as an economic response to the problem of job security and economic diversification. Representatives of several boards of trade and regional administrations have declared that it would create jobs and help the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions, currently faced with the closing of numerous companies traditionally active in the forestry and mining sectors.

Anticipated spin-offs will be important for the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions, for this is where jobs will be created and a degree of economic stability will ensue. Representatives of municipalities and cities in the Nord-du-Québec, Abitibi-Témiscamingue and Saguenay-Lac-Saint-Jean regions have all proclaimed the necessity of the Eastmain-1-A and Rupert diversion project. During the Pôle Québec-Chaudière-Appalaches presentation, it was emphasized that the project would have economic spin-offs in this central Québec region. Moreover, spin-offs would not be limited to the region hosting the project site and nearby areas, but would also impact all Québec regions, notably by contributing to an overall increase in quality of life, intergenerational equity, the development of technical know-how, a specialized labour force, and greater networking opportunities. Engineering firms that submitted briefs also highlighted the project’s major economic spin-offs for the entire province. Techmat, however, insisted that major projects in general, and this project in particular, enable regions to better compete for jobs and even to increase their ability to bid on national and international projects.

The project will help Québec maintain its competitive advantage and enviable international reputation for its hydropower engineering and capacity. Engineering firms, regional contractors and regional government representatives all believe that the project not only represents economic spin-offs, but will also support Hydro-Québec in upholding the international reputation it enjoys as a result of its engineering successes.

Some also stated that contracts reserved for regional contractors should go from $1 to $5 million. As explained by municipal representatives and delegates from regional boards of trade, this increase
is based on their faith in the ability of regional contractors to satisfy the proponent’s requirements. Furthermore, the Conseil des élus d’Abitibi-Témiscamingue (CEAT) officially requested, during the public hearings, that the proponent further split up larger contracts to enable smaller companies to respond to requests for proposals. Such a move would help small businesses, often located outside of urban zones, better meet the needs of the proponent and thereby keep certain economic spin-offs in the regions (as opposed to urban centres in the southern region of the province).

The FTQ (Fédération des travailleurs du Québec) maintains that Cree communities will be positively affected by economic spin-offs from the project. For example, a training centre was recently inaugurated in Waswanipi to further the hiring of Crees within the territory and on Hydro-Québec construction sites. In its presentation, Construction Péribonka provided examples of how an Innu community organized itself to benefit from contracts related to projects in Saguenay-Lac-Saint-Jean, and noted that the participation of other First Nation communities could also come into play for other project-related contracts.

According to the SM Group, the project will represent a boost to the Nord-du-Québec region’s potential for development. The SM Group and Tourisme Baie-James stated that the building of roads for project construction will enable development of the region’s tourism potential by facilitating travel to areas that could previously not be reached. Indirect spin-offs will ensure the resources necessary for regional economic diversification.

**Regional diversification**

In its presentation, Tourisme Baie-James was insistent with regard to the issue of tourism potential, claiming that Hydro-Québec facilities had over time become major tourist attractions, counting 12,000 visitors each year. The organization is convinced that if the necessary resources are allocated to improving infrastructure quality, tourism can help diversify the Nord-du-Québec’s regional economy and ensure the region’s sustainable economic development. As regards to the Eastmain-1-A and Rupert diversion project, the tourism potential for the regional economy is even more significant, given its planned location near major urban centres and subsequent accessibility by a large population. In its presentation, ComaxAT explained that the Abitibi-Témiscamingue region had spared no effort to diversify its economy, which rested solely on resources and was hence dependent on forestry and mining. Despite the region’s efforts, agriculture and tourism are still slow to be considered major economic activities. Still according to ComaxAT, hydropower projects are an excellent means of diversification for regional economies, where existing labour skills in forestry and mining can easily be adapted to such initiatives.

**Regional identification and youth employment**

From a social perspective, municipal administrations believe that the Eastmain-1-A and Rupert diversion project will offer youth the possibility of regional employment and possibly prevent them from migrating to southern Québec’s major urban centres. Municipal administration members emphasize that continued development absolutely requires the involvement of youth. With no jobs or career prospects, youth will leave the regions. Such an exodus will prohibit maintaining the existing social structure and economic system.
Engineering firm Cima+ attested to the timing of the project. With many engineers fast approaching retirement age, youth will be able to learn from exchanges with them, hence ensuring the transfer of knowledge between generations of engineers. Because of this hydropower project, people - and more specifically youth - will stay in the regions and contribute to regional economic development. The ACRGTQ (Québec Roads Builders and Heavy Works Association) explained that there is generation gap in the labour force of major hydropower projects, since the majority of workers are either in their twenties or in their fifties. There are notably very few workers in the 30-50 age group. According to the association, this gap makes transfer of knowledge that much more difficult. Yet, the ACRGTQ maintains that the Eastmain-1-A and Rupert diversion project will represent an opportunity to ensure this transfer of knowledge to future generations of workers.

**POTENTIAL SOCIAL IMPACTS**

**Use of the traditional ecological knowledge**
This issue was raised by the NTK working group, which explained that it was possible to efficiently use traditional ecological knowledge to better understand changes in a local zone and to call upon people with traditional knowledge to support the introduction of monitoring programs. The Makivik Corporation, which represents the interests of Nunavik Inuit in northern Québec, reiterated this concept.

According to Ted Moses, former Grand Chief of the Grand Council of the Crees and signatory of the Paix des Braves, the tallymen were and are still heavily involved in corrective measures, take part in meetings with Hydro-Québec, and will be involved in the monitoring of impacts. He added that there was a very positive relationship between the Crees and the James Bay Energy Corporation (JBEC). However, during the Montréal audiences, a certain number of participants acting on their own behalf stated that the project did not constitute sustainable development as defined by the Crees, and that the latter’s point of view would have to be further considered in decision-making. This argument ensues mostly from the fact that while many tallymen were involved in the process, the community members and tallymen not directly affected by the project feel as though their opinions were not adequately taken into account at the time decisions were taken.

**HYDROPOWER AND ITS SOCIAL ACCEPTANCE**

According to the Canadian Hydropower Association, hydropower generation is supported by 90% of the population and its development should be maximized. This issue was expressed in another way by Révérence Rupert (EnerZonia), which stated that combining wind power and hydropower would procure the greatest degree of social acceptance while reducing environmental impacts.

The Research Group in Applied MacroEcology (GRAME) stated that in assessing the Eastmain-1-A and Rupert diversion project, all potential social and environmental impacts needed to be taken into account. According to this research group, the sacred nature of the Rupert River does not constitute a sufficient argument to prevent development of a renewable energy option. In its presentation, the Conseil régional des élus de la municipalité de la Baie-James stated that it was hard to listen to comments from people from southern Québec who are against the project, primarily
because they are not from the region and would not be concerned were it not for the project being assessed.

Cima+ attested that Hydro-Québec is an economic generator for the Government of Québec. Socially, moreover, it has developed financing programs in support of festivals and community projects, to help develop and preserve the province’s social and cultural heritage.

The engineering firm Tecsult attested to the international acknowledgement of the Boumhounan Agreement signed by Hydro-Québec and the Crees, and of its acceptance as a constructive means of developing a positive participatory approach to project design and mitigation measures.

**SOCIAL ACCEPTANCE OF HYDROPOWER ACCORDING TO THE CREES**

The Crees have diverging opinions as to the acceptability of the project. The signing of the Agreement Concerning a New Relationship, better known as the *Paix des Braves*, is the main reason that propelled the Crees of Eeyou Istchee to accept the project being assessed. Signed following a referendum in 2002, the *Paix des Braves* was supported by 70% of the Cree Nation. In its presentation, the Grand Council of the Crees (Eeyou Istchee)/the Cree Regional Authority indicated that the signing of the *Paix des Braves* resulted from the fact that Québec failed to keep its promises within the framework of the James Bay and Northern Québec Agreement (JBNQA).

In its presentation, the Grand Council of the Crees (Eeyou Istchee)/the Cree Regional Authority put forth a project acceptance proposal as provided for in the *Paix des Braves*, subject to a comprehensive social and environmental assessment. Furthermore, these agencies underscored that the only way to ensure project acceptance is to introduce monitoring and follow-up methods.

Mr. Moses explained that he viewed the *Paix des Braves* as a means of bringing the Crees to accept the thought of development of the Cree territory and participating in the process. He continued his presentation by declaring that the entire Cree Nation would benefit from the Eastmain-1-A and Rupert diversion project and that if the latter successfully passes the social and environmental analysis phase, the Nottaway-Broadback-Rupert project, as provided for in the James Bay and Northern Québec Agreement (JBNQA), will be abandoned, notably in light of its significant negative impacts and status as a non-viable solution.

Mr. Moses stated that members of the Cree community have risked opposing this project due to media misinformation regarding the *Paix des Braves*, blaming the Cree media for this erroneous interpretation of the agreement. Mr. Moses emphasized that if the Cree communities accepted the Eastmain-1-A and Rupert diversion project through a referendum, it’s because the Cree way of life has changed, relying increasingly on paid employment. He continued on this approach regarding acceptability, claiming that the environment and land no longer represent a means of sustenance for the Crees, having been relegated to the role of cultural activity.
In all of the presentations by Crees during the Montréal hearings, emphasis was placed on the critical role of environment and land in the spiritual Cree universe. The significance of the environment and land was unveiled in the presentation by Charles Esau and Robert Weistche, Chief of the Waskaganish First Nation, who stated that the Rupert River was vital to Waskaganish and that community members identified with it. Chief Robert Weistche, who discussed the river’s importance to community members’ spirituality, fears that the latter will lose their identity if the river’s flow is decreased by a dam. Kenny Blacksmith attested that destruction of the lands at Eeyou Istchee resulted in a cultural genocide, and finds it unacceptable that the Cree culture could be destroyed to satisfy the way of life of other people (other referring to southern Québec and export markets such as Ontario and the United States). In his presentation to the review bodies, Kenny Blacksmith inquired as to why the Crees should waive their human rights to land in order to receive essential services that are available to others living elsewhere.

Furthermore, the Cree Board of Health and Social Services of James Bay (CBHSSJB) also opined that construction sites for development projects, hydropower projects included, brought alcohol and drugs to the Cree’s doorstep, opening the door to potential project impacts.

**UNDERSTANDING OF THE CREE PEOPLE’S HEALTH**

Presentations addressing health issues were mainly the purview of Health Canada and the CBHSSJB. The Fondation Rivières did, however, strongly insist on the fragility and quality of food supplies.

Spirituality is an integral aspect of personal health, and must be specifically taken into consideration to understand Cree health. According to the CBHSSJB, a global understanding of health must incorporate emotional health, mental health, physical health and spiritual health. This organization added that psychological problems are directly linked to developments in the North and to major changes and their contribution to the Crees’ current lifestyle.

According to Health Canada, negative social impacts of the project being assessed will generate a loss of identity, loss of traditions, loss of territory, loss of food security, a weakening of the social fabric, and a loss of social resilience. In its presentation, it notably emphasized that the project will not help resolve social problems in Cree communities but rather, render the people more fragile in terms of existing problems, and this because of increasingly vulnerable social and support systems. Health Canada also underscored that social impacts such as feelings of loss and loss of cultural identity are much more difficult to measure and mitigate than are biophysical impacts.

The Sierra Club of Canada claimed to be worried about the impact on the health of Crees, notably because they have had to abandon a diet rich in fish. It noted problems related to fish consumption according to Hydro-Québec Production guidelines and the negative effects this may have on the eating habits of Crees. In the end, according to the Sierra Club of Canada, the acceptability of the project will need to be measured according to a criterion whereby fish can be eaten at will. Moreover, any project that restricts a population from accessing a food supply source should be considered unacceptable. In its presentation, the CBHSSJB insisted that being obliged to stop eating fish represents
a major social impact for Crees. It further emphasized that this inability to eat fish was in fact the greatest social impact on the Cree Nation. In its opinion, "[…] the mercury levels, fish consumption, obesity, diabetes, all of these issues are interconnected," (VAP23, p. 147). This has had significant impacts on the well-being of the Cree population.

The belief that changes in fish consumption habits is responsible for health problems among the Cree was reiterated in a number of presentations, supported by the UQCN-Nature Québec, and upheld in Health Canada presentations. From the latter’s perspective, the solution put forth by Hydro-Québec Production, which consists of guidelines concerning fish consumption as a means of mitigating health impacts, is far from effective. In fact, this department is against the proponent’s proposals regarding mitigation measures, for the latter has not taken into account the circumstances of vulnerable groups such as young mothers and children, which nonetheless constitute a significant percentage of the population. Further in its presentation, Health Canada underlined its disagreement with Hydro-Québec Production’s recommendations, seeing as the scenarios put forth by the proponent do not consider seasonal consumption of fish, which can be heavy over certain short periods. Health Canada also stated that Hydro-Québec did not have a communication plan or follow-up measures with regard to health impacts from the project. Throughout its presentation, Health Canada asked that a follow-up program adapted to the Cree communities’ reality be created, including methods for measuring social influences on health.

Health Canada’s main argument revolved around the fact that in its environmental assessment, Hydro-Québec Production presented data based on uncertain assumptions, i.e., the acceptance of thresholds in excess of those considered acceptable by Health Canada. According to Health Canada’s premises as presented, the acceptable threshold is clearly inferior to the proponent’s assessment.

**POTENTIAL ENVIRONMENTAL IMPACTS**

Environmental impacts, while not constituting the main topic of concern, were an underlying theme of many presentations. The primary areas of concern in this regard were biodiversity, renewable energy, cumulative project impacts and contamination due to fish mercury levels.

**THE JUSTIFICATION FOR GREEN POWER**

A certain number of presenters, originating from different sectors, supported renewable power, and this for various reasons. Representatives from the Canadian Hydropower Association emphasized that hydropower constitutes a renewable energy alternative that is at once green, reduces air pollution, and ultimately contributes to the fight against climatic changes. In its presentation, Cima+ noted that Canada signed the Kyoto Protocol and that we must benefit from hydropower, notably given its status as a power source that generates relatively few greenhouse gases, particularly when compared to fossil fuels. In a more global perspective, the Canadian Hydropower Association stated that environmental assessments “emphasize local impacts, and subsequently neglect wide-scale environmental impacts such as acid rain, smog and global warming,” (VAP17 p. 80). In this context, we can assert that the Canadian Environmental Assessment Act and the Fisheries Act create
obstacles to increased development of Canada's hydropower potential, and should be amended accordingly. On the other hand, Construction Péribonka considers the environmental assessment process to constitute a process for sustainable development.

According to the Québec Electric Industry Association, hydropower is a reliable source of power generation. Wind power and hydropower are complementary, and should not be viewed as competitive power sources.

The GRAME had a more holistic approach to other power generation alternatives, stating that the project represents a good long-term sustainable option for power generation for the province. The decision to adopt this position, it was emphasized, is mostly based on significant potential negative impacts related to the use of fossil fuels, among these acid rain and climatic changes. The GRAME is convinced that hydropower projects can reduce our reliance on fossil fuels and contribute to reducing greenhouse gases.

As regards project alternatives, Révérence Rupert criticized the fact that Hydro-Québec Production’s environmental assessment did not include a sufficiently comprehensive evaluation of alternatives. The organization also noted that the proponent's analysis failed to truly take into consideration other power sources, notably solar power, the biomass approach and wind power. EnerZonia declared that wind power could represent a viable project alternative, and that wind turbines could be erected in the actual reservoirs, which would have the added bonus of limiting the aesthetic impact. It used the example of Spain and Denmark to justify the potential of wind power in Québec, considering that Spain is an excellent example of using the wind option despite a low possibility of balancing.

JAMES BAY AND HUDSON BAY

The main point raised by UQCN-Nature Québec involved the importance of considering cumulative impacts, which are significant given the Northern region’s particular sensitivity to environmental impacts. This argument was reiterated by Nunavut’s NTK group, which explained in its presentation that the ecosystems of Hudson Bay and James Bay are fragile and should be considered in any environmental assessment. This is particularly relevant as regards cumulative impacts on bodies of water from several provinces, such as Manitoba, and the construction of dams on major rivers flowing towards the north, as well as towards Ontario and Québec, with its numerous hydropower facilities. More specifically, UQCN-Nature Québec believes that enormous volumes of water flowing into Hudson Bay are actually "turbined", whereby the necessity of assessing the degree to which Hydro-Québec hydropower projects have had cumulative impacts on the region.

Cumulative impacts in the Hudson Bay and James Bay region, according to NTK, must be jointly assessed by various bodies, and this given the numerous overlapping of responsibilities in the area of water resources management. One critical element in understanding cumulative impacts on this ecosystem lies in greater knowledge. In the opinion of the Department of Fisheries and Oceans, a common baseline study including Nunavut and other responsible parties should be created to
properly assess the impacts on James Bay and Hudson Bay. In its presentation, UQCN-Nature Québec also discussed the need to assess cumulative impacts in collaboration with all of the parties involved, to generate a good picture of the environmental impacts of regional development, with due consideration given to James Bay’s and Hudson Bay’s status as important ecosystems, particularly for migratory birds.

**UNIQUE CHARACTER OF THE RUPERT GENETIC LINE BROOK TROUT**

The Rupert genetic line brook trout is unique to the region, and not found anywhere else in the world. It only exists in the Rupert River watershed. The Sierra Club of Canada, UQCN-Nature Québec and the Fondation Rivières all believe that the project will impact fish populations in the Rupert River watershed, and negatively impact the Rupert genetic line brook trout, which has a unique genotype. The Sierra Club of Canada emphasized that Canada is a signatory to the Convention on Biological Diversity and must consequently fulfill its responsibilities regarding the protection of unique species.

As regards the habitat of the Rupert genetic line brook trout, the Fondation Rivières explained that its habitat downstream of the dam is localized, relying on rapids and deep pools, and that the species occupies specific ecological niches and will therefore be impacted by the construction of sills along the Rupert River. Lastly, the Fondation Rivières addressed the lack of information in the impact assessment with regard to the Rupert genetic line brook trout. The Crees had identified spawning grounds of this species downstream of the dam in question, but these were notably not included in Hydro-Québec Production’s site options for this structure.

In the opinion of the Department of Fisheries and Oceans, the project will not have a negative impact on fish, and mitigation measures will be introduced to preserve fisheries and protect fish species and their habitats. The Department of Fisheries and Oceans confirmed that fish populations will be locally affected, namely immediately downstream of the dam, but that these impacts will decrease over distance, where conditions will be increasingly in line with natural conditions. It is satisfied with the proponent’s analysis, as well as with the proposed mitigation and monitoring measures.

**Potential impacts on migratory birds**

Environment Canada disclosed its concerns that the mitigation and monitoring measures proposed by Hydro-Québec Production are not broad enough. It suggested that in addition to creating ponds and restoring land plots destroyed during construction to their natural state, the crown corporation should also create sustainable zones for waterfowl, monitor wetlands and adopt strategies for reactive management of migratory birds, and lastly, create artificial nests and plant trees. Environment Canada explained that the implementation of tailored mitigation and monitoring measures might even result in an increase in the number of birds in the affected zone.

In its presentation, Health Canada noted that Hydro-Québec Production’s impact assessment did not adequately expound on contamination due to waterfowl mercury levels and its impacts on the health of consumers eating this food.
Monitoring and follow-up measures and reactive management strategies

In considering the presentations underway, it became obvious that monitoring and follow-up measures were a determining factor for project acceptance and justification. The Nunavik Inuit, represented by the Makivik Corporation, called for these measures, along with the introduction of a monitoring program in conjunction with the First Nations; the NTK working group echoed this request, in the hope of having Nunavut Inuit participate in the monitoring program. The presentation of the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority included a firm stance in favour of long-term monitoring of environmental and social project impacts independently of Hydro-Québec, and notably in participation with representatives from the Cree Nation, the scientific community and industry. Moreover, the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority emphasized the necessity of creating an independent body, given the Crees’ lack of faith in Hydro-Québec. This body should not include any provincial government representatives, because of the latter’s close ties to the crown corporation. Industry is also keen on the creation of monitoring programs, as explained by SM Group in its presentation. The points raised by Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority are for the most part included in presentations by individual Crees, who submitted their own concerns to the review bodies. Kenny Blacksmith hence stated that the proponent had conducted a subjective analysis of impacts, and that it was critical that a separate organization perform an in-depth analysis of cumulative project impacts.

A major point for the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority with regard to developing monitoring methods is the management of water flow as a result of diversion. They noted that Cree participation in this initiative would seemingly increase the likelihood of creating a sustainable biological environment subsequent to the river’s diversion. In this regard, it will be necessary to consider creating an independent water management control board comprised of Crees.

According to the Niskamoon Corporation, the Niskamoon Agreement prescribes the creation of an effective framework for collaboration between the Crees of Eeyou Istchee and Hydro-Québec with regard to all of the agreements signed between the parties. (It was specifically designed as a framework agreement for all other agreements.) In its presentation, the Niskamoon Corporation emphasized that the Boumhounan Agreement conferred specific importance on the Eastmain-1-A and Rupert diversion project. This agreement stipulates that Hydro-Québec shall assume all costs related to the corrective measures included in the certificate of authorization granted for this project. The corrective measures in question are specified in the Boumhounan Agreement. It was notably emphasized, during the presentations of the Niskamoon Corporation and the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority, that these measures were a mere minimum, and that review bodies’ recommendations would be adhered to in an effort to ensure additional corrective measures with regard to project impacts. The Niskamoon Corporation’s presentation intimated that there would be unexpected impacts. The Boumhounan Remedial Works Fund ($32 million) can also serve to remedy these impacts. In recapping, the Niskamoon Corporation indicated its readiness to apply the provisions of the Boumhounan Agreement in the event the project is authorized.

The Department of Oceans and Fisheries believes that a follow-up plan must be implemented in all of the areas to be monitored. It underscored, for example, its concern over the fact that fish must be able to move freely, and that slopes are frequently an issue. According to Transport Canada, Hydro-Québec Production will need to map out waterways in the impacted zones, to notably allow for
implementing any necessary mitigation measures. Again according to Transport Canada, the mitigation measures related to navigation introduced by Hydro-Québec Production will need to cover a 5-year period. Additionally, special attention will need to be paid to wood debris in diversion bays.

**Contamination and fish mercury levels**

In its presentation, Natural Resources Canada discussed the origin of mercury contamination. The federal department attested that the soil in the project zone contains mercury, but that its concentration varies along the vertical and horizontal axes and that plants serve as a catalyst for the release of mercury into the environment. Natural Resources Canada thus suggested that the proponent consider raking as a means of reducing the mercury level, which will eventually be released into the water through methylation subsequent to impoundment.

The Sierra Club of Canada, which mainly addressed mercury and biodiversity, voiced its apprehensions regarding the models used to calculate mercury levels in flooded zones.

**Gaps in the data gathered**

This section aims to illustrate what some have put forth as arguments with regard to the general need for information prior to adequately assessing the project’s social and environmental impacts. This includes information on the assessment process and details supplied by the proponent in its impact assessment.

Based on the information presented by Hydro-Québec, the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority censured the proponent for having minimized the project’s impacts on the Cree Nation overall, including environmental impacts. The organization explained that it quickly became aware that the impacts of the Eastmain-1-A and Rupert diversion project would be major, and that the diversion of such a large river had never been attempted elsewhere in North America. During the public hearings held in Montréal, non-governmental organizations, the NTK working group and government bodies raised the issue of a lack of reference data, particularly with regard to the status of James Bay and Hudson Bay ecosystems prior to the development of hydropower projects in the region 25 years ago. A similar argument was made in the Grand Council of the Crees (Eeyou Istchee)/ the Cree Regional Authority’s presentation, which decried the lack of reference year data with regard to the La Grande Complex development and wondered: how another project of such scope, in light of the missing information, could possibly be justified.

**Second assessments by non-governmental organizations (NGOs)**

The primary theme of this section revolves around the environmental and social assessment process adopted by the proponent in conducting its impact assessment. Some of the hearing participants expressed their disagreement as to the review schedule and the limitations on the financial assistance awarded, which prevented NGOs from conducting good second assessments.

The Sierra Club of Canada emphasized that the assessment process varies according to whether it focuses on the northern or southern region of Québec. In its presentation, the organization shared its concerns regarding regulatory mechanisms in northern Québec and the fact that if a project such as the one being assessed were to increase mercury levels to the estimated degrees in southern Québec, it would be considered unacceptable due to high environmental impacts.
Furthermore, the Fondation Rivière complained about the lack of financial support, specifically given the major potential environmental and social impacts of the project in question. Supported by Révérence Rupert, which had similar claims, the Sierra Club of Canada questioned the legitimacy of the environmental assessment process, and this specifically in light of the minimal financial support granted public hearing participants and the subsequent drop in the potential quality of presentations.

Lastly, the Sierra Club of Canada complained that the review schedule established in 2003 was too short, intimating that this fact "[could] even possibly lead to a legal appeal of the process," (VAP18, p. 33). Révérence Rupert made similar comments, explaining that the time allocated for reading the documents filed by Hydro-Québec was not sufficient, and that it has been shocked to learn that it had less than 30 days to consult certain documents prior to the announcement of the hearings.

In its presentation, the Metis Corporation of Québec and Eastern Canada underlined that the financial aid process implemented for the Eastmain-1-A and Rupert diversion project did not respect the rights granted the Metis, as they were neither consulted nor given funds to assess the project in question.

The city of Matagami also criticized the public hearing process, seeing that no hearings were held in Matagami to enable the population to voice its concerns regarding the project. The city’s mayor contended that the people of Matagami had to travel a long distance to participate in the public hearings, despite having requested that such hearings be held in their city. The mayor noted that the process had therefore failed to allow the citizens of Matagami to present critical information to the review bodies.
PART III

ANALYSIS OF
THE REVIEW COMMITTEE
4 PROJECT JUSTIFICATION

Project justification and the choice of hydropower network have been widely discussed through public consultation, both by individuals and by interest groups. These discussions have been conducted against a backdrop of accelerated development of the wind power sector in Québec and integration of energy-efficient solutions to energy and power supply forecasts. Many questions have been addressed to the proponent about these subjects. It had to specify and explain electrical supply and demand estimates several times over, as well as particular aspects of wind power integration into the Québec electricity distribution network. This interest in justifying power-related projects, a consistent issue in the public review of large hydropower projects advanced by the proponent, is practically inevitable, since the investment required for completing the project is very high, the proponent is a public corporation and the forums debating this issue are rare and may appear to be a closed process to the average citizen. Moreover, during consultation with Cree communities, who will see the project established on their trapping lands, with all of the consequent environmental and social impacts, the review bodies received suggestions for the development of other energy systems that would be less damaging to the environment.

Project justification is a far-reaching topic, involving social, environmental and economic issues and an increasing number of actors, beginning with the Government of Québec and reaching average citizens, including environmental protection groups, professional associations and industry representatives. Following the hearings and after deliberation, COMEX feels that an adequate evaluation of project justification is based on the following three factors: the proponent’s needs for additional supplies, alternative solutions and project cost.

In June 2006, the Government of Québec made public its 2006-2015 energy strategy. It proposes, among other things, to re-launch and accelerate development of Québec hydropower assets in order to meet the long-term demand of the Québec market, promote industrial development that creates wealth and stimulate exports. This document provides an analysis of the project justification, since it establishes the government’s direction regarding energy development and discusses the electricity supply required up to the year 2014 (R20).

4.1 THE NEED FOR ADDITIONAL SUPPLIES FOR HYDRO-QUÉBEC DISTRIBUTION

4.1.1 ENERGY AND POWER SUPPLY

Since the submission of the impact study in December 2004, the estimates regarding energy and power supplies required by Hydro-Québec Distribution (HQD) and the energy and power offered by Hydro-Québec Production (HQP) evolved as described in the documents submitted within or outside of the framework of the environmental evaluation procedure. COMEX is aware that such estimates must be reviewed periodically in order to reflect, as closely as possible, the evolution of all parameters influencing the supply. Therefore, in order to enter the discussion as realistically as possible, COMEX decided to use the data updated at the submission of the
Hydro-Québec strategic plan for the 2006-2010 time horizon, available since June 2006. Tables 4-1 to 4-5 summarize this new data and take account of the data presented in the energy strategy of the Government of Québec made public in June 2006. The scenarios presented below are valid for average hydraulicity and growth.

Table 4-1: Summary of Additional Supplies Required by Hydro-Québec Distribution (TWh)

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<td>(165 TWh PLUS LOSSES)*</td>
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<td>- 2 000 MW (A/O 2005-03)</td>
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<td>(excess)</td>
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</table>

* The energy provided is below the contractual maximum (178.9 TWh) in view of real-time supply management.
** 500 MW of wind energy reserved for the regions (MRC) and native populations are not included. Delivery dates to be determined.
† real data
Table 4-2: Summary of Additional Power Required by Hydro-Québec Distribution (MW)

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<td>39,299</td>
<td>39,794</td>
<td>40,334</td>
<td>40,570</td>
<td>40,692</td>
<td>40,817</td>
<td>40,950</td>
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<td>MINUS HERITAGE ELECTRICITY (165 TWh PLUS LOSSES)*</td>
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<td>37,442</td>
<td>37,442</td>
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<td>37,442</td>
<td>37,442</td>
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<tr>
<td>SUPPLY REQUIRED IN ADDITION TO HERITAGE ELECTRICITY VOLUME</td>
<td>(1 658)</td>
<td>1 857</td>
<td>2 352</td>
<td>2 892</td>
<td>3 128</td>
<td>3 250</td>
<td>3 375</td>
<td>3 508</td>
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<td>MINUS NON-HERITAGE ASSETS**</td>
<td>1 750</td>
<td>1 105</td>
<td>1 809</td>
<td>1 847</td>
<td>1 990</td>
<td>2 145</td>
<td>2 495</td>
<td>2 630</td>
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<td>TRANSCANADA ENERGY (BÉCANCOUR) (A/O 2002-01)</td>
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<tr>
<td>BIOMASS (A/O 2003-01)</td>
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<td>36</td>
<td>36</td>
<td>36</td>
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<td>36</td>
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<tr>
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<td>126</td>
<td>164</td>
<td>217</td>
<td>252</td>
<td>347</td>
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<td>WIND ENERGY (CALLS FOR TENDERS) – 2 000 MW (A/O 2005-03)</td>
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<td>–</td>
<td>–</td>
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<td>90</td>
<td>210</td>
<td>465</td>
<td>600</td>
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<td>SHORT-TERM CONTRACTS SIGNED (A/O 2004-01/03/04, 2005-01/02/04, 2006-01)</td>
<td>1 250</td>
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<td>INTERRUPTIBLE ELECTRICITY</td>
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<td>500</td>
<td>500</td>
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<tr>
<td>ADDITIONAL POWER REQUIRED (ROUNDED OFF TO 10 MW)</td>
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<td>750</td>
<td>540</td>
<td>1 050</td>
<td>1 140</td>
<td>1 110</td>
<td>880</td>
<td>880</td>
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</tbody>
</table>

* 500 MW of wind energy reserved for the regions (MRC) and native populations are not included. Delivery dates to be determined.
† real data
Table 4-3: Hydro-Québec Production Energy Supply (TWh) – with the Eastmain-1-A Project and Rupert Diversion

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<td>AS OF DECEMBER 31</td>
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<td>111.5</td>
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<td>PRODUCTION OF HYDRO-ELECTRIC POWER STATIONS</td>
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<tr>
<td>REDUCTION (INCREASE) OF ENERGY STOCK: REVALORISATION, FILLING AND ADJUSTMENT OF STOCK</td>
<td>(3.9)</td>
<td>0.6</td>
<td>(0.0)</td>
<td>(0.7)</td>
<td>(1.6)</td>
<td>(3.5)</td>
<td>(1.4)</td>
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</table>
Production of the Eastmain-1 power station is 2.7 TWh except for 2010 and 2011, when the contribution from the Rupert river diversion will increase it temporarily to 3.4 TWh, until the Eastmain-1-A power station is opened.

Amounts in parentheses are negative.

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<td>NEW PRODUCTION PROJECTS FOR 2006-2014 HORIZON</td>
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<tr>
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<td>2.7</td>
<td>2.7</td>
<td>3.4</td>
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<tr>
<td>EASTMAIN-1-A</td>
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<tr>
<td>DE LA ROMAINE FIRST HYDROELECTRIC PLANT (STARTING IN NOVEMBER 2014)</td>
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<tr>
<td>MANCEUVRING MARGIN FOR MANAGEMENT OF HYDROELECTRICITY VARIATIONS AND SHORT-TERM SALES</td>
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<td>10.2</td>
<td>10.8</td>
<td>11.6</td>
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<td>15.0</td>
<td>5.8</td>
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</table>

* Production of the Eastmain-1 power station is 2.7 TWh except for 2010 and 2011, when the contribution from the Rupert river diversion will increase it temporarily to 3.4 TWh, until the Eastmain-1-A power station is opened.
† real data
( ) Amounts in parentheses are negative.
Table 4-4: Hydro-Québec Production Energy Supply (TWh) – without the Eastmain-1-A Project and Rupert Diversion

<table>
<thead>
<tr>
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<td>106.3</td>
<td>107.9</td>
<td>111.5</td>
<td>114.2</td>
<td>116.1</td>
<td>10.7</td>
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<tr>
<td>PRODUCTION OF HYDRO-ELECTRIC POWER STATIONS</td>
<td>153.6</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
<td>155.1</td>
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<td>PRODUCTION OF CLASSICAL THERMAL STATIONS</td>
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<td>0.2</td>
<td>0.2</td>
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<td>PRODUCTION GENTILLY-2 NUCLEAR POWER STATION</td>
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<td>3.7</td>
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<td>LONG-TERM PURCHASES (INCLUDING CHURCHILL FALLS)</td>
<td>34.3</td>
<td>35.6</td>
<td>35.9</td>
<td>35.7</td>
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<td><strong>COMMITMENTS IN QUEBEC</strong></td>
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<tr>
<td>EXPECTED DELIVERY OF HERITAGE ELECTRICITY</td>
<td>178.6</td>
<td>178.5</td>
<td>178.4</td>
<td>178.4</td>
<td>178.6</td>
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<td>DELIVERY TO HQD – CALL FOR TENDERS A/O 2002</td>
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<td></td>
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<td>5.3</td>
<td>5.3</td>
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<td>DELIVERY TO HQD – OTHER 2005 AND 2006 AGREEMENTS</td>
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<td>0.7</td>
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<tr>
<td>OTHER (DELIVERY UNDER THE AGREEMENTS AND STATION CONSUMPTION)</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
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</table>

<p>| COMMITMENTS OUTSIDE OF QUEBEC | | | | | | | | | |
| SHORT- AND LONG-TERM CONTRACTS | 3.4 | 3.0 | 2.9 | 2.9 | 2.9 | 2.9 | 2.8 | 2.5 | |
| CURRENT RESOURCES MINUS COMMITMENTS | 186.2 | 186.1 | 189.5 | 190.4 | 190.6 | 190.6 | 190.6 | 190.2 | 4.0 |
| VARIATION OF ENERGY STOCK AND ELECTRICITY PURCHASES | | | | | | | | | |
| HYDRAULICITY (DEViation FROM THE MEAN) | 1.7 | | | | | | | | |</p>
<table>
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<tr>
<th>REDUCTION (INCREASE) OF ENERGY STOCK: REVALORISATION, FILLING AND ADJUSTMENT OF STOCK</th>
<th>(3.9)</th>
<th>0.6</th>
<th>(0.0)</th>
<th>(0.7)</th>
<th>(1.6)</th>
<th>(3.5)</th>
<th>(1.4)</th>
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<td>105.3</td>
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<td>114.2</td>
<td>116.1</td>
<td>10.7</td>
</tr>
<tr>
<td>PURCHASES OF PRIVATE PRODUCTION</td>
<td>0.0</td>
<td>0.1</td>
<td>0.7</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
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<tr>
<td>SHORT-TERM PURCHASES</td>
<td>4.7</td>
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<td></td>
<td>2.5</td>
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<td>0.7</td>
<td>0.8</td>
<td>(0.1)</td>
<td>(2.0)</td>
<td>0.1</td>
<td>1.0</td>
<td>(1.5)</td>
</tr>
</tbody>
</table>

NEW PRODUCTION PROJECTS FOR 2006-2014 HORIZON

| UPGRADES + MATH PROJECT | 0.1 | 0.3 | 0.6 | 0.7 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| MERCIER | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| EASTMAIN-1* | 0.5 | 2.7 | 2.7 | 2.7 | 3.4 | 2.7 | 2.7 | 2.7 | 2.7 |
| CHUTE-ALLARD | 0.0 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.6 | 6.1 |
| RAPIDES-DES-CŒURS | 0.0 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| PÉRIBONKA | 0.6 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| DE LA ROMAINE FIRST HYDROPOWER PLANT (STARTING IN NOVEMBER 2014) | 0.4 | 0.4 |      |      |      |      |      |      |
| MANŒUVRING MARGIN FOR MANAGEMENT OF HYDROPOWER VARIATIONS AND SHORT-TERM SALES | 9.2 | 10.8 | 10.2 | 10.8 | 11.6 | 9.0 | 7.5 | 14.3 | 5.1 |

| NON-COMMITTED RESOURCES AVAILABLE FOR LONG-TERM SALE | - | - | - | - | - | - | - | - | - |

† Real data.
( ) Amounts in parentheses are negative.
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<td>39,155</td>
<td>39,149</td>
<td>39,139</td>
<td>39,129</td>
<td>39,119</td>
<td>39,003</td>
<td>38,754</td>
<td>71</td>
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<td>POWER ASSOCIATED WITH HERITAGE ELECTRICITY, OTHER COMMITMENTS IN QUEBEC AND CONTRACTS OUTSIDE OF QUEBEC</td>
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<td>35,279</td>
<td>35,279</td>
<td>35,279</td>
<td>35,279</td>
<td>35,219</td>
<td>34,984</td>
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<td></td>
<td>192.9</td>
<td>195.5</td>
<td>195.7</td>
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<td>194.7</td>
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<td>600</td>
<td>600</td>
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<td>POWER GUARANTEED FOR WIND POWER INTEGRATION (CONTRACTUAL AND PLANNED)</td>
<td>38</td>
<td>126</td>
<td>164</td>
<td>307</td>
<td>462</td>
<td>812</td>
<td>947</td>
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<td>38,839</td>
<td>38,557</td>
<td>39,265</td>
<td>39,303</td>
<td>39,446</td>
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<td>39,891</td>
<td>39,700</td>
<td>861</td>
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<tr>
<td>CURRENT RESOURCES MINUS COMMITMENTS</td>
<td>(157)</td>
<td>598</td>
<td>(116)</td>
<td>(164)</td>
<td>(317)</td>
<td>(482)</td>
<td>(887)</td>
<td>(946)</td>
<td>(789)</td>
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<tr>
<td>ELECTRICITY PURCHASES (PRIVATE PRODUCTION AND SHORT TERM)</td>
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<td>19</td>
<td>60</td>
<td>102</td>
<td>102</td>
<td>102</td>
<td>102</td>
<td>102</td>
<td>(57)</td>
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<tr>
<td>NEW PRODUCTION PROJECTS FOR 2006-2014 (NET OF RESERVE)</td>
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<td>734</td>
<td>1,317</td>
<td>1,420</td>
<td>1,420</td>
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<td>1,255</td>
<td>1,205</td>
<td>1,040</td>
<td>1,483</td>
<td>2,004</td>
<td>2,002</td>
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</tbody>
</table>

1 Real data.
Source: All tables are taken from the Energy Strategy of the Government of Québec and Hydro-Québec Strategic Plan, June 2006.
Tables 4-1 and 4-2 summarize new data contained in the 2006-2010 Hydro-Québec strategic plan with respect to additional supplies required by HQD. These tables are not as detailed as those presented in the impact study done by the proponent. On the other hand, in comparison with the impact study estimates, they show lower energy and power needs by HQD.

In fact, in the 2014 time horizon in Hydro-Québec’s 2006-2010 strategic plan, the HQD energy requirements (first line in Table 4-1) have been reduced by 3.5 TWh in comparison with earlier estimates, while the power required by HQD beyond heritage electricity (third line of Table 4-2) has been reduced by 387 MW for the period 2012-2013 in comparison with the 2005-2014 supply plan progress status estimates. This decrease can be explained by inclusion of new annual energy savings objectives of 8.1 TWh in the 2015 time horizon, as requested by the Government of Québec in its energy strategy.

Regarding the additional supplies required by HQD in the 2014 time horizon (last line of Table 4-1), contrary to the estimates of the impact study addition (RD-10, tables B and B 1), HQD will have to meet an energy demand lower by 2.4 TWh, instead of an additional required supply of 1.1 TWh. Therefore, it will not have to resort to acquisition by calls to tender for new supplies until 2014.

On the other hand, in terms of additional power required by HQD in the 2014 time horizon (last line of table 4-2), the need for 1,140 MW persists for the 2009-2010 period. It drops to 880 MW for the periods 2012-2013 and 2014-2015. Most probably, HQD must resort to acquisition of power blocks to meet this additional demand.

It appears, therefore, that the results of consumer decisions to save electricity do not influence the demand for power and for energy in the same way. Incentives targeting residential and industrial areas mostly influence energy consumption, but this does not change the need for power during certain periods of the year.

At the public hearings, some of the stakeholders repeated the figures for power and energy required and offered by various Hydro-Québec bodies. They also reached the conclusion that there will be an energy surplus by 2014, which gives the impression that the project is not justified by internal demand of the Québec network. However, it must be pointed out that this surplus is in large part based on achieving energy savings objectives set by the 2006-2015 Québec energy strategy of 4.1 TWh in 2010 and 8.1 TWh in 2015. We must therefore remember that this is a focal area where the proponent does not fully control all the parameters, which largely depend on the goodwill of consumers.

Tables 4-3 and 4-5 present new data contained in HQ’s 2006-2010 strategic plan, regarding energy supplies (scenario at 50% probability - mean flow 1943-2003) and HQP power. Table 4-4 has also been adjusted to deduct the contribution of the Eastmain-1-A project and the Rupert diversion and, therefore, to illustrate its contribution to the energy and power supply. The same exercise could not be done for Table 4-5, since in the proponent’s 2006-2010 strategic plan, the power supply table does not provide details of the power for new production projects.
The following conclusions can be drawn from the new HQP energy and power grid data, provided by the Hydro-Québec strategic plan:

- With the Eastmain-1-A project and Rupert diversion, a manœuvring margin of 15 TWh is feasible by 2010;
- With the Eastmain-1-A project and Rupert diversion and opening of the first Romaine Hydropower Complex Project (0.4 TWh), unused resources available for HQP for sale will reach 7.8 TWh in 2014;
- Without the Eastmain-1-A project and Rupert diversion, the manœuvring margin of 14.3 TWh will be achieved in 2014, but HQP will not have any unassigned resources available for sale.

The proponent’s perspective regarding the manœuvring margin will be discussed further in this chapter.

We can therefore conclude that Québec’s internal energy needs will be met in 2014, since a surplus of 7.8 TWh should be available, according to HQP calculations and a decrease of demand by 2.4 TWH of HQD. However, it is clear that the proponent expressed his intention to be active on the export market.

During the environmental assessment process, certain stakeholders formulated hypotheses which, if they turn out to be true, would further reduce demand in Québec. These hypotheses, among other things, related to the future of industrial development in relation to Hydro-Québec’s rate structure and estimates of electricity prices sold abroad. In that case, the project would be justified exclusively in the short- and medium-term, for exports in which the profit would not have been evaluated in detail. The reservations expressed by these stakeholders show that they are not against the principle of export, but that they are questioning the evaluation of its profitability, especially in the long term, in a context in which energy production outside of Québec is constantly evolving.

Recognizing that export is a direction promoted both by the Government of Québec and by the proponent, COMEX considers that the justification of these hypotheses should not be discussed here. Moreover, the proponent and the Government of Québec have clearly identified their intention to favour exports to increase collective wealth. The Government of Québec goes further, adding a portfolio of new projects to the project being studied, which will partially start operation in 2015 at the earliest.

### 4.1.2 INCREASING THE MANŒUVRING MARGIN

Similarly to the supply and offer of energy and power by HQD and HQP, the concept of manœuvring margin was the subject of interventions at the analysis of impact study compliance and during public hearings. Throughout the environmental assessment process, the proponent was stressing that this margin must be 15 TWh to permit the operator, or HQP, to meet its obligations. For the proponent, the notion of a manœuvring margin is even more important since he must make a report of its evolution to the Régie de l’énergie on a regular basis, demonstrating to this independent body that it is able to meet the demand for electricity at all times.
The proponent indicates that the Eastmain-1-A project and Rupert diversion will add 893 MW of power and 8.5 TWh to his energy park, including 5.3 TWh as of 2010, for diversion of the Rupert river. The project will contribute to re-establishing the HQP manœuvring margin. In this way, as of 2010, HQP will have an annual manœuvring margin of 15 TWh. According to the proponent’s explanations, no long-term commitment in Québec or outside of Québec will be made as long as the annual manœuvring margin for the management of hydropower variations remains below 15 TWh (RP10). This margin includes both the management of variations and short-term export sales budgets. The addition of the energy produced by the project will increase the manœuvring margin, evaluated at the end of the 1990s at, approximately, 5 to 8 TWh, to 15 TWh, since the proponent has been active on the brokerage market.

If the project is not completed, the manœuvring margin would be, approximately, re-established at 15 TWh in 2014 (14.3 TWh), after having fluctuated between 7.5 and 11.6 TWh between 2005 and 2012. On the other hand, there would be no energy surplus available for long-term sale, as indicated in the Table 4-4. COMEX considers that the proponent’s interventions regarding this issue are credible and that the project would contribute to establishing a manœuvring margin that would permit to increase the export.

4.2 ALTERNATIVE SOLUTIONS

4.2.1 WIND POWER POTENTIAL

This subject has been a subject of numerous interventions during the public consultations. The review bodies noted that this energy production form is often seen as an alternative solution to the project. The general consensus presented by verbal presentations and memos submitted is that this form is considered less damaging than the hydropower from the environmental point of view, since it makes a lesser impact on the surrounding environment. Many participants supported accelerated development of wind potential on the territory covered by the CBJNQ.

In the opening presentation at the public consultation sessions and in his responses to certain questions, posed by examining bodies or participants, the proponent presented an argument that execution of the Eastmain-1-A and Rupert diversion project will allow a complementary power quantity to HQD to integrate new wind energy plant until 2014. It must be pointed out that wind energy provides electricity production, which fluctuates in time, according to the weather conditions, wind strength, temperature, etc. Therefore, in order to maintain the continuity of electricity supply, it is necessary to compensate the intermittence of wind energy production by production of energy from sources that can be controlled better, such as hydropower. During the public consultations, the case of Denmark was quoted as an example of a country which can count on a supply system well interconnected with the neighbouring countries to ensure constant delivery of electricity regardless of the contribution of the domestic wind power plants.
This requirement is confirmed by the first agreement of wind energy integration concluded between HQP and HQD, which has been approved by the Régie de l’énergie in February 2006. With this agreement, HQP made available to HQD a guaranteed power equal to 35% (346.5 MW) of the contractual power of wind energy plants in the first call for tenders (990 MW). This is also confirmed in the HQP energy and power supply, where the power guaranteed for wind energy integration is accounted for and varies from 38 MW in 2006 - 2007 to 947 MW in 2014 - 2015.

Development perspectives of wind energy in Québec would also be limited by the capacity of integration of wind energy in the energy transport network. A study performed by RSW (Ministère des Ressources naturelles et de la Faune), has shown that according to the current state of technology, the capacity that can be efficiently integrated is limited to, approximately, 10% of the maximum network demand, or, approximately, 3,600 MW in 2005, and 4,000 MW in 2015. However, research continues in this field and the value of 10% has been adjusted upwards by Hydro-Québec Transénergie (HQT). Development of this sector will therefore evolve according to the technological progress made in this energy production centre.

COMEX considers that the proponent’s explanations regarding the possibilities and constraints associated with this sector are justified. It also notes that the projects involving production of electricity from wind energy require a careful examination of the resulting impact, as in the case of hydropower. For example, we can consider that production of 1,500 MW of power generated by the project and water turbines of the Rupert River in the existing centres of the La Grande Complex, would require a minimum of 1,000 wind turbines of 1.5 MW each to replace it. By comparison, the project of building a wind power plant with the power of 204 MW in the Brisay Sector, which is currently analysed within the environmental evaluation procedure described in Chapter 22 of CBJNQ, involves installation of 136 wind turbines over a surface of 72 km². During the public consultations held in Chibougamau, the proponent specified that a wind turbine park with power comparable to that of the studied project would require a surface of approximately 600 km², which is comparable with the surface occupied by the diversion bays (VAP17, p.179). The surface and adaptation required for construction and maintenance of a wind turbine park with the power comparable to the studied project are therefore not negligible.

For the reasons presented above, COMEX considers that wind energy represents an interesting alternative to the basic hydropower system in Québec, but could not replace viable hydropower projects.

4.2.2 ENERGY EFFICIENCY

The issue of energy efficiency has already been discussed in the previous sections, discussing the energy needs for the 2014 horizon. The current objective set in the energy strategy of 8.1 TWh in 2015 has been integrated into the HQD provisions and, as it was mentioned above, is largely responsible for the reduction of need in Québec in 2014 in comparison with earlier previsions. COMEX does not have data that would permit to judge the value or capacity of meeting this objective.
Nevertheless, it is aware that meeting of such objectives is related to parameters other than those that can be controlled by the proponent, such as the cost of other forms of energy production, the degree of participation of various clienteles in energy savings programs or the economic context of industrial sectors with large consumption of electricity.

We can mention that, since 1992, various objectives set by the proponent have been met with more or less success, depending on the clientele. Therefore, we must keep in mind that the new objective of 8.1 TWh could actually be reached if all external factors influencing the behaviour of consumers are met. Among these factors, many experts note that the electricity rates are a significant incentive to save energy. Otherwise, the manoeuvrering margin required by the proponent by 2014 could not reach 15 TWh, even with implementation of the studied project, which would jeopardize the desired manoeuvrability margin (Table 4-3).

It is now publicly known that the Government of Québec wants to accelerate the development of hydropower with the construction of 4,500 MW of new projects within the next 5 years (R20). Among these new projects, the most advanced in terms of analysis is La Romaine Complex, for which the proponent hopes to obtain authorizations permitting to start the construction of the first station at the beginning of 2009. COMEX notes that none of these projects has been a subject of complete environmental evaluation or public consultations. Therefore, this portfolio of projects would, rather, be part of the proponent’s offer and demand previsions for a further horizon than that chosen for the Eastmain-1-A and Rupert diversion project. These projects cannot be considered as a valid alternative solution and adapted within the time, stipulated for re-establishing of a manoeuvrering margin that the proponent hopes to achieve as fast as possible in order to remain an active player on the exports market.

4.2.3 OTHER ALTERNATIVE SOLUTIONS

During the public hearings, other alternative solutions have been mentioned. They mainly include geothermic, biomass, and solar energy sources. These energy production sectors are considered by the stakeholders as sustainable or renewable in the meaning of sustainable development.

COMEX considers that these alternatives are promising in certain circumstances, but require technological development, which will make them financially more accessible to the whole Québec population. Presently, there are plans to equip public buildings with geothermic systems, indicating a real interest in terms of energy savings. Moreover, the energy strategy of the Government of Québec mandated Hydro-Québec, as well as the Agence d’efficacité énergétique and Société immobilière du Québec, to examine incorporation of geothermic and solar energy in the overall production of energy in Québec and management of governmental buildings. Other jurisdictions are also interested in the development of solar energy. Therefore, there is a willingness to promote these forms of energy in the context of energy savings, especially in terms of heating of houses and buildings. However, in the short- or middle-term, all these alternatives cannot compete with hydropower in terms of rapid availability of large energy and power blocks or contribution to the collective economic well-being.
The proponent also has a possibility to import the electricity up to 15.5 TWh. However, the import mode interconnections are used both by HQD and HQP, and the congestion risks are such that it has been decided to give the interconnection priority to HQD to meet the local needs. In the current situation, the import mode interconnections cannot be considered as a regular and reliable source of supply, but rather as a business opportunity on a short-term market (R19).

4.3 SELECTION OF PRODUCTION MEANS

4.3.1 THE PROJECT COST AND ITS RELIABILITY

The expected total cost of Eastmain-1-A and Rupert diversion is 3,946 million dollars, and, namely:
- 2,043.5 million dollars for partial diversion of the Rupert river;
- 1,179.2 million dollars for the Eastmain-1-A station;
- 723.2 million dollars for the Sarcelle station.

The Table 15-1 of the Appendix to the Environmental Impact Study presents the break-down of the total cost of the project according to the main components. As indicated on page 2-19 of Volume 10 of the Appendix to Environmental Impact Study, this cost does not include the cost of reaching the agreement with the James Bay municipality (300 million dollars), amounts allocated for the funds described in the Boughounan Convention (43.65 million dollars), or the costs of integration to the network (185 million dollars). The cost of transport for the project, in the amount of 179.7 million dollars, is identified in the table 15-3 of volume 1 of the Appendix to the Environmental Impact Study.

Certain participants of public hearings have stressed the fact that the projects flat cost should include the cost of transport and various agreements, signed with interested parties. Others insisted on the proponent’s contribution to the Generations Fund and on royalties, which he must now pay to the Government for the use of water resources as of January 2007. To that effect, we can mention that the proponent in his strategic plan made public in June 2006 specified that the fund will receive water resources royalties calculated as $3.28 per 1000 kWh produced and by benefits resulting from export.

Regarding the project cost, COMEX considers that it is not its mandate to discuss the evaluation of these costs and their impact on profitability. However, all information indicates that the cost of kWh produced is between 4.4 and 4.8 cents, which is clearly advantageous with respect to other hydropower considered or wind energy projects.

COMEX encourages the proponent to show transparency in the domain, sensitive for the whole Québec society, since public investments spread over many years are involved. Therefore, the proponent would benefit from presenting the impact study documents which would include condensed and clear information showing that all costs have been taken in consideration and avoiding giving the impression that a part of information is not easily accessible to the public.
4.3.2 CONCLUSION

COMEX recognizes that re-establishing the 15 TWh manœuvring margin in 2010 is a need for the proponent in the context where collective wealth resulting from sale of electricity is recognized by the Québec society. Therefore, it considers that despite the lower previsions of additional supply required by 2014, this project is a step forward in the proponent’s attempt to consolidate his position as energy supplier.

The analysis of data, evidence and memos at its disposal, leads COMEX to the following conclusions:

- The proponent may profit from the existing infrastructures to produce more energy at an advantageous cost;
- The project is feasible from an economic standpoint in view of the production cost, execution costs and reasonable expectations of profit on the internal and external markets;
- The project may significantly contribute to achieve the desired manœuvring margin of 15 TWh, which will help the proponent respond to the internal demand variations and at the same time take advantage of export markets;
- In view of lowering of provisions of additional supply required by 2014, the improvement of the proponent’s manœuvring margin and export are the essential reason behind the project. COMEX recognizes the legitimacy of these reasons as part of the corporate strategy;
- The project will contribute to the increase of dividends that the proponent will pay to the Government of Québec, to the profit of the whole Québec society;
- As of today, there is no alternative solution and no combination of alternative solutions that could guarantee the same operational and economic advantages as this project;
- Wind energy production represents an interesting addition to this project and will benefit from its implementation, but it cannot replace it.
This chapter deals with the main biophysical issues associated with the project. In this context, "issue" means an environmental, social or broader concern in connection with a project or environmental impact that is a deciding factor in environmental or social acceptability at the project. The selected issues were either raised by the proponent, the experts consulted, the public or the assessment team.

The chapter is broken down into the following project sections: Rupert diversion bays; Rupert-Lemare-Nemiscau Rivers; Rupert Bay and estuary; increased-flow section; La Grande Rivière estuary; James Bay coast as well as the areas affected by structures and related activities. For each section, an impact assessment was conducted on fish communities, the most important issue, land and semi-aquatic animals and special-status species.

5.1 RUPERT DIVERSION BAY SECTION

5.1.1 FISH

5.1.1.1 Fish community maintenance

Baseline
Under existing conditions, the forebay section (see map 5-1) consists of a mosaic of bodies of water of widely varying sizes, characterized essentially by lentic habitats such as lakes and ponds, and to a lesser extent, by streams of different sizes. Based on the proponent's experimental fishing, there are currently thirteen fish species in these habitats.

In the lakes sampled in the forebay, based on the number of fish per species, the mean numeric fishing yield (expressed in number of fish/net-day) and relative abundance, walleye is the most abundant species, followed to a lesser extent by lake cisco, white sucker, lake whitefish, northern pike and lake trout.

In the forebay's rivers, represented by the Rupert and Lemare, the biggest net catches were walleye, northern pike and white sucker. Seine net catches indicated a large quantity of fallfish, blacknose dace, yellow perch, spottail shiner and lake chub. There are no fallfish or spottail shiners in this section's lakes and streams. The streams selected for the sampling contained an abundance of lake chub, mottled sculpin, longnose dace and brook sticklebacks.

For each sampled lake, the proponent used the maximum sustainable yield (MSY) method to evaluate production capacity in kilograms of fish/hectare/year. Based on this value, the biomass in kilograms of fish/ha/year was estimated for each catch species. From these calculations, the proponent concluded that the production capacity of the lakes and rivers in the diversion bays are comparable to existing literature for northern regions.

In terms of biomass (kg/ha), most important species differ slightly from the abundance results because the weight of the individual fish comes into play. As such, the walleye is predominant in
the forebay lakes, followed by the white sucker and the northern pike. When present, the lake trout and the longnose sucker account for much of the biomass. River biomass is primarily comprised of walleye, northern pike and sucker while streams are dominated by brook trout, lake chub, burbot and mottled sculpin.

In the tailbay lakes, the catches and number of species are smaller than in the forebay. Burbots were found in the tailbay lakes but were absent from the forebay. However, there were no brook trout, lake sturgeon, mottled sculpin, round whitefish or longnose sucker. Here again, the walleye is the most abundant species, along with the lake whitefish, lake cisco, white sucker and northern pike.

In rivers, such as the Nemiscau, the walleye, lake whitefish and northern pike are the main net-catch species. As for the seine net catch, the main species are yellow perch and in smaller numbers, lake chub and logperch.

In lakes and rivers, the biomass is supported primarily by the lake whitefish, the dominant species, followed by the walleye, white sucker and northern pike. In the streams, it is supported by suckers, followed by burbot, northern pike and mottled sculpin.

**Proponent’s assessment of future conditions**

After impoundment, the lakes and streams will be interconnected to form a single body of water comprised of a main stream and fairly significant ramifications where the flow velocity will be slower, and in some cases, where the depth will be shallow. The impoundment documented at the La Grande complex shows that, initially, the fish population is dispersed in the new water mass causing the fishing yield to fall off for all species. Subsequently, i.e., from 2 to 6 years after impoundment, these yields gradually increase. For example, in the Opinaca Reservoir, 4 to 6 years after impoundment, lake cisco, northern pike and lake whitefish yields increased 2.5 to 10 times over (R23). However, not all species enjoy the same success during this yield-increasing phase. The results of the Environmental Monitoring Network (EMN), set up by the proponent to track the progress of fish communities in the La Grande complex, show that lake whitefish, northern pike and, in some cases, lake cisco yields all increased. And, despite a tough start, the walleye is now populating these large bodies of water with great success. Thus, in the Opinaca Reservoir, 15 years after impoundment, the walleye catch continues to grow after dropping off in the first 5 years of the reservoir’s existence.

Given the changing trends observed elsewhere in the territory of the La Grande complex, the proponent has formulated the following hypotheses on the evolution of the existing species:

- Immediately after impoundment, the fish population will be dispersed in a very large water mass, resulting in a brief reduction in fishing yields;
- In the two diversion bays, the fish will benefit from the nutritional explosion caused by the decomposition of flooded organic matter. This situation will be reflected in fishing yields, which will increase significantly after impoundment;
- After impoundment, the physical characteristics of the Rupert forebay will be very similar to those observed in Mesgouez Lake. As well, the fish communities of the Rupert forebay will resemble those of Mesgouez Lake once they are stabilized, i.e., 10 to 15 years after impoundment;
– The species diversity of the tailbay will be increased with the addition of small species, which will migrate from the forebay through the tunnel. In the medium range, the lake sturgeon, longnose sucker and brook trout will also be found in the tail’s bay. However, the survival rate of the fish after their passage through the tunnel and the speed of migration are impossible to predict;
– There will not be any significant long-term change in the biological characteristics of the main fish populations of the Rupert diversion bays;
– The larger aquatic area will result in increased biomass. Consequently, there will be a net gain of about 453 tonnes of fish in the forebay and 56.4 tons in the tailbay, comprised mostly of the dominant species, i.e., walleye, white sucker, northern pike and lake whitefish;
– The proponent believes there will be a positive residual impact on fish, both in terms of habitat area and biomass production potential. Given its duration and intensity, this impact is considered major.

**COMEX analysis**

COMEX agrees that the expansion of the aquatic environment will generally favour fish community development and, by extension, increase the biomass of fish that will complete their life cycle. During project assessment, the methods used to evaluate future biomass as well as the accuracy of the results were questioned. While COMEX agrees with the proponent’s predicted biomass increase, it believes that the monitoring program must be better planned to improve the accuracy of future biomass assessments.

However, it would be more relevant for diversion bay users to know the spatial and temporal evolution of the main species by using simple but recognized fish statistics derived from a sampling protocol that is representative of the environment. In this regard, the proponent’s hypotheses mentioned earlier must be verified through a rigorous monitoring program adapted to the targeted objectives.

Given the proponent’s experience acquired during the EMN’s 23-year existence, and the fact that the latter had measuring stations in environments similar to those that will be found in the Rupert diversion bays, the main species should progress in the direction predicted by the proponent. However, such a program must be rigorously planned in order to provide useful information to users of the area and to document the evolution of the fish communities.

To this end, the follow-up program already suggested by the proponent in its environmental commitments (DCAP 15) should be improved by incorporating the following:

– Involve the Mistissini Crees in the planning and execution of the field work to allow them to become familiar with the new bodies of water as quickly as possible. This principle pertains to one of the concerns voiced by the Grand Council of the Crees during the public hearings and reiterated in the brief filed at that time (M46);
– Effective communication of the results to land users (tallymen and other anglers) and exchanges with them during program implementation in order to take their observations and concerns into account;
– Planning of adequate temporal and spatial coverage to test the hypotheses put forth by the proponent using experimental fishing statistical indicators;
– Flexible implementation of the follow-up program and solutions so as to be able to react to the results.
In the supplement to the December 2005 impact assessment, the proponent undertook to redo the baseline characterization before the diversion bay impoundment to better determine the effects of the impoundment on fishing yields. After impoundment, the follow-up program will continue to characterize the temporal evolution of the fish populations (RP10).

Aimed at the fish communities and the fish production capacity of the diversion bays, this follow-up program will be completed with specific measures aimed at checking the effectiveness of spawning ground development or problems specific to certain species (see Map 5-1).
5.1.1.2 Lake trout

Baseline
During experimental fishing aimed at characterizing the fish communities, the lake trout was only found in lakes deeper than 10 m. The fishing, which took place in 2002 and 2004 in certain lakes, produced low yields in both years (0.5 and 0.48 fish/net-day) despite changes to the sampling protocol requested by the Crees, who felt that the 2002 results underestimated the quantity of brook and lake trout. The inventories made it possible to confirm the use of 15 spawning grounds in three lakes in the forebay and one lake in the tailbay. All these spawning grounds are found at a depth of between 0.5 and 2.0 m and are located primarily in lakes RP062 and Des Champs, in the forebay, and in Lake Arques in the tailbay. Fish is also abundant in Bourier Lake, east of Arques Lake, which, however, will not be affected by the creation of the diversion bays.

Proponent’s assessment of future conditions
In the past, the proponent has observed that the lake trout has trouble maintaining its recruitment in the reservoirs due to winter drawdown that exposes the spawning grounds and compromises egg development. However, the proponent also noted that since the water drawdown is less pronounced in the diversion bays, this species will likely be more abundant there and maintain its population over time. Nevertheless, because the existing spawning grounds are becoming too deep, the proponent suggests creating new ones in lakes RP062, Des Champs, Cabot and RP030 totalling 4,157 square metres (PD9).

While the breeding requirements of the species are well known, the success of these new developments is not assured. To increase the chances of success, the new spawning grounds will be stocked with eggs, fries and juveniles. Moreover, to attract spawners at breeding time, a number of individuals of both sexes ready to spawn could be confined in enclosures installed in the spawning grounds.

According to the proponent, these developments in an environment where the maximum drawdown will be two meters will allow the lake trout populations to maintain their recruitment in the forebay. The physical and biological integrity of these developments will be monitored every two years until five years of data indicating the presence of spawners and eggs has been collected.

COMEX analysis
The proponent’s efforts to ensure the breeding of lake trout are acceptable and consistent with the practices. However, in order to complete its life cycle, the lake trout requires sufficient water depth near the spawning ground to limit predation on juveniles migrating between the nursery area and the feeding habitat. Moreover, it is debatable whether the hydraulic, hydrological, physical and chemical conditions that will prevail in the future diversion bays, particularly in Des Champs Lake, which is on the main water route, are adequate as a feeding habitat despite the abundant presence of forage fish.

It would therefore be wise to ensure that the vertical temperature profile of the lake near the new developments is adequate for the survival of the species before developing new spawning grounds. However, these developments will be much easier to implement during the project construction period because the machinery will be on site and the land will not yet be flooded. COMEX was informed of discussions regarding this issue was discussed between the proponent, the Department of Fisheries and Oceans and the Ministère du Développement durable, de l’Environnement et des Parcs. Following these discussions, it was agreed that the proponent would monitor the thermal
regime and dissolved oxygen in Des Champs Lakes and RP062 at the same time as the development of new spawning grounds (SADP22). Concurrently, the proponent will assess other lakes that will serve as new lake trout spawning grounds if the two target lakes prove to be unsuitable for the species' survival (SADP22).

While in agreement with this method of proceeding, COMEX considers that ultimately the goal is to ensure the effectiveness of the proposed measures, meaning that if measures fail in the old diversion lakes, the proponent may have to look for bodies of water outside the diversion bay area that would be more favourable to lake trout populations.

5.1.3 Lake sturgeon

Baseline
The experimental fishing in this forebay section shows that lake sturgeon are found only in fresh water, more specifically, in a 20-kilometre stretch of the Rupert River, between KP 309 and 329, and a 36-kilometre stretch of the Misticawissich River.

A first spawning ground was located at KP 325 of the main reach of the Rupert River and a second at KP 14 of the Misticawissich. Both spawning grounds are in whitewater. Available winter distribution data reveal that the sturgeon frequent the upstream portion of the Misticawissich spawning ground. The number of individuals caught remains low, with a fishing yield of 0.5 fish per net-day. Analyses were conducted to determine the genetic line of the sturgeon catch. It seems that the individuals of the forebay are similar to those of Mesgouez Lake, while certain genetic differences were observed downstream of KP 314 in the Rupert River. There were no catch in the tailbay section.

Proponent’s assessment of future conditions
Once the forebay is created, the habitat will be essentially lentic with a few fast-flowing sections, notably, in the canals. The impassable obstacle located at KP 329 will disappear with the rise in water level, which will allow the species to reach Mesgouez Lake but will cause the two identified spawning grounds to disappear. Mitigation measures are therefore required in order to reduce the project’s impact on this species.

According to the proponent, the entire forebay will become a good feeding habitat and breeding will be supported by the development of two spawning grounds to replace those mentioned above. As such, an initial spawning site will be developed at KP 333 upstream of the maximum level, which is 306.4 m. A second spawning site will be developed 60 m downstream, but it will only be usable when the diversion bay is at its maximum level, i.e., a flow from the Rupert River of 1,260 m³/s and more (800 m³/s diverted and 460 m³/s of instream flow in the lower reaches of the river). All of these developments form the first spawning ground.

The second spawning ground will be developed at KP 35 of the Misticawissich River, approximately 300m upstream of the maximum diversion bay level. This spawning ground could also be used for the walleye and lake whitefish (see map 5-1).

With these developments, the proponent believes that the maintenance of the lake sturgeon in the forebay will be assured. In addition to these measures, the proponent will develop a multispecies spawning ground at the outlet of canal S-73-3, also called C6, which could be used by, among
others, the sturgeon if it populates the entire diversion bay (DCAP25). According to the minutes of the meeting held June 19, 2006 between Hydro-Québec, the Department of Fisheries and Oceans, and the Ministère du Développement durable, de l’Environnement et des Parcs (DCAP22), the sturgeons of the spawning ground developed in canal C6 will be stocked to accelerate the proliferation of the species in this area. Just as in the case of the lake trout, the spawning ground will be monitored every two years until five years of data indicating the presence of spawners and eggs has been collected.

With regards to the tailbay, the proponent assumes that sturgeon will eventually establish itself through downstream migration from the forebay but cannot specify how long this will take. The proponent bases its assumption on the fact that a similar phenomenon was observed in Lake Boyd where a population of sturgeon from the Opinaca Reservoir has successfully made a home there for the past 10 years, when in fact there was not one sturgeon before the Eastmain-Opinaca-La Grande (EOL) diversion (R24). To facilitate the completion of its life cycle, a multispecies spawning ground meeting the needs of the sturgeon will be developed downstream of canal 15, also called C4 (DCAP25). Should the spawning ground developed in canal 15 not be adequate, another will be developed in the outlet canal upstream of Arques Lake. Following the same logic of a gradual move downstream, the lake sturgeon in the diversion bays could eventually end up in the Eastmain 1 Reservoir where the proponent will have introduced individuals from the stock in the Eastmain River, downstream of the Eastmain-1 dam and in the Opinaca Reservoir. There is therefore a mix of the two genetic pools, because the diversion bay sturgeon is genetically different from its counterpart in the Opinaca Reservoir. However, the proponent concludes that biodiversity will be maintained since the sturgeons in the Eastmain-Opinaca system are also found in the upper reaches of the Opinaca River, which is protected from a potential invasion by impassable obstacles.

COMEX

Given that lake sturgeon is a species valued by the Cree and likely to be labelled vulnerable or threatened, COMEX places great importance on its maintenance in the forebay. Moreover, in its analysis, it also noted that the creation of the forebay, especially the south portion where the sturgeon are located, touches three traplines, which increases interest in the species.

COMEX believes that the proponent has made sufficient and acceptable efforts to ensure the breeding of this species in the forebay. However, whether these developments succeed or the cohorts survive to maturity remains to be seen. As for the success of the spawning grounds, the proponent mentioned at the public hearings that similar spawning grounds were developed in the des Prairies River and in the Saint-Maurice River downstream of the La Gabelle powerhouse (R10). In both cases, the spawning grounds showed signs of use despite the interannual flow variation during the breeding season. It can therefore be concluded that the physical design of the proposed spawning grounds (depth, speed, substrate) offers good success potential. However, adjustments may be necessary if the development proves ineffective in terms of adult use or egg or larvae production.

With regards to colonization of the diversion bays and downstream reservoirs by the lake sturgeon, there is a long-term risk of mixing between the Lake Mesgouez-Rupert River genetic line and that of the Eastmain River and the Opinaca Reservoir (see section 5.4.1.1).

COMEX therefore concludes that the spawning grounds monitoring program is adequate, both for the spawning grounds near Mesgouez Lake and in the Misticawissich River and for the C6 canal spawning ground, which will have been stocked with breeding specimens and lake trout.
The success indicators for the developments must also be appropriately selected. The Department of Fisheries and Oceans (DFO) and the Ministère du Développement durable, de l’Environnement et des Parcs (MDDEP) and the proponent agreed that larvae drift would be a good indicator of use because it includes both the laying of eggs and their development (DCAP22). COMEX agrees with this choice.

5.1.1.4 Rupert brook trout

**Baseline**

There are currently brook trout in the lakes and streams sampled in the forebay section. However, it is in the latter that the species is most abundant. The average lake catch size is approximately 400 mm whereas it is about 125 mm in the streams. In both cases, the growth rate is characteristic of these two types of habitats. In the streams, we noted the use of only two spawning grounds. There was no catch in the tailbay section. This lack of abundance was confirmed in 2004 during fieldwork conducted with the Cree trappers concerned (RP22).

Given the presence of Rupert brook trout in the area and its importance for both sport and subsistence fishing, genetic analyses were conducted on individuals from the river itself, as well as on individuals from the different lakes and tributaries that will be part of the forebays and tailbays and from Misticawissich River. These analyses were intended to determine whether the fish belong to the typical Rupert genotype known for its high growth rate when environmental conditions allow. After analysis, it was determined that 12 out of 16 brook trout have a similar genotype as the Rupert genetic line. The four others have a genotype more similar to populations living outside the Rupert watershed, without however, having any particularly distinguishing characteristics.

**Proponent’s assessment of future conditions**

According to the proponent, the brook trout survive in reservoirs but are only occasionally caught due to predation in an environment where the walleye and northern pike are very abundant. Moreover, the diversion bay impoundment will destroy some of the breeding grounds in the lake tributaries in the study area. There will therefore be a low abundance of brook trout, and the proponent plans to support production by developing a spawning ground and improving the feeding habitat in the reduced flow areas. Moreover, the brook trout may find spawning grounds in the residual portions of the tributaries and, according to the proponent, colonize these areas which until now were inaccessible due to impassable obstacles that will disappear with the rise in water level.

The proponent believes that in the long term, the brook trout found in the downstream section will come, like the lake sturgeon, from the migration of individuals. However, it will remain rare, and its abundance will probably compare with that found in the Opinaca Reservoir, where it has been marginal and absent from catches for many years. With regards to maintaining the genetic heritage, the proponent sees no risk of genetic mixing, because all the individuals of the study area will belong to the Rupert genetic line (ES5).
COMEX analysis

The literature concerning this species shows that the Rupert genetic line is found in Mistassini Lake, along with other very different genetic lines of brook trout. The growth rate, diet and spawning migration route are also very different (OED26). As it is found in the southwest portion of the lake, the brook trout will also colonize the stretch of the Rupert River between Mistassini Lake and its mouth, even if the genetic characteristics have not been verified between lakes Mistassini and Mesgouez. It can safely be assumed it is widespread in the Rupert River system because genetic studies conducted to date have placed it both in Lake Mistassini and Rupert River, downstream of Mesgouez Lake, as well as in some bodies of water located in the diversion bay areas. It should be noted that the ability to reach a significant size in a short period of time is not exclusive to the Rupert genetic line. The same phenomenon is found in the Broadback River and Lake Assinica, where the catch includes large individuals belonging to a genetic line that has the ability to reach a significant size if environmental conditions are right.

COMEX believes that the project will have little impact on the Rupert brook trout in the Rupert River watershed given the documented extent of its geographic distribution. However, in the diversion bay section, the abundance of the brook trout will be reduced in relation to current quantity. During the public hearings, some individuals, as well as the Mistassini residents, the Sierra Club of Canada, Révérence Rupert and Fondation Rivières expressed concerns regarding the species’ survival. Some were also particularly concerned by the negative impacts of the project on the habitat and integrity of the Rupert genetic line.

While it may be legitimate to be concerned with this genetic line, scientific literature and the proponent’s data allow us to conclude that the impacts on the Rupert genetic line will be limited and will not jeopardize its survival. However, given that genetic data are missing for the stretch of the Rupert River between lakes Mistassini and Mesgouez, COMEX believes it would be relevant to further document the genetic line of the brook trout found there, particularly in the areas of the Osprey and Awashish outfitters. This characterization could be done from brook trout caught by recreational anglers who use these outfitters.

More locally, with regards to developing spawning grounds in creek RP082 mentioned above, its tremendous natural productivity indicates that it would be better not to intervene in this environment by trying to improve it. COMEX is in favour of these developments downstream of Rupert River’s KP 314 as contemplated by the proponent.
5.1.1.5 Mercury problem

Baseline
Under natural conditions, the fish in the diversion bay section show the following mercury concentrations:

Table 5-1: Mercury concentration in fish in the diversion bay section and in the west section of the La Grande complex

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>MERCURY CONCENTRATION IN THE DIVERSION BAY SECTION AND THE RUPERT, LEMARE AND NEMISCAU RIVERS (mg/kg)</th>
<th>MERCURY CONCENTRATIONS IN THE BIOPHYSICAL ENVIRONMENT OF THE WEST SECTION OF THE LA GRANDE COMPLEX (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longnose sucker (400 mm)</td>
<td>0.14 (0.10-0.29)</td>
<td>0.12 (0.12-0.22)</td>
</tr>
<tr>
<td>Lake whitefish (400 mm)</td>
<td>0.11 (0.07-0.22)</td>
<td>0.11 (0.05-0.20)</td>
</tr>
<tr>
<td>Lake sturgeon (900 mm)</td>
<td>0.18 (0.17-0.19)</td>
<td>0.25 (0.03-0.40)</td>
</tr>
<tr>
<td>Walleye (400 mm)</td>
<td>0.57 (0.29-1.04)</td>
<td>0.60 (0.30-1.02)</td>
</tr>
<tr>
<td>Northern pike (700 mm)</td>
<td>0.61 (0.34-0.73)</td>
<td>0.59 (0.30-0.93)</td>
</tr>
<tr>
<td>Lake trout (600 mm)</td>
<td>0.69 (0.66-0.74)</td>
<td>0.57 (0.23-0.89)</td>
</tr>
</tbody>
</table>

Source: Adapted from EI1.2, Table 10.30

Range of values for each species of special interest.

In a natural environment, certain species can show higher mercury concentrations than the consumption standard of 0.5 mg/kg. This may be the case for walleyes measuring 400 mm or larger, for northern pike 700 mm or larger, and for lake trout 600 mm or larger.

Proponent’s assessment of future conditions
The diversion bay impoundment will trigger mercury methylation produced by bacterial activity generated by decomposing vegetation and organic matter in submerged soil as well as its transfer to living organisms in the diversion bays. This transfer occurs through the scattering of methylmercury in the water column, the wave-induced erosion of reservoir shorelines and the suspension of eroded matter, as well as through active biotransfer from the first links in the food chain (phytoplankton, periphyton) to fish.

A number of factors determine the quantity of methylmercury released in the water column. For example, the relationship between the flooded land area and the annual water volume passing through the reservoir is a good indicator; the bigger the ratio, the stronger the availability of mercury because the dilution will be weak and the export reduced. Filling time is also an important factor that influences maximum mercury concentrations in fish. The shorter the filling time, the faster the maximum mercury values are reached and the faster the reservoir fish will return to concentrations comparable to natural conditions. Other parameters such as the nature of the organic plant matter, physical environmental conditions (water quality, temperature, etc.) and reservoir size and management all come into play in predicting the temporal evolution of fish mercury levels.

In the case of the diversion bays, the filling time is short and the relationship between the flooded land area and the annual water volume passing through is relatively small. Consequently, the proponent believes, based on a semi-empirical model developed originally to predict phosphorus
release, that non-piscivorous fish will return to similar concentrations as those found in natural bodies of water after 11 years whereas it would take 19 to 29 years for piscivores to return to these concentrations, because they are at the top of the food chain. Among the piscivores, the lake trout would take 27 to 29 years to recover (see table 5-2). Although the proponent does not have the necessary data to predict mercury concentrations in sturgeon, it believes that the mercury increase and decrease curves in this species will be comparable to those observed for the northern pike.

Table 5-2: Predicted maximum fish mercury concentrations in main forebay and tailbay species

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>LAKE WHITEFISH (400 MM)</th>
<th>NORTHERN PIKE (700 MM)</th>
<th>WALLEYE (400 MM)</th>
<th>LAKE TROUT (600 MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIAL VALUE (mg/kg)</td>
<td>0.11</td>
<td>0.11</td>
<td>0.61</td>
<td>0.61</td>
</tr>
<tr>
<td>MAXIMUM VALUE (mg/kg)</td>
<td>0.38</td>
<td>0.44</td>
<td>2.52</td>
<td>3.08</td>
</tr>
<tr>
<td>MAXIMUM INCREASE FACTOR</td>
<td>3.5</td>
<td>3</td>
<td>4.1</td>
<td>5</td>
</tr>
<tr>
<td>TIME TO REACH MAXIMUM VALUE (years)</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>TIME TO RETURN TO RANGE OF NATURAL VALUES (years)</td>
<td>11</td>
<td>11</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

Source: EI1.2, Table 10-32

It should be noted that all the considered species found both in the forebays and tailbays will see their mercury levels increase slightly in the tailbays despite the fact that the flooded land area is smaller and the water renewal is much more rapid than in the forebay. This is explained by the fact that mercury inflows from the forebay will be added to the mercury released from decomposing flooded organic matter in the tailbay.

The proponent also recognizes that mercury put back into circulation in the diversion bays will be exported to the Lemare and Nemiscau Rivers and, to a lesser extent, to the Rupert River. This export will cause increased contamination of the fish located there. Table 5-3 illustrates these trends for the different downstream points of the control structures, which restore instream flows.
Table 5-3: Predicted fish mercury concentrations downstream of control structures

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>RUPERT RIVER</th>
<th>LEMARE-LEMARE</th>
<th>NEMISCAU LAKE</th>
<th>DOWN-STREAM OF NEMISCAU LAKE</th>
<th>LEMARE RIVER DOWN-STREAM OF CLOSURE POINT</th>
<th>NEMISCAU RIVER DOWN-STREAM OF CLOSURE POINT</th>
<th>CHAMPION LAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PK314-LEMARE</td>
<td>LEMARE-LEMARE</td>
<td>NEMISCAU LAKE</td>
<td>DOWN-STREAM OF NEMISCAU LAKE</td>
<td>LEMARE RIVER DOWN-STREAM OF CLOSURE POINT</td>
<td>NEMISCAU RIVER DOWN-STREAM OF CLOSURE POINT</td>
<td>CHAMPION LAKE</td>
</tr>
<tr>
<td>LAKE WHITEFISH</td>
<td>Maximum value</td>
<td>0.17</td>
<td>0.15-0.17</td>
<td>0.16</td>
<td>0.15</td>
<td>0.22-0.26</td>
<td>0.22-0.42</td>
</tr>
<tr>
<td></td>
<td>M.I.F. (1)</td>
<td>1.5</td>
<td>1.4-1.5</td>
<td>1.5</td>
<td>1.4</td>
<td>2.0-2.4</td>
<td>2.0-3.8</td>
</tr>
<tr>
<td></td>
<td>Time to achieve maximum value (2)</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Return time (3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0-6</td>
<td>0-9</td>
</tr>
<tr>
<td>NORTHERN PIKE</td>
<td>Maximum value</td>
<td>0.84</td>
<td>0.78-0.86</td>
<td>0.80</td>
<td>0.78</td>
<td>1.03-1.19</td>
<td>1.04-1.84</td>
</tr>
<tr>
<td></td>
<td>M.I.F.</td>
<td>1.4</td>
<td>1.3-1.4</td>
<td>1.3</td>
<td>1.3</td>
<td>1.7-2.0</td>
<td>1.7-3.0</td>
</tr>
<tr>
<td></td>
<td>Time to achieve maximum value</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Return time</td>
<td>13</td>
<td>11-13</td>
<td>12</td>
<td>11</td>
<td>17-18</td>
<td>17-22</td>
</tr>
<tr>
<td>WALLEYE</td>
<td>Maximum value</td>
<td>0.79</td>
<td>0.73-0.8</td>
<td>0.74</td>
<td>0.73</td>
<td>0.96-1.11</td>
<td>0.97-1.71</td>
</tr>
<tr>
<td></td>
<td>M.I.F.</td>
<td>1.4</td>
<td>1.3-1.4</td>
<td>1.3</td>
<td>1.3</td>
<td>1.7-1.9</td>
<td>1.7-3.0</td>
</tr>
<tr>
<td></td>
<td>Time to achieve maximum value</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Return time</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0-9</td>
<td>0-15</td>
</tr>
<tr>
<td>LAKE TROUT</td>
<td>Maximum value</td>
<td>0.95</td>
<td>0.88-0.97</td>
<td>0.90</td>
<td>0.89</td>
<td>1.17-1.35</td>
<td>1.18-2.08</td>
</tr>
<tr>
<td></td>
<td>M.I.F.</td>
<td>1.4</td>
<td>1.3-1.4</td>
<td>1.3</td>
<td>1.3</td>
<td>1.7-2.0</td>
<td>1.7-3.0</td>
</tr>
<tr>
<td></td>
<td>Time to achieve maximum value</td>
<td>5</td>
<td>5-6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Return time</td>
<td>19</td>
<td>17-19</td>
<td>17</td>
<td>17</td>
<td>21-23</td>
<td>22-23</td>
</tr>
</tbody>
</table>

(1): M.I.F.: maximum increase factor
(2): Return time: Return time to within range of natural values observed in the Rupert River Basin in years.
(3): Number of years
Source: EI1, adapted from Table 11-38
We note that immediately downstream of the closure points, the fish from the Nemiscau River will experience the largest increases in mercury concentration due to the higher levels in the tailbay. However, the greater water dilution between the closure point and the confluence with the Rupert River explains why the mercury values in the Nemiscau fall more rapidly downstream than in the Lemare River. In the case of the Rupert River, the maximum values achieved are very close to natural values, except for the lake trout, which will have higher mercury concentrations than the natural values for about 17 years.

The contamination will be monitored over time through a targeted environmental follow-up of the species of special interest, with sampling stations spread out in the diversion bays, reduced flow areas, increased flow areas and control environments.

**COMEX analysis**

The public hearings revealed that there is still a scientific debate regarding the detailed mechanisms for releasing methylmercury. The proponent’s method for calculating changes in mercury concentrations was also criticized.

However, despite the interest in this regard, COMEX considers that the important aspect of this problem is the increase in mercury concentrations in fish and the time it takes to return to comparable natural environment values, as it relates to Crees use of the diversion bays. It bears mentioning that these values observed in the lakes or streams of the region exempt from development presuppose that consumers of these fish will still have to follow the fish consumption guidelines in order to protect their health (see section 6.3.2).

Based on La Grande Complex Environmental Monitoring Network findings, a rapid increase in concentrations after impoundment followed by a slow recovery to natural values is very common. The data published by the proponent clearly attests to this, although the recovery curves vary with the reservoirs assessed. As such, 16 years after impoundment, the lake whitefish in the La Grande 4 Reservoir now show concentrations similar to those found in bodies of water under natural conditions. However, in the Opinaca Reservoir, levels in the lake whitefish were still above natural levels over the same period of time, but the increase factor was higher and the recovery not completed 16 years after impoundment (OED 27). This increase, followed by a slow recovery, was also observed in Scandinavian countries where the creation of reservoirs for hydropower purposes also caused an increase in fish mercury concentrations followed by a return to comparable natural condition values.

Increased mercury concentrations are therefore unavoidable and effective mitigation measures to counter this phenomenon begin with a relatively selective harvest of organic matter from the soil before flooding. While theoretically possible, these measures are not very realistic in practice because of the large areas to clear, the problems in eliminating plant and organic matter from the soil, the time required for this removal and the cost of these measures. Moreover the manipulation of excavated soil combined with the runoff of surface water from this soil could put the mercury back into circulation, thus contaminating the neighbouring river system.

COMEX is aware that new guidelines will have to be issued for consumption of fish from the diversion bays for 20 to 30 years following impoundment. Therefore, a monitoring of the temporal evolution is required in order to validate the proponent’s predictions. It is also important that the results be communicated quickly to land users, along with the necessary explanations to prevent
these environments from being considered forever lost (See section 6.3.2). COMEX would like to emphasize that the Crees should be closely involved in planning the fieldwork to compile data as well as when defining the strategies to disseminate the information.

5.1.2 LAND AND SEMI-AQUATIC ANIMALS IN THE DIVERSION BAYS

Baseline
In collaboration with the Crees, the proponent took an inventory of several species of land and semi-aquatic animals, integrating traditional knowledge into the work. The proponent also used data taken from the literature in order to evaluate the presence of different species in the diversion bay section and to assess project impacts.

The following subsections present the baseline and project impacts on the caribou, moose, black bear and beaver, which are the main species valued by the Crees, as well as on micromammals, some of which found in the study area have special protection status.

Caribou
Two ecotypes frequent the study area: the woodland caribou and the migratory barren-ground caribou. The woodland caribou population consist of isolated small herds that live in the boreal forest year round and move little. Migratory barren-ground caribou move in two large herds, the George River and Leaf River herds, and migrate large distances. The calving of the migratory barren-ground caribou takes place in northern Québec and its winter habitats are further south. During the winter, the two ecotypes are present in the project study area. The woodland caribou is considered threatened in Canada and vulnerable in Québec. These ecotypes are difficult to distinguish morphologically. While caribou may appear to belong to a given ecotype based on certain behavioural characteristics, only a DNA test is conclusive in this regard.

Works performed by the Ministère des Ressources naturelles et de la Faune (MRNF – Wildlife Section) has clearly shown the presence of woodland caribou in the sections that will be affected by the project. As well, the migratory barren-ground caribou has been increasingly migrating further south in recent years, making it difficult to determine the species’ settlement in the study area.

During the inventory conducted in March 2002 by the proponent, eight caribou trails were identified in the diversion bay section, including two inside the diversion bays and six in the 5-kilometre peripheral strip. However, the ecotype could not be determined. The proponent estimates the caribou population in the diversion bays at between 8 and 18 in the peripheral strip. Sport hunting is prohibited in the area and the Cree’s harvest, between 1992 and 2001, was estimated at less than three caribou per year.

According to the proponent, the winter habitats and calving constitute limiting factors for the caribou. It uses winter habitats that afford protective cover against predators as well as frozen bodies of water to rest and escape from predators. Travel is facilitated by windswept hard-packed snow. The diversion bay section offers the caribou a good winter habitat. High-potential habitats account for 53% of the diversion bay area and 37% of the 5-kilometre peripheral strip.
In the spring, the woodland caribou is found in the peat bogs, considered an ideal calving and feeding ground. The diversion bay section is not conducive to woodland caribou calving. In fact, 57% of its area offers low-potential habitats and only 8% of the diversion bays and 5% of the peripheral strip are considered high-potential habitats.

**Moose**

During the inventories, 14 moose trails were identified in the areas north and south of the projected diversion bays. No trail was found in the diversion bays. According to the proponent, there were no moose in the diversion bays and 24 were found in the peripheral strip. Sport hunting data collected between 1992 and 2001 show that not a single moose was killed in the diversion bay section. According to the proponent, less than five moose were killed each year by the Crees over the same period. High-potential habitats account for 21% of the diversion bay area and 32% of the peripheral strip. Low- or zero-potential habitats cover 55% of the area.

**Black bear**

The black bear is relatively common in the James Bay area; however, its abundance and distribution in the diversion bay section are not well documented. According to the Cree’s hunting data, one bear is killed per year. Based on existing literature, the proponent estimates that there are 8 bears in the diversion bays and 36 in the 5-kilometre peripheral strip. High-potential habitats of the species account for 64% of the diversion bay and 50% of the peripheral strip.

**Beaver**

An inventory of the beaver colony indicates there are 61 in the diversion bays and 125 in the 2-kilometre peripheral strip. According to the proponent, the beaver population is about 250 in the diversion bays and 550 in the peripheral strip. The Crees trapped approximately 45 beavers per year between 1992 and 2001 on traplines, some of which are located in the diversion bays. High-potential habitats account for 17% of the diversion bays and 27% of the peripheral strip while low- and zero-potential habitats account for 65% of the area (diversion bays and peripheral strip). In the study area, beaver hunting is reserved exclusively for the Crees.

**Micromammals**

While micromammals are found in all sections of the project, most of the related information is described in this section so as to simplify the project’s impact assessment on these animals. The proponent trapped these micromammals in the study area and identified 10 species (ES13). The MRNF –Wildlife Section also took inventories that show the presence of additional species (see table 5-4).
Table 5-4: Inventory of micromammal species in project sections

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>STATUS IN QUÉBEC</th>
<th>SECTION WHERE SPECIES WAS IDENTIFIED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIVERSION BAYS</td>
<td>RIVERS</td>
</tr>
<tr>
<td>GRAPPER’S RED-BACKED VOLE</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>MEADOW VOLE</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>ROCK VOLE*</td>
<td>Susceptible in Québec</td>
<td>G4, N4, S3</td>
</tr>
<tr>
<td>NORTHERN BOG LEMMING</td>
<td>No status</td>
<td>G4, N4, S4</td>
</tr>
<tr>
<td>SOUTHERN BOG LEMMING</td>
<td>Susceptible in Québec</td>
<td>G5, N4, S3</td>
</tr>
<tr>
<td>WOODLAND JUMPING MOUSE*</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>MEADOW JUMPING MOUSE</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>DEER MOUSE</td>
<td>No status</td>
<td>G5, N4, S3</td>
</tr>
<tr>
<td>ARCTIC SHREW</td>
<td>No status</td>
<td>G5, N5, S4</td>
</tr>
<tr>
<td>COMMON SHREW</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>AMERICAN WATER SHREW*</td>
<td>No status</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>PYGMY SHREW</td>
<td>Susceptible au Québec</td>
<td>G5, N5, S5</td>
</tr>
<tr>
<td>HEATHER VOLE</td>
<td>No status</td>
<td>G5, N7, S4</td>
</tr>
</tbody>
</table>

* : Species listed by MRNF-Wildlife Section
G : Global (total distribution area of species)
N : National (Canada)
S : Subnational (Québec)

1 : In great danger
2 : In danger
3 : Vulnerable (rare)
4 : Not common, not rare but of concern in the long term
5 : Large distribution, high abundance and demonstrated stability (Example: G5 means a globally distributed species, abundant, stable and widely distributed in the section)
Proponent's assessment of future conditions

Land clearing and the construction of structures will change wildlife habitats, displacing animals that will move towards less disrupted areas. After impoundment, scheduled for December, animals still in the area that are able to move quickly, such as the moose and caribou, will leave the section. During impoundment the proponent has also planned a helicopter fly-over by once a week over the diversion bays to track land animals' movement. This follow-up will allow the proponent to identify sections where the species may be trapped by the rise in water level. Animals with a limited ability to move or that are in hibernation will drown. This includes certain species of small wildlife, micromammals, amphibians and reptiles. During the operation period, flow management of the diversion bays will affect wildlife use of the riparian environment. The following subsections describe the impact on the species concerned.

Caribou

The proponent does not predict any caribou mortality during the diversion bay impoundment because these animals will be able to move. A monitoring program for large animals will nonetheless be implemented in collaboration with the Crees in order to spot animals endangered by the rising water and, if applicable, to relocate or catch them.

The creation of the diversion bays will result in a loss of 210 kilometre$^2$ of high-potential winter habitats for the caribou or 53% of all the high-potential habitats (PD11). As well, 51 kilometre$^2$ of vegetation conducive to woodland caribou calving will also be lost or 10% of these environments in the section (diversion bays and peripheral strip). The proponent believes that the creation of the diversion bays should have little impact on woodland caribou and no impact on population maintenance in the section. The proponent also believes that the north-south orientation of the diversion bay should allow the migratory caribou to move further south in winter.

No impact is predicted during the operation period. The proponent will conduct a follow-up to assess caribou abundance and density in the diversion bay section.

Moose

The proponent does not predict any moose mortality during the diversion bay impoundment because the animals will be able to move. A monitoring program for large animals will nonetheless be implemented in collaboration with the Crees in order to spot animals endangered by the rising water and, if applicable, to relocate or catch them.

The impoundment will result in a loss of 82 kilometre$^2$ of high-potential moose habitat or 21% of all the high-potential habitats in the diversion bays. This loss of habitat will not disrupt the local populations because no animal or wintering ground was found during the inventories of the diversion bays and because the location of the moose's wintering ground can vary by 10 kilometres from one year to the next.

No impact is predicted during the operation period. The peripheral strip of the diversion bays contains good moose habitats. The presence of the diversion bays should not change the species' relocation corridors. The proponent will conduct a follow-up to assess moose abundance and density in the diversion bay section.
Black bear
The black bear hibernates as soon as the first snowfall becomes permanent. Given that impoundment is planned for the month of December, the bears in the diversion bays run the risk of drowning. The year before the diversion bay filling, the tallymen will be asked to remove bears found in the section. The impoundment will result in a loss of 235 kilometre² of high-potential habitat or 64% of all the high-potential habitats in the diversion bays. No impact is predicted during the operation period.

Beaver
The diversion bay impoundment will affect approximately 250 beavers. The tallymen are planning an intensive beaver trapping or relocation program before the impoundment. Moreover, a monitoring program will make it possible to spot beavers endangered by the rising water, and if applicable, to relocate or trap them.

The creation of the diversion bays will result in a loss of 67 kilometre² of high-potential habitat or 17% of all the high-potential habitats in the diversion bays. This loss of habitat should not compromise the survival of the beaver population in the section.

During the operation period, low water level fluctuations in the diversion bays and good food coverage will allow beaver colonies to sprout along the new bodies of water. A few years after impoundment, the proponent will conduct a follow-up of the beaver colony established on the shores of the diversion bays to assess wildlife use of the riparian environment.

Micromammals
The proponent foresees the death of many micromammals during the diversion bay impoundment because they are in hibernation in December. The impoundment will result in a loss of habitat for most of the species identified. Thanks to a micromammal trapping campaign, the proponent will check for the presence of special-status species in wetlands or seeded environments.

COMEX analysis
COMEX considers that despite the loss of land habitat for numerous species and the death of many small animals during the diversion bay impoundment, the survival of the majority of the species will not be compromised.

However, there is a lingering doubt as to the actual impact of the project on the woodland caribou. The fact that there are two ecotypes in the section in winter complicates the impact assessment. The rarity of the sedentary woodland caribou contrasts with the abundance of the migratory caribou. Habitat fragmentation or loss could be at the root of the woodland caribous’ precarious situation (OED17). A number of scientific studies have observed the avoidance behaviour of the woodland caribou with regards to human activities, particularly logging and line structures (roads, powerlines, etc.). Avoidance distances of 106 m and as much as 1 kilometre have been documented. Considering the sections avoided by the caribou, the loss of habitat caused by the project could be far greater than predicted by the proponent. The line corridors may provide predators and Cree or Sport hunters with increased access to the woodland caribou’s home range. Given the risks to the woodland caribou, and in order to assess how it adapts, among other things, to the increased land access, COMEX believes that the proponent should use telemetric monitoring to track the woodland caribou in the various project sections during the construction and operation phases.
proponent should also monitor the native harvest, in order to obtain additional information on the presence of woodland caribou in the study area.

The proponent has planned an intensive beaver and black bear trapping and relocation program before the diversion bay impoundment. Based on the experience of the Eastmain-1 hydropower development project, it can be assumed that the proponent will offer the tallymen contracts during this project. As such, COMEX believes that the proponent should take the necessary means to ensure that these contracts leave the tallymen sufficient time to trap or relocate these animals.

The proponent’s micromammal trapping campaign only provides an idea of the species present at a specific time in certain locations. It does not provide information on the distribution and abundance of the species in the study area. Given the lack of knowledge and the fact that some of these species have special protection status, it is difficult to assess the real impact of the project and especially the impact on biodiversity in the study area. Although the proponent has planned a follow-up program for micromammals in wetlands or seeded environments, the program needs to be more comprehensive in order to provide better knowledge of the presence of these species in the area.

5.1.3 BIRDS

5.1.3.1 Waterfowl

Baseline
The diversion bay section consists of many lakes of difference sizes, brooks and rivers, including portions of the Rupert, Nemiscau and Lemare Rivers. These bodies of water are waterfowl habitats, depending on each species’ preferences and period in the lifecycle. The presence of riparian wetlands is also associated with waterfowl land use. Rare and not highly developed, these wetlands typically consist of narrow bands or strips along lakeshores. The abundance of coarse deposits and low water level fluctuations explain these small areas.

The most abundant waterfowl species observed in the diversion bay sections, all periods combined, are, in chronological order: Canada goose, American black duck, common merganser, and green-winged teal. Large concentrations of Canada goose are observed during spring migration and moulting season while American black ducks represent the most abundant breeding pairs. The inventory taken in May 2002 revealed the presence of 577 breeding pairs\(^1\), including 25% American black duck, 21% common merganser, 11% Canada goose, and 9% green-winged teal. Among the 17 species of waterfowl listed, 11 were confirmed as breeders. Moreover, the waterfowl concentration areas indicated by the Crees generally correspond to the concentration areas observed during aerial inventories.

The bodies of water in the diversion bay section do not seem to have particular breeding habitats that distinguish them from the bodies of water in the control area. In fact, the indicated pair density (observation of a single male in its nesting habitat is interpreted as observation of a pair because it is presumed that the female is brooding and therefore out of sight) per 10 kilometre of banks are similar in the diversion bay section and in the control area. Compared to the other sections of the project, the diversion bays present relatively low densities of waterfowl.

\(^1\) Including the common loon, the greater scap and the black scoter. The two latter species, while excluded from the calculation, are not considered breeders because their known breeding area is located beyond the 53rd parallel.
Proponent’s assessment of future conditions during the construction phase

During the construction phase, shoreline and work area clearing as well as jobsite activities will be disruptive for the waterfowl. Given that this work will occur during periods of land use by the waterfowl, i.e., from May to October, these disruptions will mean less time devoted to feeding, greater energy expenditure due to an increase in movement and stress, as well as risk of loss or unsuccessful nesting. Moreover, ground nests will be trampled during land clearing works and hollow trees, used for nesting by certain tree-nesting ducks, will be cut. The common merganser, the hooded merganser, the bufflehead and the common goldeneye are known species that use trees hollow to nest, at least in southern Québec (OED31). Lastly, the diversion bay impoundment will significantly alter the habitat by reducing the number of bodies of water and by flooding nesting areas.

In the diversion bays, clearing activities will change approximately 33% of the land environment which will be flooded by the diversion. Based on this proportion, the proponent estimates that approximately one-third of the indicated breeding pairs (about 50) in the diversion bay section that use hollow trees for nesting could be directly affected by land clearing works. The nesting of a third of the ground-nesting ducks, i.e., approximately 25 to 30 indicated breeding pairs per year, could also be affected during each of the three years of land clearing works (RP10). A drop in breeding success is therefore feared throughout the land clearing period. The diversion bay impoundment will not create any direct nest loss because it will take place in winter.

In addition to the mitigation measures that will be applied to the land clearing works, construction machinery and traffic, the proponent suggests revegetating the worksites to mitigate the impact of the construction works on the waterfowl. The worksites will be revegetated at the end of construction.

Proponent’s assessment of future conditions during the operation phase

The presence and flow management of the diversion bays will have an impact on waterfowl populations using the diversion bay section. Altering the habitat from multiple bodies of water of varying sizes to two large masses of water will affect use of this section, both during nesting and migration. The waterfowl habitat of the diversion bay section could be improved by restoring large areas of riparian wetlands.

The creation of the diversion bays will change the number and size of the bodies of water in the section. This will definitely influence waterfowl use of the area because it was observed, in the section under study as well as elsewhere in James Bay and in southern Québec, that ponds and small lakes (<10 ha) are the most densely populated aquatic environments by breeding pairs. Of the waterfowl species currently present in abundance in the diversion bay section, the Canada goose and the green-winged teal nest primarily in ponds and small lakes, while the American black duck seems to use rivers, large lakes and small lakes to the same extent depending on whether it is nesting or raising broods. As for the common merganser, it does not seem to favour one type of body of water over another although broods were observed primarily on rivers and very large lakes.

The proponent assessed the impact of an altered habitat on breeding pair density in the diversion bay section during the operation period. To this end, the proponent determined the approximate abundance of Anatidae breeding pairs which could frequent the diversion bays during the operation period based on the density of breeding pairs observed by type of body of water in the diversion bay section. According to the proponent’s estimates, given that the diversion bays will occupy an area of 34,500 ha, they should provide shelter to close to 330 Anatidae breeding pairs after the
diversion. The loss is therefore estimated at 150 pairs in relation to the observations made in 2002 (482 indicated pairs observed). This is the maximum loss, i.e., 32% of the indicated couples in the diversion bay section. The losses are not the same for each species since some will be greatly affected, others hardly at all, and others still will benefit from the situation (see Table 5-5).

Table 5-5: Anatidae gains and losses (indicated pairs) during the operation period in the diversion bay section

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>LAKES 500 HA AND OVER WITHIN DIVERSION BAY BOUNDARIES IN 2002</th>
<th>TOTAL NUMBER OF INDICATED PAIRS WITHIN DIVERSION BAY BOUNDARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER PER 100 HA</td>
<td>TOTAL NUMBER</td>
</tr>
<tr>
<td>CANADA GOOSE</td>
<td>0.123</td>
<td>8</td>
</tr>
<tr>
<td>GREEN-WINGED TEAL</td>
<td>0.061</td>
<td>4</td>
</tr>
<tr>
<td>AMERICAN BLACK DUCK</td>
<td>0.215</td>
<td>14</td>
</tr>
<tr>
<td>NORTHERN PINTAIL</td>
<td>0.031</td>
<td>2</td>
</tr>
<tr>
<td>COMMON GOLDENEYE</td>
<td>0.000</td>
<td>0</td>
</tr>
<tr>
<td>RED-BREASTED Merganser</td>
<td>0.031</td>
<td>2</td>
</tr>
<tr>
<td>COMMON Merganser AND Merganser SP.</td>
<td>0.461</td>
<td>30</td>
</tr>
<tr>
<td>OTHER SPECIES (n=5)*</td>
<td>0.000</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

* Other species: mallard, ring-necked duck, surf scoter, bufflehead and hooded merganser.

* The greater scaup and the black scoter are not considered breeders because their known breeding area is located beyond the 53º parallel.

Source: RP11, p. 10-224

Based on this information, it can be assumed that during nesting periods and brood rearing, the common merganser will clearly benefit by the presence of the diversion bays, whereas the American black duck and Canada goose should continue to use the area, although in smaller numbers.

During the operation period, the species that will dramatically reduce their use of the diversion bays are those that are absent or rarely present on large and very large lakes during nesting and brood rearing periods. According to the inventory results of 2002, the mallard, bufflehead, red-breasted merganser, ring-necked duck, common goldeneye and surf scoter will no longer or rarely use the new habitats during nesting and brood rearing. It should be noted that during the 2002 inventory, very few individual mallards and buffleheads were observed in the diversion bay section.
Moreover, during the operation phase, the abundance of non-breeding, moulting Anatidae, particularly among Canada geese, should increase in the diversion bay section. The observations made during the waterfowl inventories carried out for this project, as well as during the follow-up on other reservoirs in the region, show that during the moulting period, these birds gravitate towards reservoirs and very large bodies of water, using them more than the control areas. The size of the increase will also depend on the restoration of the riparian wetlands.

The proponent also predicts that the presence of the diversion bays will have a positive impact on spring migrators’ use of the diversion bay section, primarily the Canada goose. The inventory results for Boyd Lake, Sakami Lake and the Opinaca Reservoir seem to show that a portion of the Canada goose population makes a stop on these bodies of water during migration. This same corridor is far less used during the fall migration, suggesting that the same will hold true for the Rupert diversion bays.

In order to answer the questions raised by the review bodies, the proponent conducted a more in-depth analysis of the restoration potential of the aquatic beds and riparian wetlands (RP17). This allowed the proponent to better assess the project’s impact on waterfowl, which will be directly affected (RP10). The assessment was based on a detailed examination of future bathymetry conditions, substrate types and surface deposit slopes. The results of this assessment show a substantial increase in restoration potential from the first assessment (from 223 ha to 3,400 ha of high-potential area). The riparian environments with good restoration potential are in fact much larger than the current riparian wetlands (approximately 200 ha) because they represent about 1% of the section’s wetlands and consist of 26% swamp land, 9% marsh land and 65% aquatic beds (RP17, p. 17). However, it is understood that an unknown portion of these areas will not support riparian vegetation in the long term because of such factors as exposure to prevailing winds, fetch and currents. A follow-up program is therefore planned to measure the accuracy of the predictions.

According to the proponent’s assessment, the areas with good swamp, marsh and aquatic bed restoration potential should be similar in both diversion bays. As well, the increase in maximum levels in winter due to the ice should create slightly more than 500 ha of peat swamp in the tailbay (see Table 5-6).
Table 5-6: Area with good wetland restoration potential in the Rupert diversion bay section under future conditions

<table>
<thead>
<tr>
<th>RIPARIAN ENVIRONMENTS</th>
<th>GOOD-POTENTIAL AREA (HA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FOREBAY</td>
</tr>
<tr>
<td>Peat swamps</td>
<td>0</td>
</tr>
<tr>
<td>Swamps and marshes</td>
<td>467</td>
</tr>
<tr>
<td>Shallow waters (grass beds)</td>
<td>957</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1424</strong></td>
</tr>
</tbody>
</table>

Source: RP17, p. 13

The increased size of the riparian wetlands could favour the Anatidae since these birds have a predilection to these environments where they feed on vegetation or invertebrates.

**Proponent’s anticipated mitigation measures and environmental follow-up**

The proponent suggests a number of mitigation measures such as digging ponds in a bog around the tailbay in order to encourage use of the section by Bonaparte’s gull and the Anatidae. The proponent also plans to set up nesting boxes to offset the loss of hollow trees in the short term. The section on mitigation measures for waterfowl hunting by members of the Mistissini community states that the proponent will develop 10 ha of wetlands in the diversion bay section. The proponent includes a technical note with regards to this proposal identifying 13 sites meeting the selection criteria (DCAP2). A number of sites have borrow pits adjacent to the peat bogs, which will make it possible to create diverse wetlands in a given section, making them more appealing. These large sites offer considerable leeway when choosing the sections in which to take action.

In response to a question regarding this development proposal, the proponent presented other possible measures to increase the waterfowl potential in the diversion bay section, for example, bay development, pond and channel excavation in the tailbay peat bogs, the creation of riparian wildlife habitats, and the development of borrow pits and other work areas (RP13).

The proponent plans to follow-up on the evolution of breeding pair and brood density in the diversion bay section and in the control area. An inventory of the nesting pairs in the spring and broods in the summer is planned in the first and third years of construction, as well as during the diversion period. This will be followed by three years of follow-up, i.e., in the third, sixth and tenth year of the diversion bay operation. An inventory of the Canada goose during spring migration and during moulting periods is planned according to the same schedule (except for the first year of construction and the sixth year of operation).

The proponent will follow-up on the use of the planned developments in the tailbay peat bogs (excavation of ponds) by Bonaparte’s gull and the Anatidae.
The proponent undertakes to track the progress of the riparian wetland recovery in order to verify the accuracy of its hypotheses. The proposed program calls for an inventory of the riparian vegetation in the fifth year, during the diversion period, and three inventories during the operation period, in the third, sixth and tenth year.

**COMEX analysis**

Although the project will have an impact on waterfowl in the diversion bay section, the magnitude is difficult to accurately quantify because several parameters associated with the restoration of the habitat and with annual changes in the regional waterfowl population cannot be incorporated into the calculation of potential gains or losses. Nonetheless, the breeding success of a proportion of Anatidae breeding pairs within the boundaries of the diversion bays will be reduced during the construction period and for a few years after operation begins. In fact, parts of some of the nesting habitats will be flooded, forcing waterfowl pairs to find new sites.

The riparian environment should recover a few years after impoundment, which should favour the return of waterfowl nesting pairs to the section. However, in its estimate of areas with good restoration potential, the proponent cannot state the proportion of swamps that could be restored in relation to marshes. As mentioned in the impact study complement, aquatic beds and marshes are the waterfowl’s preferred habitat in all seasons, whereas swamps are little used. Although this analysis is based on use of the Rupert River and Rupert Bay riparian wetlands because the diversion bay section was too small for analysis purposes, the results corroborate general knowledge of the waterfowl (ES30). Be that as it may, unless the areas presenting good restoration potential were greatly overestimated, the size of the riparian wetlands in the diversion bay section will be larger than that currently observed, which can only be good news for waterfowl.

Nevertheless, since several waterfowl species do not use large bodies of water during nesting and brood rearing, it is possible that some species will no longer use this section at all. Consequently, even if large areas of riparian environments are restored, the breeding pair density may still remain below that currently observed in this section. The observations made in other reservoirs and diversion lakes show, however, that dabbling ducks represent the most abundant breeding pairs in the years following impoundment. The densities of the American black duck and green-winged teal are even the same as those observed before impoundment. Only follow-up will allow the proponent’s hypotheses to be tested.

The types of bodies of water created by the diversion bays should promote use of the section by Canada geese during spring migration and during the moulting period. The proponent will monitor use of this section.

The proponent presents almost no mitigation measures to reduce the impact on waterfowl during the construction period. Extending or modifying the land clearing period (winter cutting) would have certainly have spared many broods. While the land clearing period was extended by one year (from two to three years), the proponent justifies its refusal to change the cutting period by citing quality criteria with regards to cutting, stacking and burning, which require that the work be carried out on snow-free ground, i.e., from May to October, and more importantly, by its obligation to complete the work on schedule. COMEX considers that the impact of land clearing on waterfowl will be significant but remains aware that land clearing must be done carefully, leaving as little debris as possible behind to allow restoration of the new riparian habitats.
With regards to the mitigation measures planned for the operation phase, COMEX considers that applying a careful combination of the measures contemplated to increase waterfowl potential should encourage waterfowl use of the diversion bays. COMEX suggests that wildlife developments be created at the same time as the construction work in order to benefit from the equipment already on the jobsites, and more importantly, to maximize the habitat recovery period. The program explaining the ultimate choice of measures, the location of the developments and the schedule will be submitted to the authorities concerned for approval before the work begins. Moreover, each development should be monitored to verify waterfowl use.

Given the substantial impact on waterfowl, the evolution of the waterfowl population at the regional level should be monitored. As agreed between the entities concerned and the proponent (PD1), the criteria and objectives must be defined jointly before the follow-up programs are submitted. If the monitoring reveals that the objectives have not been met, the proponent will have to develop corrective means and measures to ensure the objectives are achieved.

Lastly, because very little information is available on the condition of nesting boxes used by waterfowl, COMEX suggests a follow-up in this regard to determine the extent to which they are used and how well they stand up to not being cleaned or repaired. This monitoring could be conducted in collaboration with the tallymen and should be spread out over a period of at least five years.

5.1.3.2 Other birds

Baseline
Among aquatic birds other than waterfowl, the common loon, the great blue heron, Bonaparte’s gull and the herring gull all frequent the area during breeding season. While no nest was found, about 10 species of shorebirds are considered breeders. Ten raptor species have been observed in the diversion bay section. The osprey is the most abundant species, with over 30 sightings. Over 50 species of forest birds were counted through the use of 133 listening stations. The most frequently heard were the white-throated sparrow, the dark-eyed junco, Lincoln’s sparrow and the ovenbird. Lastly, four special-status species were observed in the diversion bay section: the sandhill crane, Bonaparte’s gull, the short-eared owl and the bald eagle. While no great grey owl was sighted, it most probably uses this section for nesting.

Birds use all types of biotypes depending on each species’ preference. The wetlands present the greatest array of species. In this regard, forest bird density is somewhat higher in riparian biotopes (5.2 pairs/ha) than in forest biotopes (2.7 pairs/ha). The low densities of forest biotopes in summer 2003 compared to those recorded during inventories taken earlier in the region could be explained by interannual fluctuations in insect abundance and fragmentation of the spruce forest caused by recent large forest fires. One section in particular, located north of the tailbay, is considered important for birds because it is frequented by three special-status species.
Proponent's assessment of future conditions during the construction phase

Construction and land clearing will affect bird species using the diversion bay section because they will take place during the critical breeding period. The construction of hydraulic structures will result in habitat loss, including peat bogs. The construction and land clearing activities will affect birds to varying degrees, depending on whether they nest in an open space or in the forest, and may even result in nest destruction and failed breeding by many forest birds. The impoundment will alter the entire section, flooding different types of biotopes and resulting in a loss of land habitats and wetlands. A reduction in breeding success is feared for most of the bird species frequenting the diversion bay section.

More than 52 kilometre$^2$ of the songbird's forest habitat will be cleared in addition to 1.28 kilometre$^2$ of area allocated to structures and borrow pits. These activities will lead to nest destruction and brood abandonment. Over one million nests could be lost as a result of land clearing. The impoundment will eliminate 188.1 kilometre$^2$ of land habitats and peat bogs, which will be flooded. The annual breeding of some forest birds will be compromised, and the loss of habitat will affect close to 43,000 songbird pairs.

Proponent's anticipated mitigation measures

In addition to the current mitigation measures regarding land clearing, construction machinery and traffic, the proponent proposes to revegetate the worksites in order to mitigate the impact of construction work on birds.

Moreover, during the land clearing activities, a one-kilometre buffer zone will be maintained around the site occupied by Bonaparte's gulls to reduce the impact on this special-status species. Tree cutting will begin after the birds have left. With regards to flooding, two trees each supporting a great blue heron nest will be checked and possibly moved before the impoundment. If the situation dictates, artificial structures will be built nearby.

Proponent's analysis of future conditions during the operation phase

The diversion bays will alter the entire section by flooding large areas of land and creating large bodies of water. Over 188 kilometre$^2$ of land biotopes will be flooded, resulting in a loss of land habitats at the local level.

Still, some 26 kilometre$^2$ of land biotopes and peat bogs will only be flooded in case of strong flows under the ice cover. The loss of trees, the periodic retreat of shrub covers, as well as the formation of openings and depressions, will cause herbaceous plants to sprout. Over time, these land environments should be transformed into wetlands propitious to birds. These areas are located predominantly in the north part of the tailbay (RP17).

Moreover, estimates of areas with good potential for riparian wetland restoration show that they could be much larger than at the present time. The impact on shorebird populations will depend on restoration of riparian environments.

In addition, shallow water, the presence of many bays and the increase, in the medium term, of the fish population in the diversion bays should be good for the osprey. However, the lack of trees close to these bodies of water could be a limiting factor for the species. In the short term, the dispersion of fish populations and the partial submersion of two trees supporting osprey nests could reduce the breeding success of individuals nesting in the diversion bays.
While the restoration of riparian wetlands will benefit many songbird species, the loss of land areas, and more specifically, forest habitat, will reduce the section’s ability to support strictly forest species. Pairs that have lost their breeding territory will have to find new ones, which will result in saturation of adjacent habitats due to competition. This situation will last a few years. The loss of forest habitat will therefore reduce the population of several local species.

Proponent’s anticipated mitigation measures and environmental follow-up

The proponent has planned a number of measures to encourage birds whose nesting site will be affected by impoundment to use the section. These measures are aimed at existing species for which artificial nesting structures can be built or favourable nesting environments developed. No specific mitigation measure is planned for forest birds.

Artificial nesting platforms will be installed, if necessary, for the osprey, the bald eagle and the great blue heron. A few ponds will be dug in a peat bog in the tailbay, near large black spruces for Bonaparte’s gull pairs.

Each installed platform will be monitored as will use of ponds developed for Bonaparte’s gull. The osprey, bald eagle and short-eared owl breeding pairs will be monitored and the number of forest bird breeding pairs will be counted once vegetation returns a few years after the diversion bays are put into operation.

COMEX analysis

The main impact on birds will occur during the construction phase. Local birds will be affected by land clearing to varying degrees depending on whether they nest in an open space or in the forest. The size of the forest bird population and the area cleared will have an impact on the breeding success of a vast number of songbirds (approximately 43,000 pairs) during the three years of land clearing. This impact is directly tied to the land clearing period, which will take place at the same time as the bird breeding season.

The proponent presents no mitigation measures to reduce the impact on forest birds. The proponent justifies its refusal to change the cutting period, citing quality criteria with regards to cutting, stacking and burning, which require that the work be carried out on snow-free ground, i.e., from May to October, and more importantly, its obligation to complete the work on schedule.

Most of the songbird species frequenting this section will be able to occupy a part of the restored riparian environments. COMEX believes that although significant, the impact on songbirds will abate rapidly (AV36). The three-year land clearing period and the disruptions resulting from the construction work should cause the birds to gradually relocate during breeding season, given that the adjacent environments are already used by these same species (AV36). Lastly, given that the areas with good restoration potential should be larger than those today and that more birds use riparian habitats than forest habitats, these new riparian environments should be able to partially offset the loss of land habitats. COMEX considers that in this context, it is important to track the songbirds in the new riparian environments in order to document this impact. It bears mentioning that this project impact is one that cannot be mitigated without a major change to the project design and schedule.
5.1.4 SPECIAL-STATUS PLANT SPECIES

In order to update its knowledge of the special-status plant species found in the study area, the proponent consulted the Centre de données sur le patrimoine naturel du Québec [Québec Natural Heritage Data Centre] (CPDNQ). In 2002 and 2003, it also took specific inventories with a view to locating certain special-status plant species. According to the information compiled, there is no such species in the diversion bay section. No impact is therefore anticipated.

5.2 RUPERT, LEMARE AND NEMISCAU RIVERS SECTION

5.2.1 ANALYSIS OF INSTREAM FLOW REGIME

Described in section 2.4.2.1, the instream flow regime cannot be analyzed without taking into account the eight hydraulic structures (weirs, blankets and spurs) used in the project to maintain water levels and avoid major bank exposure (see section 2.2.1). These structures have a major impact on hydraulic conditions, particularly on summer feeding habitats. Similarly, the lateral inflows of the tributaries affect hydrological and hydraulic conditions as they empty into the main reach. These hydraulic structures and the lateral inflows of the tributaries should be kept in mind when analyzing the impact of flow reduction in this section.

Instream flows in spring and fall

The flow conditions for the breeding season were determined using microhabitat type modeling. This modeling is used to predict the biophysical conditions of the environment integrating both the quantity and quality of spawning habitats (weighted usable area or WUA) that will be available based on flow variation.

Only the spring and fall spawning habitats in lotic environments were analyzed by the proponent. With no hydraulic structures present, these habitats are especially affected by flow reductions. The instream flow control was established with a view to conserving these spawning habitats in a lotic environment. Spring spawning is represented by the lake sturgeon and by a guild composed of walleye, longnose sucker and white sucker. For is part, fall spawning is represented by the lake whitefish. The species selected to determine the instream flow are adequate and represent 75% of the relative abundance of the fish caught. The socioeconomic interest of the sucker is not as high as the walleye and sturgeon but they are abundant and serve as forage fish to predator fish.

Two sites located at KP 216 and 281 were modeled to establish fall and spring instream flows. They are considered representative of the breeding habitats found elsewhere in this section of the Rupert River. The habitats in all the lotic areas of the Rupert are found in the two sites selected. Moreover, the proportion occupied by the habitat types in the two sites selected is, in most cases, the same as in all the lotic areas.

Two microhabitat models were used in the impact assessment. The model using a Habitat Probabilistic Index (HPI) was deemed more suitable than the one using the Habitat Suitability Index (HSI) as the latter does not take into account the interrelationship of basic variables such as speed and substrate. For example, rapid flows are generally associated with a coarse substrate, and slow flows with a finer substrate. Since these variables are closely related, they provide a redundant contribution to the model and can falsify findings. Still, only the conditions of the guild spawning
habitats were subject to the HPI model in the impact assessment. Due to lack of sufficient data, the proponent used the HSI model for the lake sturgeon and lake whitefish. At the request of the review bodies, a new model, based on the Habitat Probabilistic Index (HPI) was developed and validated for these two species. These two models meet COMEX’s requirements. Two instream flows were recalculated for each site and species, one taking into account all available habitats, the other considering only the best ones.

In order to determine the instream flow regime, the proponent only considered the highest flows for the spring and fall, selected from the scenarios analyzed. The new results did not substantially change the instream flow values initially selected. However, in order to maintain the same instream flow regime, the proponent would have had to change two parameters in its initial methodology.

First, the proponent was 20% more strict in its selection criteria for the best guild and sturgeon spawning habitats (RP11). This make it possible to better identify the impact on the most used habitats and in general, tends to increase instream flows.

Second, for the lake whitefish, the proponent used a different decision criteria aimed at preserving 80% of the maximum weighted usable area (WUA max), i.e., the maximum spawning habitat potential. The initial criterion was 90%, the same as the one used for the spring spawning. The proponent states that the percentage used to determine ecological instream flows can change from 40% to 90% according to certain assessments (RP11) and that a determined instream flow between 80% and 100% of WUA max can be deemed sufficiently prudent to protect fish habitat.

If in fact nothing changes to the instream flow regime following an analysis that takes into account these new parameters, the guild now determines the spring flow instead of the sturgeon. For its part, the fall instream flow would have been up 393 m³/s (M32) if the proponent had preserved 90% of the WUA max.

The proponent had to check the strength of its weighted usable area assessment (RP11). It took into account the possibility of error in certain parameters affecting the hydrodynamic simulations and the determination of the biological models (HPI) for the lake whitefish and lake sturgeon. The sensitivity analyses showed that the habitat simulations (WUA) were robust and did not call into question the values of the proposed instream flows. However, thanks to this exercise, small but important changes were made to the proposed instream flows which usually never include a possibility of error. In the case of the biological models (HPI), 15 new sub-models were generated, making it possible to determine a possible variation in the instream flow values. The result for the lake whitefish at KP 216 showed, for example, a dispersion that could reach 39 m³/s, around the mean instream flows (RP11).
**Summer instream flow**

The summer instream flow was set in order to respect the parameters in the Boumhounan Agreement, i.e., a minimum of 20% of the mean annual flow. As a preliminary assessment of instream flows and in the absence of accurate onsite surveys, this type of approach, based solely on mean annual flow percentage, is based on the assumption that the health of a river’s aquatic ecosystem depends on its hydrological regime.

The minimum required flow set out in the Boumhounan Agreement resembles a hydrological method referred to as 0.25 QMA (25% of the mean annual flow), developed by and currently used in the Maritime Provinces. This method determines the minimum flow required to preserve fish habitats. This approach is derived from the Montana method, still predominantly used in North America, where 30% to 50% of the annual instream flow, depending on the time of year, is sufficient to safeguard aquatic habitats. These methods were developed in regions with a climate similar to Québec and where the rivers have a comparable hydrological regime. Their recommendations with regards to instream flows are generally considered conservative, particularly with regards to lakes (OED21).

The project ensures on average 28.7% of QMA at the closure point while controlling the flow regime according to critical periods. This flow is above the 20% QMA minimum established in the Boumhounan Agreement. It bears mentioning that these hydrological methods were not designed to take into account the presence of hydraulic structures, which in this case, substantially reduce habitat loss. They also do not take into account lateral inflows such as those from the Marte, Lemare and Nemiscau Rivers, which increase the flow at the mouth up to 49% of QMA (see map 2-9).

A percentage of the mean annual flow as defined in the Boumhounan Agreement is a very rough figure that does not provide any information on residual available aquatic habitats based on flow reduction. Consequently, the proponent checked the area using the wetted-perimeter method between current summer conditions (254 kilometre²) and future conditions, including the hydraulic structures (233 kilometre²). According to its calculations, 91% of the water area will be maintained, not taking into account the last weir adjustments at KP 223 recovering some 800 ha of additional aquatic habitats (PD5). This is a general assessment that will be examined in greater detail in the next section.
Winter instream flow
The winter instream flow is also subject to the requirements of the Boumhounan Agreement. Its primary role is to guarantee egg incubation for species that breed in the fall. The proponent presumes that these conditions will also allow the survival of juvenile and adult fish. In light of the numerous requests made by the review bodies for clarifications on the relationship between water levels and winter instream flow, new data was necessary. The proponent’s predictions were deemed acceptable following the replies given to the request for additional information.

COMEX analysis
COMEX deems that the instream flow regime is consistent with Québec government policy on instream flow for the protection of fish and fish habitat (R9). By safeguarding fish habitats, this regime will ensure an acceptable level of normal biological activity. However, the changes following the replacement of the HSI models and the results of the robustness analysis show that the instream flow value falls within a flow range that can be higher or lower than the one selected by the proponent. Consequently, COMEX considers it important that the proponent respect its commitment to employ adaptive management for the instream flow regimes (RP13). This regime must be effective in maintaining fish communities, especially to ensure the project’s sustainable development. Should the values or periods of instream flows prove to have been poorly assessed with regards to spawning habitats or fail to guarantee the survival of fish resources, the proponent will have to promptly perform additional assessments and consider changing them. However, the proponent’s analysis effort with regards to determining instream flows is worthy of mention because it is a scientific advance in this field, particularly within the framework of a project subject to an environmental assessment process.

COMEX would like to point out the drafting of agreement regarding water management of the Rupert River. The purpose of this agreement is to allow the Grand Council of the Crees, the Cree Regional Authority, Hydro-Québec and the Société d'énergie de la Baie James (SEBJ) to “manage” and maintain the project’s ecological instream flow regime in order to safeguard fish stocks and habitat. This agreement will help protect the ecology of certain sections designated by the signatories and their traditional use by the Eeyou Istchee Crees. It will also ensure that Hydro-Québec and SEBJ would work together with the Crees to resolve any problems that may arise with regards to their commitments. The agreement further provides that any change made to the project will be conditional on obtaining the authorizations required by government authorities.

In order to facilitate the application of any modification to the instream flow regime that may be recommended under the agreement mentioned above, COMEX believes that the relevant government authorities should be informed of the conclusions of the agreement signatories and of the follow-up carried out by the proponent. To this end, the monitoring reports must be filed according to a schedule that allows quick action to ensure the success of the ecological instream flow regime.
5.2.2 FISH

5.2.2.1 Maintaining spawning habitats for the main species

According to the proponent, close to 166-egg deposit areas were identified on the Rupert River, distributed mainly among suckers (52) and walleye (48). Northern pike follows with 26 spawning areas, against 11 for the lake sturgeon. The lake whitefish has 18 breeding areas, compared to 9 for the lake cisco and only 2 for the brook trout.

As mentioned earlier, a microhabitat model was applied to the spawning habitats of the main species in order to assess their potential. The spawning areas modeled at KP 216 and 281 were deemed representative. Consequently, their protection will ensure the same for the other spawning grounds located at different parts of the Rupert River.

Some spawning grounds will be lost following construction of the hydraulic structures. Such is the case for the walleye and sucker spawning grounds immediately downstream of the control structure at KP 314. The proponent is proposing to replace them with a multispecies spawning ground whose location downstream of the spillway canal will be determined based on future flow conditions. To the right of the weir at KP 170, the loss of a second walleye spawning ground will be mitigated by the expansion of a nearby upstream spawning ground. According to the proponent, developments could be added to this section, which already contains five other walleye spawning grounds, if their use was critically reduced.

Walleye and sucker spawning habitats abound on the Rupert River. These species often share the same whitewater breeding areas. COMEX believes that the loss of a limited number of spawning grounds and the proposed mitigation measures minimize any potential breeding-related risks.

Pike alone represents 16% of the spawning areas and 19% of the experimental net catches. However, it is the only large species that was not subject to a microhabitat model. This species breeds in spring, in aquatic beds in calm waters. These environments will be protected by the presence of weirs. According to the proponent, these developments will ensure a sufficient number of spawning habitats for this species. They will also be favourable for the yellow perch, spottail shiner, log perch and stickleback.

To favour spring spawning, the proponent reassessed the transition periods for the spring instream flow, and suggested decreasing the transition period between the winter and spring flow to 5 days instead of 9 and increasing the transition period between spring and summer flow to 9 days instead of 5. The future hydrograph will be closer to natural conditions, thereby providing better protection to the larvae of pike and other species spawning in calm waters or in shallow habitats (PD5). COMEX considers this a sound adjustment.

The brook trout was not given any special attention since it rarely uses this section. However, the presence of brook trout in the tributaries caused the proponent to increase the potential of the four tributaries located at KP 41, 191, 265 and 311 by expanding or developing spawning grounds. After reducing the flow, a risk of free flowing obstacles was found in six tributaries of the Rupert River at KP 74, 101.5, 107, 136, 254 and 299. Based on the follow-up findings, measures will be taken by the proponent, as needed, to maintain access to these tributaries (PD5.3).
The proponent undertakes to redevelop the lake sturgeon spawning ground at KP290 (PD9) and the existing spawning grounds at KP281 and 216 of the Rupert River based on the findings of the follow-up.

The review bodies asked the proponent to discuss the impact of sediment deposit on the spawning grounds and the risk of fouling. The proponent stated that to the right of the spawning grounds identified on the reaches of the Rupert River, the anticipated speeds are greater than the critical speeds for depositing fine particles (silt, fine sand and medium sand). No impact is therefore feared with regards to possible fouling of the spawning grounds due to the deposit of fine particles. Still, exposed banks will be stabilized by seeding on nearly 400 ha of slightly sloping sections comprised of fine materials. This stabilization will reduce erosion and favour bank use by wildlife.

In section 24.2.5 of the impact assessment, the proponent undertakes to monitor natural and developed spawning grounds. This follow-up will pertain to, among other things:
- the spawning grounds at KP 216 and KP 280, in order to validate the model-generated predictions;
- use of lake sturgeon spawning grounds identified in the lower reaches of the Rupert River with the help of larvae drift (PD9);
- the redevelopment of existing spawning grounds downstream of the weir at KP 170 in order to take into account the new flow distribution in the Rupert channels;
- developments to increase their potential use by brook trout.

The proponent proposes mitigation measures for the breeding of species in whitewater. Two multispecies spawning grounds will be developed downstream of the weirs at KP 110.3 and 223 of the Rupert. These measures do not compensate directly for a loss of spawning grounds but rather for unexpected impacts for these species.

**COMEX analysis**

COMEX agrees with the impact assessment and the mitigation measures proposed by the proponent. However, because the effectiveness of these developments remains difficult to predict, an exhaustive follow-up using appropriate indicators is necessary. For example, the larvae drift of the lake sturgeon is an interesting biological indicator for this species. If these spawning grounds are poorly used, corrective measures will have to be considered, including moving them. Regeneration of aquatic beds is also an important issue that will require careful follow-up in order to ensure their use and colonization by the northern pike and forage fish.

The Crees must pay special attention to the harvest of spawning ground species, particularly those that will become more accessible once the territory opens up with the construction of access roads.
5.2.2.2 Case of the anadromous lake cisco

According to the proponent, the anadromous lake cisco population feeds in Rupert Bay and James Bay during spring and much of summer. In August and September, it goes back up the lower part of the Rupert but not beyond KP 24.5, i.e., the impassable Smokey Hill rapids (see map 5-2). Echo-sounding work in the field reveals that spawners gather in great numbers between KP 13.5 and 24.3, particularly between KP 18 and 23 where the highest densities have been observed. The traditional dip-net fishing of the lake ciscos takes place in the fall, at KP 24.3, along the right banks of the Rupert, right up to the foot of the rapids. The ciscos are found very near this bank and venture into shallow areas (less than 50 cm), which makes them accessible to Cree anglers who set up spurs made of coarse substrate to increase fish concentration.

Lake whitefish is used to determine the flow during fall spawning. However, the results of this modeling cannot be fully transposed to the Smokey Hill site for lake cisco breeding. The cisco seems to prefer slower flows than the lake whitefish and the spawning period is slightly later.

Lake cisco spawning is not very well documented due to sampling difficulties at the time of freeze up. This difficult is exacerbated for anadromous populations that breed in lotic environments. Still, the physical description of the environment in several locations of this section frequented by the lake cisco indicates that it can spawn in a wide range of depths and speeds that can vary from 2.25 m to 8.5 m and from 0.2 to 1.4 m/s.

The main changes to the breeding area of the Smokey Hill anadromous lake cisco have been studied in detail using the partial conveyance method. This method involves subdividing short sections of river flow into longitudinal sections. The speed and depth is estimated for each section. Upstream of the hydraulic structure consisting of a rock blanket (KP 20.4), the average depth, maximum depth and wetted area will be almost fully maintained.
However, the mean flow velocity will fall approximately 61%. Upstream of the rock blanket, the situation is different. The 34% decrease in mean flow velocity is less significant than upstream but the mean depth for this section will be about 12% lower. According to the proponent, the 2 to 8 m stratum volume, preferably used for spawning, will fall about 30% but will not be a limiting factor. The total spawning area will be reduced by 5%. The substrate will keep its current characteristics and remain free of fine particles. For a part of the breeding season, the fall instream flow will be the same as the lowest flow recorded under natural conditions.

**COMEX analysis**

Based on current knowledge, no one can predict whether the lake cisco will continue to frequent the Smokey Hill traditional fishing site following the Rupert River diversion. The proponent is aware that 100 cm reductions in levels for this section of the Rupert River could affect the traditional Cree fishing site. Still, together with the users, the proponent undertakes to monitor the fish in this section with a view to finding one or more new fishing sites and to take the necessary measures to facilitate dip-net fishing (DCAP15).

The uniqueness of this anadromous population in Rupert Bay is due to its abundance in the river in fall and to its current harvesting. According to the proponent, no field study can quantify the number of lake and anadromous lake cisco spawners. The Crees annually fish approximately 10,000 at Smokey Hill, apparently with no negative effects on the population. The proponent assumes that the size of this population in tens or even hundreds of thousands. This exceptional wildlife resource calls for great caution with regards to the project impact.

The lack of an estimate for this population is problematic, precluding a proper follow-up to check its maintenance after the flow changes caused by the project. The success of Cree fishing is directly related to the abundance of these fish and any testing of redeveloped sites must take this factor into consideration. Lastly, given the lack of statistics on how heavy harvesting affects abundance, it is impossible to adequately manage this resource and to react in case of problems. The proponent’s egg harvest was insufficiently conclusive to permit an abundance assessment and does not reflect the presence of tens of thousands of ciscos. Before partially diverting the Rupert River, it is important to use other indicators such as larvae drift to better determine the current conditions of anadramous lake cisco spawners. While this indicator will not provide information as to the absolute abundance of the cisco population, it will make it possible to measure changes in the population and evaluate the egg clutch and growth.

While not well documented, the migration of anadromous lake ciscos is important to understanding the dynamics of this population. According to the findings of an Eastmain River assessment, after diversion (DCAP24), the migratory fish could include not only mature individuals ready for breeding but also immature individuals. According to this assessment, once they have migrated, immature ciscos could remain in a river an entire year before maturing. Consequently, lake ciscos in the spawning grounds of the Eastmain River could come directly from James Bay or be immature anadromous individuals that matured after their stay in the river. In the Eastmain River, prior studies identified migratory peaks at the end of August and early September, without however, noting whether the fish were immature individuals or spawners. This potential migration of spawners and immature anadromous ciscos in the Rupert River should be documented either through subsistence or experimental fishing before partially diverting the river.
If these immature anadromous individuals are in fact present in the Rupert River, they will be subject to the annual instream flow regime and will have to adapt to the new conditions during and after the work before breeding next fall. Their presence in the Rupert River should be confirmed and better described.

Following analysis of this information and of the opinions obtained, COMEX concludes that under future conditions, the anadromous lake cisco could continue to migrate upstream to the current spawning ground at KP 24. It is even possible that the reduction in flow speeds will allow the ciscos to continue to the impassable waterfall at KP 25.6, 1.1 kilometres farther up depending on whether or not crossing is possible at KP 24.5. Moreover, the planned hydraulic changes to the upstream and downstream rock blanket will maintain conditions conducive to cisco spawning.

As suggested by the proponent, the lake cisco population between KP 13.5 and 25.5 of the Rupert River should be monitored (PD9). This follow-up should include the larvae drift in the spring and the migration of spawners and immature anadromous individuals in the fall, beginning with a baseline established over two years prior to the diversion. Application of the adaptive management concept to the fall instream flow, which can include an increase in instream flow, should consider the cisco in addition to the other species in order to take into account the possible distinguishing characteristics of this anadromous population. Given that it ends approximately two weeks before the end of the cisco breeding, the fall instream flow merits special attention.

However, due to the planned hydraulic changes and current knowledge, it is difficult to predict whether the lake cisco will continue to frequent the traditional Smokey Hill dip-net fishing site or continue to do so in the same way. There is a lingering uncertainty as to the harvest that the current site or the one nearby can yield. In light of its monitoring, the proponent will have to respect its commitment to develop one or more new traditional dip-net fishing sites equivalent to Smokey Hill. COMEX believes that based on the abundance of this resource, other sites along the Rupert River have equivalent harvest potential. Otherwise, the proponent will have to implement the required mitigation or compensation measures in concert with the Waskaganish population.

COMEX concludes that an awareness program developed in collaboration with the Crees is necessary to maintain the appeal of the site because the Smokey Hill fishing site could see its popularity fall for various reasons (relocation tests and errors, fishing or fish quality, etc.). This program should also include promoting voluntary catch reporting among fisherman and talleymen.

### 5.2.2.3 Maintaining fish communities in the Rupert River

The description of the fish community is based largely on experimental net fishing that took place in 2002. The Rupert River’s fish community is made up of 22 species, the most abundant of which is by far the walleye (41%), followed by the northern pike (19%), the lake sturgeon (10%), the lake whitefish (9%), the longnose sucker (9%) and the white sucker (7%). Other species represent less than 1.5% of catches. Seine net catches offer a more representative picture of small species such as the spottail shiner (17.7%), the fallfish (17.5%) and the juvenile sucker (16.2%).

According to the proponent, in future conditions the fish communities in the Rupert River will persist. This conclusion is drawn from lessons learned monitoring the Eastmain and Opinaca rivers, both of which underwent a total flow diversion with their fish communities persisting in the long term. The analysis of the sediment transport and the thermal regime of the Rupert River indicate that these will
not cause appreciable changes to the habitats of the communities. However, the fish communities could see minor changes and an overall loss of biomass for all species, which the proponent estimates at 16% for the river stretches. This loss is considered conservative, because if Lake Nemiscau is included in the calculation, the loss is estimated at 8.5%. The productivity of the lake’s entire area is very high and will remain virtually unchanged. The lake is located in the middle of the reduced-flow area and has sufficient influence on biomass loss estimates to prompt the proponent to present these two approaches.

The project will have two major effects on aquatic habitats in the reduced-flow area. First of all, in spite of the presence of hydraulic structures, losses of aquatic area of 9% are anticipated. Second, the habitats saved by the presence of these structures will have slower flow velocities, accentuating their lentic character. These changes are presented in table 2-17, in particular for type 2 channel habitats, which will be transformed into type 3 channels (see section 2.4.2.1). These channels represent the majority of habitats on the Rupert River. In future conditions, these channels will occupy 79.3% of the total area.

**COMEX analysis**

Because of the area of type 2 and 3 channels, their influence on the proponent’s analyses is such that they essentially account for the forecasts. The model used by the proponent takes into account these two feeding habitats in the analysis to predict the production potential of species of fish, taking into account the changes to available habitat-types (e.g.: channel 1, basins, rapids, weirs, etc.). This model, called meso-habitat, uses two parameters: the area of habitat types and indexes of fish preference for these habitats. The DFO has performed a parallel analysis subdividing the habitat areas into zones (see section 2.4.2.1) and modifying preference indexes according to its own criteria. Once again, in spite of changes to the preference indexes, the overrepresentation of type 2 and 3 channels in each of the zones explains why the analyses performed by the proponent and the DFO reached essentially the same conclusions (M32).

In summary, according to the proponent, during the transformation of a type 2 channel into a type 3 channel, this habitat type will see its flow velocity reduced somewhat and its substrate thinned, as it will be made up mostly of pebbles and gravel rather than cobbles and pebbles. According to the meso-habitat approach, species that could in theory benefit the most from this major increase in type 3 channels are the lake sturgeon, the walleye, the lake whitefish, the northern pike and the fallfish, which will see their potential increase. However, suckers and yellow perch should see their potential decrease. The proponent suggests, however, that the white sucker is a colonizing species and could adapt fairly easily to the expected changes to habitat types, so the production losses for this species could be more limited than anticipated. The other species are represented in too small numbers for reasonable conclusions to be drawn from the calculations. The majority of these species—the yellow perch, the burbot, the lake chub and the lake cisco—maintain a strong presence in lakes and, according to the proponent, the reduced flow will be beneficial to some of them.

Because of the total area loss of 20 km², production potential will decrease by 10.7% following the drop in flow (not taking into account Lake Nemiscau) and will affect all species. According to the proponent, this decrease will be less than 10% for the lake sturgeon, the white sucker, the lake cisco, the trout-perch, the yellow perch and the fallfish. It will be more than 20% for the longnose sucker, the burbot, the round whitefish, the brook trout and the spottail shiner and between 10% and 20% for other species of fish.
Table 2-17 presents area losses, using the zones the DFO defined in its report presented to the review bodies (M32). The areas indicate clearly that the greatest impact will be felt mainly between KP 216 and 300 (zone 8) of the Rupert River. The impact assessment initially indicated that this zone would sustain major impact due to a reduction by some 1,000 ha, or 23%, of its area. If we exclude Lake Nemiscau (zone 7), this stretch contains most of the aquatic habitats but will sustain the greatest losses. Given this fact, following meetings with the departments involved, the proponent has proposed a 10-cm increase in the water level upstream from the KP 223 weir, slightly obstructing the flow area of the south branch of the river (PD2). This will move the target section from the weir at KP 243 to KP 253. This increase will result in a major gain in aquatic habitat of 828 ha. The mitigation measure will restore a portion of the river with many meanders and benefit grass beds and nursery habitats. In agreement with the tallymen involved, this increase will create additional flooding of 189 ha compared to natural conditions (PD9 and PD5.1).

In agreement with the proponent’s conclusions about the fish communities, the COMEX has underlined the importance of a follow-up, in particular to test the hypotheses drawn from the proponent’s analysis. While the relative abundance of species in this community may vary, it should be shown that valued species and species with an important role in the food chain of the ecosystem (forage fish) are being preserved.

COMEX believes that in spite of habitat loss along certain stretches of the Rupert River, the fish communities will persist in the short, medium and long term after the reduction in flow. Unlike the Eastmain and Opinaca rivers, the Rupert River will have an instream flow regime and hydraulic structures that will preserve most aquatic habitats.

COMEX notes the proponent’s efforts to understand the ecology of the lake sturgeon, a species that is highly valued by the Cree. While no negative impact is anticipated on the sturgeon’s feeding habitat, thorough follow-up should be performed for a period long enough to follow the development of year classes until reproduction. Particular attention should be paid to zone 8, which has a large lake sturgeon population, making it an important site both in terms of the productivity of the species and the colonization of sections downstream. COMEX believes that stocking lake sturgeon fries between KP 110 and 170 of the Rupert River is a promising measure, but one that must be accompanied by a follow-up program for harvesting lake sturgeon, in cooperation with the Crees. The success of such a measure depends upon the reasonable harvesting of this wildlife resource, particularly in the long term. It must not replace protection and habitat development efforts or supply the fisheries in the short to medium term, but rather ensure the viability of the existing fish population.
5.2.2.4 Free movement and passability of obstacles

The proponent has classified obstacles to the free movement of fish and has counted 49 of them in the Rupert River, mainly waterfalls and cascades. Among these, 23 have been classified as impassable with certainty or with reservations.

Among the 9 changes planned for the Rupert River, 5 obstacles considered impassable with reservations (KP 65.9, KP 77, KP 164.5, KP 308.5 and KP 310) should be passable with reservations after the diversion. Four waterfalls, located at KP 49, 103, 156 and 309, will go from impassable with reservations to passable, or passable with reservations.

The Boumhounan Agreement sets out the characteristics and location of 8 hydraulic structures that must allow for the continued free movement of fish. However, the proponent believes that the construction of weirs, at KP 49, 85, 110.3 and 170, near impassable obstacles, will not alter the free movement of fish. The other structures (KP 20.4, 33, 223 and 290) are designed to allow for the free movement of fish. The rock blanket will maintain flow velocities that are passable for the fish, in particular for the lake cisco. At KP 33, the fish will be able to travel using a secondary branch with no structure in present conditions. At KP 223 and 290, channels for upstream migration will be built, and the proponent will ensure that their design respects the physical constraints (velocity, slope, and water level).

The free movement of fish in the Rupert River will not be affected during construction because the hydraulic and control structures will be built upstream from natural obstacles that are already passable or that will have a temporary structure that permits movement. In the case of the anadromous lake cisco, the work on the rock blanket at KP 20.4 will take place outside of spawning season.

COMEX analysis

COMEX believes that the project will not create new obstacles and that there will be no notable impact on the fish communities. A few modifications will increase the passability of certain obstacles and, in turn, the home range of the fish. These modifications could even have a positive medium- and long-term impact on several species. As noted by the proponent, the specific composition of the Rupert reduced-flow reach is relatively homogenous, although the abundance of different species may vary by habitat and season. The opening of a few short stretches will not result in the introduction of new species or significantly change the structure of the fish community.

Among all the tributaries of the Rupert River, only 6 are at risk of incision following headward erosion, which could result in new obstacles and hamper the movement of fish, particularly of brook trout. The proponent will follow-up on these streams to determine the extent of the impact and to take necessary corrective measures.

The proponent should follow-up on the effectiveness of the four hydraulic structures at the lower reaches of the Rupert River, designed to allow for the free movement of fish.
5.2.3 LAND AND SEMI-AQUATIC WILDLIFE IN THE RUPERT, LEMARE AND NEMISCAU RIVERS SECTOR

Baseline
In the Rupert, Lemare and Nemiscau rivers sector, the species of land and semi-aquatic wildlife chosen for analysis are caribou, moose, black bears and beavers, which are the main species valued by the Cree. Information on micromammals that live in the sector of the rivers is found in section 5.1.1.2.

Maintaining current water levels in the Lemare and Nemiscau rivers will not lead to changes to land animal habitats. In the Rupert River, the reduced water levels in segments not influenced by a hydraulic structure will result in changes to riparian habitats. However, this change will be negligible for large animals.

The proponent counted 53 active beaver colonies during a fly-over of the banks of the Rupert River and estimates the beaver population along the Rupert River at 212 individuals. The stretch of the Rupert River downstream from Lake Nemiscau has a high density of colonies, 2.5 times higher than the stretch located upstream from the lake. This density on the shores of the lake is lower than along these two stretches. Most of the colonies are in flat terrain habitats and on gently sloping banks.

Future conditions as assessed by the proponent
The main impact of building hydraulic structures along the Rupert River will be disruptions to wildlife and a drop in the water level of certain stretches of the river. The land clearing required to build these structures will affect small areas of land environment. No impact is anticipated on the caribou, moose or black bear. According to the proponent, the 53 beaver colonies identified along the Rupert will be affected. However, the proponent believes that the beavers will relocate and adapt to the new conditions. At the request of users, the proponent will implement an intensive beaver trapping or relocation program conducted by tallymen in the sectors not influenced by the hydraulic structures.

No impact is anticipated on large animals during the operation period. The proponent estimates that along the Rupert River, 30 beaver colonies, or almost 120 animals, will be in sectors influenced by a hydraulic structure and will benefit from conditions favourable to their maintenance. However, on stretches not influenced by a hydraulic structure, a drop in the water level of 1.1 m to 2.1 m will lead to bank exposure. Around 23 beaver colonies could be affected, representing 92 animals. The proponent has not assessed the impact on these colonies but has indicated that monitoring the Eastmain and Opinaca rivers, both rivers with reduced flow, has shown increased signs of beaver activity and demonstrated that the beavers benefit from the reduced flow.

The proponent will seed the grasses in the exposed stretches of the Rupert River to reduce the erosion of the shores and encourage their use by wildlife. A few years after the diversion bay impoundment, a survey of beaver colonies on the shores of the Rupert River will assess the use of the riparian environment by wildlife.
COMEX analysis
COMEX believes that maintaining current water levels in the Lemare and Nemiscau rivers, will prevent changes to land wildlife habitats. In the Rupert River, the drop in water levels on stretches not influenced by a hydraulic structure will result in changes to riparian habitats, which will, however, be negligible for large animals. The follow-up program for the beaver colonies along the Rupert River will make it possible to assess the actual impact of the drop in the water level on this species, particularly in sectors that are not influenced by a hydraulic structure.

5.2.4 AVIFAUNA (WATERFOWL)
Baseline
Because the flow of the Lemare and Nemiscau rivers will be maintained and the proponent does not anticipate any changes to riparian habitats along these rivers, only the Rupert River was considered in the analysis.

The wetlands near the Rupert River are primarily made up of areas, often very large, of peatland. The riparian habitats along the Rupert River are generally linear and small, except for a few particularly suitable spots, such as between KP 195 and 205, 238 and 249, and between KP 262 and 270.

Waterfowl that use the Rupert River in the spring for migration and nesting generally prefer the aquatic grass beds. Only geese use other environments in the spring, specifically marshes and peatland. During the summer, the American black duck and its broods prefer the marshes, in part due to their diet and method of feeding.

In total, 26 species of geese, Canada geese and ducks were observed during inventories performed in 2002 and 2005. The most abundant species in all periods were Canada geese, the American black duck, the common merganser and the common goldeneye. Large groups of Canada geese were observed during spring migration. Almost twice as many indicated breeding pairs of waterfowl were observed during inventories conducted in 2002 compared to inventories conducted in 2005. The difference can be explained by the ban on flying over particularly productive sectors. Nevertheless, more species, including at least one brood, were observed in 2005 than in 2002. The stretches of the river most used by all species are located between KP 0 and 15, 105 and 120, 170 and 215, 225 and 265, as well as between KP 285 and 310. The breeding pairs of Canada geese were mainly concentrated between KP 50 and 100, while pairs of American black ducks were found all along the river, particularly in the Lake Nemiscau sector and between KP 220 and 270.
Future conditions as assessed by the proponent during the construction phase
In order to limit impact on habitats, the proponent has planned to implement hydraulic structures that maintain water levels over fairly long distances along the river. In choosing the location of the weirs at KP 110.3, 170 and 223, it took into consideration sectors with the largest concentrations of waterfowl, among other criteria.

The construction of hydraulic structures will affect only a small area of land and aquatic environments. These areas are not large enough to affect the availability of habitat for waterfowl. Nevertheless, birds may avoid the work areas during construction.

Because the diversion phase is part of the construction phase, the impact of flow management on waterfowl will be the same as in the operation phase and is dealt with below.

At the end of construction, the proponent will revegetate the work areas and has also planned for general mitigation measures with respect to land clearing, construction machinery and traffic.

Future conditions as assessed by the proponent during the operation phase
The main impact on waterfowl habitat during the operation phase will result from the effects of flow management on riparian environments along the Rupert River. The habitats will be permanently modified, either through flooding of the land environment, the exposure of shallow-water areas or changes to the type of riparian wetland (from marsh to swamp, for example). These changes to habitats will likely lead to changes in the use of certain sectors of the river by waterfowl.

The reduced amplitude of annual variations in water levels will be a major contributor to the reorganization of riparian vegetation. The proponent foresees virtually no change to the riparian vegetation along the stretches influenced by a weir. It has created forecasts of the development of riparian vegetation along stretches not influenced by a weir using monitoring data for vegetation from the Eastmain and Opinaca rivers post-diversion. The data indicates that exposed aquatic grass beds will slowly disappear and be replaced by new grass beds that develop in the new body of water. However, these exposed areas will be more limited than in natural conditions, given the reduction in variations of amplitude. The marshes will invade the exposed areas in the short term and then be replaced by swamps. The proponent anticipates net gains of more than 2300 ha of swamp and 30.4 ha of marsh, as well as losses of 172.4 ha of aquatic grass beds (26.6% of total grass beds along the river).

The largest areas of marshes lost should be located mainly along two stretches of the river, at Lake Nemiscau and along the stretch between KP 224 and 271. However, this information is out of date, because the new design of the weir at KP 223 will make it possible to maintain water levels over more than 10 km upstream, in the sector with well-developed riparian environments (D15.1). Following the review of the design of the weir at KP 223, the proponent anticipates a significant gain of 800 ha of wetted area over previous data (losses of more than 600 ha of wetted area along this stretch). The largest areas of aquatic grass bed losses are between KP 214.8 and 224 and between KP 124.8 and 170. The proponent does not anticipate a significant loss of riparian wetlands in 13 of 17 stretches of the Rupert River.
In order to maintain water levels over as long distances as possible, the water levels directly upstream of certain weirs will be raised. Slightly more than 100 ha of land area will be flooded, mainly upstream from the weirs at KP 223, KP 33 and KP 110.3.

According to the proponent, given the expected gains in riparian environments (swamps), the number of Anatidae species (particularly the Canada goose and the American black duck) should increase in the short term, as was observed on the Eastmain and Opinaca rivers after their diversion. In the long term, Anatidae species should remain stable or increase slightly compared to data from the 2002 inventory along 13 stretches that will be only slightly affected or unaffected by losses in riparian environments. As well, while there should be no other change to the number of Anatidae species along stretches influenced by a weir, the reduction in flow velocity, reductions in fluctuations of flow and the stabilization of water levels could slightly increase Canada goose and dabbling duck populations along these stretches.

According to the proponent, the impact summary of the reduced flow on the Rupert River shows a net loss of 8 breeding pairs (PD7). However, the approach used by the proponent to determine gains in breeding pairs requires that a species already be established along the stretch where the balance of suitable habitats is positive after the diversion, which results in an almost certain underestimation of the gain in dabblers, particularly of the green-winged teal.

Four species will be more affected by the change in habitats, all of them diving ducks, of which 71% of the losses involve the common merganser. Six species will see their populations grow: the Canada goose, with a significant increase of 57%; the American black duck; the ring-necked duck; the mallard; the green-winged teal; and the American wigeon. In general, stretches with large exposed areas will support fewer mergansers and more Canada geese and dabblers (PD7). The most significant losses anticipated are concentrated in the sector between KP 214.9 and 223.
The loss of grass beds should affect only the number of non-breeding adults (moulting) that use the two stretches where the losses will be most significant. According to the proponent's estimates, around 27 non-breeding adults will be affected by these habitat losses and will have to find new moulting sites. Migrants should be only somewhat affected; in 2002, migrants primarily used stretches that will be influenced by a weir.

**Mitigation and environmental follow-up measures planned by the proponent**

Working with the Cree, the proponent plans to seed around 400 ha of exposed bank along the Rupert River to encourage vegetation regrowth, which will help feed waterfowl during brood rearing and moulting periods.

The proponent also plans to develop wetlands in the diversion canal at KP 49 (PD1). However, the gain in wetland area that will result from this development has not been specified. The proponent has plans for a project in the bay propitious to goose hunting on the south shore of the river at KP 311. It has also proposed to the tallymen developing ponds for goose hunting in certain borrow pits used for the project (see section 6.4.1.1).
The proponent will follow-up on the populations of waterfowl that use the Rupert River sector. The follow-up, which will take place over 4 years, will include an inventory during the construction period, another during the diversion period, and two more inventories, 3 years and 10 years after the beginning of the operation phase. An inventory of riparian and aquatic vegetation on the shores of the Rupert River will also be performed in order to assess the potential for restoring riparian wetlands, and, consequently, the waterfowl habitat.

Complementary study – comparison between waterfowl density on reduced-flow and undeveloped rivers

According to the proponent, while a number of rivers have been diverted in Québec, very few follow-up studies have been performed to compare waterfowl density on a river before and after the diversion. The proponent’s complementary study (PD12) compared the density of waterfowl on reduced-flow rivers (Eastmain, Opinaca and Petite Opinaca) and undeveloped rivers (Rupert and Broadback). These rivers are located in the same region, run on similar substrates, are subject to the same climate and have similar fish communities. However, the comparison between these rivers is not entirely accurate, given that the Rupert River will be partially diverted, with an average annual ecological flow regime of 28% and hydraulic structures to maintain water levels. Unlike the Eastmain, Opinaca and Petite Opinaca rivers, the Rupert River will still have spring floods and summer and winter low-flow periods, like a natural river. However, their amplitude will be reduced.

Inventories performed in 2005 show that waterfowl density on reduced-flow rivers is slightly higher than on undeveloped rivers. This difference can largely be attributed to the density of dabbling ducks, mainly the American black duck and the green-winged teal, which is 1.7 to 5 times higher.

According to data from monitoring waterfowl populations in the southwestern and eastern regions of New Québec (OED33) and the Eastmain and Opinaca rivers environmental monitoring program (OED34), populations of American black ducks and Canada geese that nest on the reduced-flow rivers increased virtually every year after these rivers were diverted.

The density of indicated breeding pairs of diving ducks observed during 2005 inventories was similar, although slightly higher, on undeveloped rivers. This difference is due to the significantly lower density of the common merganser on reduced-flow rivers.

Furthermore, the total density of broods, particularly of dabblers, was clearly higher, by 2 to 5 times, on reduced-flow rivers. There was no significant distinction for diving ducks. Nevertheless, the highest concentrations of broods of all species of diving ducks were observed on undeveloped rivers. The same applies to non-breeding adults. Reduced-flow rivers were clearly used more than undeveloped rivers by these adults, mainly by dabblers.

It is possible that the increase in waterfowl populations on the Eastmain and Opinaca rivers is attributable to the increase in the number of American black ducks and Canada geese observed in southern Québec, as well as the appeal of reduced-flow rivers for these species. Reduced-flow rivers seem to suit populations of Canada geese, American black ducks and dabbling ducks in general. These species are closely tied to wetlands because they feed mainly on vegetation and invertebrates in this environment. This relationship is particularly strong in the case of geese, Canada geese, scaups, and dabblers in general, while most diving ducks feed on invertebrates or fish. Riparian wetlands expand on exposed areas of reduced-flow rivers. During inventories in 2005, the area of aquatic grass beds, marshes and swamps represented between 26% and 31% of the shores of the Eastmain, Opinaca
and Petite Opinaca rivers, compared to 11% for the Rupert River. Furthermore, reduced-flow rivers contain a higher proportion of ponds, the preferred environment of dabblers and Canada geese. All of these factors explain the greater density of waterfowl, particularly of dabbling ducks, on reduced-flow rivers.

Nevertheless, the greater presence of swamps compared to other wetlands makes it possible to imagine changes to habitats in the long term. The swamps, particularly on the Eastmain River, have clusters of large alders and willows, demonstrating that the activity of ice on the river cannot stop growth. This type of habitat should normally evolve toward a more forested environment, which is less appealing to waterfowl.

The proponent compared the use of stretches of reduced-flow rivers with and without weirs. In general, it seems that a slightly higher number of species of breeding pairs (2 to 3 species) use stretches that are not influenced by a weir, while up to twice as many broods were observed along stretches influenced by a weir.

**COMEX analysis**

According to the proponent’s estimates, fewer than ten pairs may have to find new nesting sites as a result of habitat loss caused by exposure during the operation phase. This number does not take into account the development of a new wetlands in the diversion canal at KP 49 and its habitat potential for waterfowl, or the gain resulting from raising the weir at KP 223.

The results of monitoring of waterfowl populations on the reduced-flow Eastmain, Opinaca and Petite Opinaca rivers seem to show that there may be an increase in waterfowl populations in the medium term, mainly of dabbling ducks and Canada geese. The quality of habitat could, however, vary in the long term, if the shores are transformed into more forest-like habitat. Hydraulic structures should significantly reduce the effects of the drop in water levels and maintain a large portion of the riparian habitats. In the sectors that are not influenced by a weir, new aquatic grass beds, particularly swamps, should colonize the new environments. These riparian wetland habitats are suitable for waterfowl.

Specialists from Environment Canada’s Canadian Wildlife Service have reached an agreement with the proponent regarding a follow-up program for waterfowl populations using the reduced-flow reach of the Rupert River (PD1). The Broadback River was chosen as a reference river to assess interannual variations in regional populations of waterfowl. The program will validate the accuracy of the environmental assessment performed by the proponent and adjust mitigation measures if necessary.

COMEX notes that waterfowl populations that use the Rupert River habitats should not be affected by the project. It believes that a follow-up to assess the density of waterfowl along the reduced-flow reach of the Rupert River and monitoring wildlife projects should determine whether the project is effective and allow for any necessary adjustments.
5.2.5 SPECIAL-STATUS PLANT SPECIES

Baseline

Inventories conducted by the proponent in 2002 and 2003 confirmed the presence of 4 special-status plant species in the Rupert, Lemare and Nemiscau rivers sector, specifically *Gratiola aurea* f. *pusilla*, *Hiericum robinsonnii*, *Hudsonia tomentosa* and *Canadanthus modestus*. These species are all likely to be designated threatened or vulnerable in Québec.

Future conditions as evaluated by the proponent

According to the proponent, *Gratiola aurea* is the only plant species affected by the project. It estimates that certain populations will be partially exposed following the implementation of weirs, specifically 3 specimens downstream from the weir at KP 33 of the Rupert River and 7,000 downstream from the weir at KP 223.

Inventories of *Gratiola aurea* count 35 populations, representing a total of around 1,100,000 specimens, on the Rupert and Marte rivers (see RP11, p.338). Many specimens were inventoried along stretches of the Rupert influenced by a hydraulic structure. In particular, this is the case for Lake Nemiscau, where 90% of specimens were recorded. However, because the water level will be maintained by hydraulic structures, no impact should be felt.

The populations on the exposed stretches of the Rupert River could be lost. The proponent estimates these losses at almost 1% of all individuals counted and no mitigation measures are planned. However, the proponent has indicated that when the exposed stretches of the Rupert River are seeded, precautions will be taken to avoid disrupting areas where the plant grows, specifically by marking out these sectors. The proponent notes that the project’s impact will be assessed by monitoring populations and that particular attention will be paid to populations of *Gratiola aurea* when following-up on riparian vegetation along the Rupert River in 2012, 2014, 2017 and 2021 (DCAP15 p. 106).

COMEX analysis

Given the large number of specimens of *Gratiola aurea* and the fact that the majority of individuals are found in the Marte River and at Nemiscau Lake, where water levels will be maintained, COMEX believes that the impact of the project on this plant species is acceptable, in spite of the loss of individuals following the construction of the weir at KP 33, mainly in the exposed areas of the Rupert River. The COMEX maintains that the proponent should adjust seeding activities in the sectors where the species *Gratiola aurea* was inventoried.
5.3 THE RUPERT BAY AND RUPERT RIVER ESTUARY SECTOR

5.3.1 FISH

5.3.1.1 Preserving species in Rupert Bay

Baseline
Over the past fifteen years, inventories performed in Rupert Bay and the estuaries of its main tributaries indicate that there are 40 species of fish spread around the bay (see sections 2.4.4.1, 2.4.4.2 and 2.4.4.3) and in the stretch between the first set of rapids and the river mouth. These are exclusively freshwater species, such as the northern pike and the white sucker, as well as brackish-water and marine species, such as the sculpin and the capelin. A third group, made up of freshwater species that tolerate a certain level of salinity, also use the bay, specifically the stickleback, the brook trout, the lake whitefish and the lake cisco. More specifically, experimental fishing shows a variation in specific abundance according to the following environments:

- the walleye dominates catches at the foot of the first set of rapids of the tributaries (Nottaway, Broadback, Rupert, Pontax), followed by the lake whitefish, the lake cisco, the longnose sucker and the lake sturgeon;
- at the mouth of the tributaries, the longnose sucker and the walleye dominate catches;
- the freshwater zone is colonized by the longnose sucker, which represents 84% of catches. There is also sturgeon, telemetric monitoring of which indicates that it uses the entire freshwater zone up to Stag Rock in summer and returns to the tributaries in the fall to spend the winter there;
- in the mixing zone, the longnose sucker is still abundant, and the sculpin makes an appearance. The lake cisco and the lake whitefish appear regularly in catches;
- the scuplin and the lake cisco dominate in the saltwater zone.

According to the proponent, the great diversity of species found in Rupert Bay, greater than in other northern estuaries, is due to the fact that it is the southernmost estuary on the east coast of James Bay and Hudson Bay, and it has a large freshwater area, which results in the presence of both species that are tolerant and those that are intolerant of salt water. The average length of specimens caught indicates that the bay is used as a summer feeding area for the first age classes and confirms that this environment can play the role of nursery colony.

Seasonal movement was also noted for the salmonid, the longnose sucker and the walleye. Without contest, the greatest movement in terms of abundance was that of the lake cisco, which enters the Rupert River during the fall to spawn from the bay where it spends the summer, in particular in the mixing zone. Experimental fishing done in 1991 showed that the number of adults caught at the foot of the first set of rapids of the Rupert River and at Smokey Hill was higher than in any of the other tributaries of the bay. The individuals caught were almost all sexually mature. The migratory movements are the same for the lake whitefish. However, immature individuals coming from the bay remain largely at the mouth of the tributaries and do not swim up further. During the summer, young longnose suckers and walleyes are found both at the mouth of the tributaries and in the mixing zone. They return to spend the winter in the mouth of the tributaries late in the season. Adult walleyes remain mainly in the tributaries during the summer, while the longnose suckers move to the freshwater zone of the bay. In the fall, they return to the mouth of the tributaries, without swimming up to the first set of rapids. The brook trout shows seasonal movement from James Bay.
to the tributaries of Rupert Bay, but these results must be interpreted with caution due to the limited number of catches they are based on.

Rupert Bay is also home to larvae of several species of fish. The freshwater zone is used solely by species that reproduce in freshwater, such as suckers, perch, trout-perch, chub, sculpin and goldeye, while the saltwater zone is exclusively occupied by marine species: sand lances and capelin. In the transition zone, there are both marine species and freshwater species that can tolerate brackish water, such as suckers, lake ciscos, sand lances, spoonhead sculpins and sticklebacks. Aside from the lake cisco, it is impossible to assess the Rupert’s contribution to larvae drift, compared to the Nottaway, Broadback and Pontax rivers.

Future conditions as assessed by the proponent
According to the proponent, reduced flow will be the main source of impact on fish and their habitat in the Rupert River estuary. The estuary is delimited by KP 2.2 and -8 in relation to Waskaganish. According to the proponent’s calculations, the spring flow will be 869 m³/s and the autumn flow 372 m³/s. The first set of rapids from KP 4 to KP 5.5, which are known reproductive sites, will continue to provide suitable breeding habitats for the survival of the species that use them. However, the proponent has not specified how the number of habitats will compare to the current situation.

The main physical changes to the Rupert River estuary will be a drop in the water level at low tide and reduced flow velocity throughout the tidal cycle (see sections 2.4.4.1 and 2.4.4.3). In certain locations, these changes will result in the extension of certain low tides and submerged aquatic grass beds, which, according to the proponent, will have a positive impact for its functions as fish habitat. As specified in this section, there will be no saltwater intrusion in this sector, nor any inversion of the current at flood tide. As a result, freshwater species will still enjoy a suitable environment for completing their life cycle. The species that return to the mouth of the Rupert River for the winter, downstream from the first set of rapids, will benefit from a reduced volume of frazil produced by the first set of rapids, which accumulates downstream. Finally, the physical changes caused by the diversion will not create an obstacle to migration or the free movement of fish.

In the bay, the movement of the freshwater-saltwater interface upstream and the reduced area of the freshwater zone are the main sources of impact on the fish and their habitat. The reduced freshwater zone will diminish the aquatic environment of freshwater species such as the emerald shiner, the burbot and the lake sturgeon. The proponent notes that the burbot prefers the cold waters of the mouths of tributaries, the emerald shiner is already marginal in the freshwater zone and the sturgeon can tolerate low salinity. The proponent concludes that the reduced flow will have only a slight negative impact on the fish and its habitat in Rupert Bay.

Although the development of fish communities is not related to the Waskaganish Biodiversity Reserve, which encompasses the Pontax river watershed, it is appropriate to note some additional information on the development of the littoral fringe following the diversion of the Rupert River. According to the proponent, the reserve encompasses the five islands at the mouth of the Pontax River, where the proponent has modelled the salinity conditions upon the diversion of the Rupert River. It concludes that a saltwater intrusion in the Pontax estuary is unlikely and that the variations in salinity at the downstream edge of the islands will be limited. As well, the proponent does not expect any significant negative effects on the development of foreshores or on the riparian vegetation of the Rupert River estuary and Rupert Bay. These conclusions also apply to the Ministikawatin Biodiversity Reserve.
COMEX analysis

COMEX considers the impact of the project on fish communities in the Rupert River estuary and Rupert Bay to be minor. It recognizes that the species that use the area of the first set of rapids, the estuary and the freshwater zone are of greater concern because of the reduced flow. However, maintaining a minimum flow regime can save the breeding habitats at the first set of rapids and help limit saltwater intrusion further upstream in the bay. The freshwater zone will remain large, because the permanent freshwater zone will still extend from the mouth of the river to midway between the Pontax River and Poplar Point, in spite of a reduction of 80 km². All the other species of special interest that use Rupert Bay tolerate a certain degree of salinity. As well, the increase in residence time in the freshwater zone will result in a slight plankton bloom, which will be beneficial to fish that feed there at all stages of growth.

The modeling of the physical parameters of the mouth of the Pontax River (current, salinity, water level) indicates that upstream from Jolly Island, the water will remain fresh permanently, meaning no impact on the freshwater fish. Downstream from the island, flashes of a low degree of salinity could occur, but the fish that do not tolerate saltwater will be able to move toward the river when this happens. In this respect, COMEX believes that the project will not affect the uniqueness or the representativeness of the Waskaganish Biodiversity Reserve.

During public hearings, the DFO submitted a brief in which it expressed concerns about the productivity of Rupert Bay. The brief mentioned that the total organic carbon (TOC) from the Rupert River would drop with the reduction in flow, and that this drop could have an impact on the phytoplankton and benthic production of the bay (M32). Since this report was issued, the proponent has pursued discussions with the DFO, and it was agreed that he would follow-up on this significant problem using COT measures and establishing a growth curve for the longnose suckers that are abundant at the mouth of the river and in the freshwater zone (PD9). This measure satisfies COMEX, insofar as more global monitoring of the current, salinity and water levels is undertaken for all the sectors of Rupert Bay. As well, the principle of adaptive management proposed by the proponent could make it possible to correct a situation unfavourable to the productivity of the environment.

It was also agreed with the proponent that larvae drift of lake ciscos and lake whitefish that reproduce at KP 24 of the river will be monitored before the diversion of the river in order to establish a baseline. The follow-up will continue after the diversion of the river to check on the survival of these species in the river (VAP 22). According to COMEX, this follow-up should extend up to the estuary of the river, to verify use by the different species that are currently recorded and to ensure that they continue to use this area. COMEX reiterated its conclusion regarding the involvement of the Cree community in the planning, execution and distribution of information of the biophysical environment follow-up programs.
5.3.2 LAND AND SEMI-AQUATIC WILDLIFE IN THE RUPERT RIVER ESTUARY AND RUPERT BAY SECTOR

No impact is anticipated on riparian vegetation in the Rupert River estuary or on the high marshes of Rupert Bay. The proponent anticipates no impact on land mammals or on the boreal chorus frog, a species of special concern in Quebec that uses the sector. As well, even if minor physical modifications are anticipated in the Rupert River estuary and Rupert Bay, the project will have no impact on sea mammals. COMEX agrees with the proponent’s assessment.

5.3.3 AVIFAUNA

Baseline

Waterfowl

The James Bay coast is recognized as a major corridor for the spring and fall migration of waterfowl. The coast provides habitats for rest, feeding and moulting.

Spring inventories of waterfowl in Rupert Bay performed in 2002 identified 25 species of birds, made up of at least 65,612 individuals. The most abundant species were the brant, the Canada goose, the northern pintail and the green-winged teal, representing more than 90% of all waterfowl counted.

Rupert Bay and Boatswain and Cabbage Willow bays are some of the sectors used most by waterfowl. Thousands of individuals make their way there during spring migration. Very large groups of brants and a few thousand Canada geese use the sectors slightly south of Rupert Bay, on the shore of the west coast of the community of Waskaganish, as well as around the mouth of the Octave River. Finally, several thousand Canada geese gather in the sector located between Poplar Point and the mouth of the Pontax River (see map 2-12).

Most species of geese and Canada geese nest in the regions north of the study zone. To reach their nesting areas, certain species, such as the lesser snow goose and the brant, migrate almost exclusively along the James Bay coast. The Canada goose, however, seems to use a much wider migration corridor, running from the James Bay coast to the La Grande complex reservoirs. In fact, the spring 2002 inventories showed that the Canada goose uses two migratory paths in the study area of the project: the increased flow section of the Opinaca Reservoir, Lake Boyd and Sakami Lake and the Rupert Bay coast. Observations are limited to Rupert Bay, given the fly-over restrictions requested by the Crees to the north along the James Bay coast.

Of the corridors used by the Canada goose during the fall migration, only the increased-flow section was studied. Similar flight restrictions over the coasts of Rupert Bay and James Bay prevented assessing the use of the coastal sections and making comparisons between the two corridors. Nevertheless, the inventory data shows that the Opinaca-Boyd-Sakami corridor is used much less during the fall than the spring.

Following the recovery of populations in Southern Ontario, the “resident” Canada goose population (Branta canadensis maxima), which nests in the south, experienced a major increase over the past few years, growing from around 20,000 individuals in 1997 to 400,000 individuals in 2000. Canada geese often migrate as far as the north of James Bay, even to Hudson Bay, for their annual moulting. Major concentrations of moulting geese have been observed in the increased-flow section (see section 5.4.1.3).
A number of species of ducks also migrate along the corridor that runs along the James Bay coast. Many species nest within the territory of the La Grande complex, while others move further north. The results of the inventory show that during the spring migration, the Rupert Bay coast supports greater densities of the northern pintail, the green-winged teal and the American black duck than the Opinaca-Boyd-Sakami corridor.

In moulting season, Rupert Bay, the Opinaca-Boyd-Sakami corridor and the Laforge and Caniapiscau reservoirs are host to large populations of dabblers. The largest variety and greatest density are found in Rupert Bay.

The James Bay and Rupert Bay coastal environments, more particularly the mudflats and marshes, are important habitats for waterfowl year-round. Observations made during spring and summer 2002 show the importance of low marshes for all species and high marshes in the spring for dabblers.

**Migratory shorebirds**

According to inventories, around 100,000 migratory shorebirds used Rupert Bay in 2002, including the white-rumped sandpiper, the greater yellowlegs and the semipalmated sandpiper, which represent the 3 most abundant species.

The 2002 inventories showed the presence of 26 species of shorebirds. Thirteen of the species observed are considered arctic breeding birds, while 6 other species are classified migratory and breeding birds. The others are passage migrants, which are rare in Québec. Among the species inventoried in 2002, 19 are considered in decline in Canada, of which 9 are considered in strong decline in Québec. These birds mainly use the mudflats and low marshes.

**Special-status species**

Thirteen species of special-status birds were observed during inventories performed in 2002: the marbled godwit; the Nelson’s sharp-tailed sparrow; the Le Conte’s sparrow; the peregrine falcon; the black tern, the sandhill crane; the short-eared owl; the Wilson’s phalarope, the little gull; the Bonaparte’s gull, the bald eagle; the yellow rail; and the Caspian tern.

Seven of these species were observed mainly in the Rupert Bay sector. Most of these species are considered probable breeders.

Rupert Bay, including Boatswain Bay, could be home to the largest population in Québec of certain species, including the Le Conte’s sparrow, the Nelson’s sharp-tailed sparrow, the yellow rail and the sandhill crane. The two sightings of marbled godwit nests constitute a first in Québec.
**Future conditions as assessed by the proponent during construction and operation phases**

According to the proponent, there will be no appreciable negative impact on the development of foreshores or on vegetation in the Rupert River estuary or in Rupert Bay. As a result, the proponent anticipates no measurable change to the habitats of Anatidae species, migratory shorebirds and other species.

The proponent plans to follow-up the riparian vegetation in Rupert Bay over a period of 10 years after the beginning of the operation phase. No follow-up of avifauna is planned in the Rupert Bay sector.

**COMEX analysis**

It appears that the avifauna habitat rather than the avifauna itself could be affected by the changes to the environment that result from diverting the Rupert River.

According to the proponent, the reduced freshwater inflow from the Rupert River to the bay will shift the marine intrusion zone slightly to the south of the bay. This will be felt by low-marsh plant communities, among others, growing in the zone affected by the tide. The organization of low-marsh plant communities, located in the new transition area between freshwater and brackish water, will be slightly changed. According to the proponent, the transition area on the west coast of the bay should remain within the present sector. On the east coast of the bay, this area, located in the Bois Brûlé point sector, will shift approximately 4 km south (see section 5.3.1.4). The dominant species of vegetation, the common threesquare, should not be affected by this change in salinity because it tolerates freshwater to slightly brackish water environments (see map 2-12).

The fact that the low-marsh plant zone, which is a preferred riparian habitat for waterfowl during migration and breeding, will be affected by the changes could be cause for concern. However, observations of the distribution of birds in the bay show that aside from the brant, which seems to prefer freshwater to slightly brackish water environments, there are thousands of dabbling ducks and Canada geese in the freshwater, transition, brackish water and saltwater zones. Furthermore, the new transition zone will be relatively short given the dimensions of the bay. As a result, COMEX believes that it is unlikely that the change to the low-marsh plant community in the new transition zone will result in an appreciable impact on the avifauna.

The proponent anticipates some extension of the low marsh in the Rupert River estuary sector. This increase in habitat area will benefit waterfowl. The habitat of migratory shorebirds and species at risk will not be affected by the project.

During hearings, the COMEX noted that stakeholders were concerned about reductions in the Canada goose population along the coasts of James Bay and Rupert Bay. A number of people indicated that they believed that since the creation of the La Grande complex reservoirs, the geese migrate further inland, which has had an impact on traditional goose hunting along the James Bay coast. This question is revisited in section 5.4.3.
5.3.4 VEGETATION – RUPERT BAY

Baseline
The Rupert River estuary
Diving has shown that very little submerged vegetation blankets the main channel of the Rupert River estuary, with flow velocity the main reason for this. In secondary channels, the river bed is partly covered by submerged vegetation.

Rupert Bay
The coastal wetlands of Rupert Bay are well developed because of clay deposits and the level topography of the bay. They are particularly vast in Cabbage Willow and Boatswain bays. The string of coastal vegetation extends from dry land to open water, in a succession of swamps and high and low marshes.

The tide submerges and exposes a portion of the coast. The length of submersion varies according to level and determines the distribution of vegetation. The upper zone, including high marshes, swamps and fens, is flooded only during storm high tides and equinoctial tides. The height of the mean high water is the limit between the upper zone and the middle zone, occupied by the low marsh.

A salinity gradient, which increases upstream to downstream in the bay, leads to changes in marsh plants. The upper zone swamps are not affected by these changes and have a plant composition similar to that of the rest of Rupert Bay. There are 3 groups of plant species in the marshes: those associated with freshwater, the estuary shores and the seashore. The salinity gradient is what influences the distribution of plants in marshes.

Analyzing the distribution of plants makes it possible to establish transition zones between freshwater and brackish water environments along the bay. From the west coast of the bay, the transition zone is between the Octave River and Ours Noir Point. On the east coast, this zone is located at the height of Bois Brûlé Point (see Map 2-12).

Seawrack
Research into seawrack in Rupert Bay has shown that the species is currently absent or only forms small beds of no ecological signification.

Special-status plant species
The inventories conducted by the proponent in 2002 and 2003 confirm the presence of 20 special-status plant species in different types of habitats in the Rupert Bay sector. However, none of these species was located in tidal area habitats. Therefore, no impact is anticipated.
**Future conditions as assessed by the proponent during the construction and operation phases**

**The Rupert River estuary**

The main source of impact on vegetation in the river estuary is the reduced water level and flow velocity at low tide. The proponent anticipates the extension of low-marsh vegetation in the estuary and, depending on the sector, an increase in the area of aquatic grass beds. The proponent cannot quantify the increase in these areas. Nevertheless, any increase in aquatic grass beds is positive for fish and waterfowl. Waterfowl will also benefit from the extension of the low marsh, as a strong association has been observed (related to diet) between most species of waterfowl and plant species that make up the low marsh (ES30).

**Rupert Bay**

Due to reduced fresh water inflows into the Rupert River, the proponent anticipates some continuance of the saltwater intrusion further upstream in the bay. The saltwater intrusion limit should move approximately 4 to 5 kilometres upstream of the bay. The transition area on the west side of the bay, currently located between Ours Noir Point and the Octave River, should remain in the same section. As such, the proponent does not anticipate any significant impact on the coastal vegetation on the west coast of the bay.

On the east coast, the transition area currently level with Bois Brûlé Point should end up a bit further south. The proponent anticipates minor changes to the organization of plant communities. Please note that no impact is anticipated on the dominant species, the common three square, since it grows both in fresh and slightly brackish water. The companion species most favourable to brackish waters could spread upstream.

The vegetation likely to be most affected by changes to salinity is found specifically in the low marsh vegetation area, located below the mean high water level. The proponent is of the opinion that areas located further up in the plant succession (high marsh, swamp, peat land) which are affected only at high tide during storms or the equinox, should not suffer any impact from changes to the salinity in the new transition areas.

The Cabbage Willow and Boatswain bays, already located in brackish or salt water areas, will not be affected. The proponent will follow-up on the coastal vegetation in the bay. Follow-up operations will take place every four years, between the first and tenth year of operation.

**COMEX analysis**

COMEX noted that minor, but positive impacts are anticipated on fish and waterfowl in the Rupert River estuary. A minor impact is also anticipated in the transition area between fresh and brackish water on the east coast of Rupert Bay. This change will affect the vegetation sequence of the low marshes, particularly important for the waterfowl, both during the migratory and brood rearing periods. Impact on the waterfowl habitat is covered in the section on birds (see 5.3.1.3). The Environmental and Social Impact Review Committee is of the opinion that the monitoring done by the proponent will make it possible to determine the validity of the predictions.

None of the twenty special-status vascular plants surveyed in the Rupert Bay section were found in the estuary wetlands or transition areas between the freshwater and brackish water areas of the bay.
5.4 THE INCREASED-FLOW SECTION

5.4.1 FISH

5.4.1.1 Eastmain 1 Reservoir

Baseline
At the time of the Rupert River diversion, the Eastmain 1 Reservoir will have been in existence for five years. The composition of its fish community will be similar to that of the Opinaca Reservoir after five years in operation, namely: the lake cisco, lake whitefish, northern pike, white sucker, longnose sucker and walleye. This is a valid comparison, since the Opinaca Reservoir is located directly north and its fish community is similar to what is found in bodies of water located within the confines of the Eastmain 1 Reservoir. The less abundant species found there were the lake sturgeon, whitefish, fallfish, yellow perch, lake chub, spottail shiner, pearl dace and trout-perch. Five years after its impoundment, Eastmain 1 should have matured in the same way and its fish community will evolve towards a new state of equilibrium.

Proponent’s assessment of future conditions
The annual mean level of the Eastmain 1 Reservoir will sustain a 26 cm drop once the Eastmain-1-A powerhouse goes into operation (despite greater water inflows, the turbine capacity will be increased with the addition of the Eastmain-1-A powerhouse). This drop in levels will not exceed normal fluctuations that would have occurred in the reservoir prior to the Rupert diversion, which leads the proponent to conclude that the diversion will not have any perceptible, negative impact on the fish or its habitat.

COMEX analysis
Comex agrees with the proponent’s findings as to the status of the Eastmain 1 Reservoir, five years after its impoundment. The composition of its fish community should compare with that of the Opinaca Reservoir, after the same period. These conditions will form the baseline for the Eastmain-1-A project. The Rupert diversion should not have any impact on the fish, or its habitat, since changes to the drawdown will remain within fluctuations occurring in the reservoir prior to the deviation.

5.4.1.2 Remaining stretch of the Eastmain River

Baseline
The remaining stretch of the Eastmain River is located between the Eastmain-1 dam and the Opinaca Reservoir. Current conditions in this section mirror those that will prevail following the impoundment of the Eastmain 1 Reservoir and the eventual commissioning of the Eastmain-1 powerhouse, before the Rupert River diversion. This stretch constitutes one of the two main concentration areas of sturgeon in the Opinaca Reservoir and its tributaries; the other concentration area is located in the north section of the Opinaca Reservoir. That same area is also home to, in descending order: the northern pike, lake whitefish, walleye, white sucker, longnose sucker and lake cisco. Several of these species will reproduce in the remaining stretch of the Eastmain River in baseline condition, including the lake whitefish, sucker, walleye and northern pike. This stretch of the Eastmain River poses no obstacles to the free movement of fish, since the weir installed at KP 207 is equipped with a fish pass, whose effectiveness will be evaluated during Eastmain-1-A project. This structure will help maintain the quality of the main feeding and hibernation habitats of the Acipenser fulvescens population.
However the lake sturgeon spawning ground located immediately downstream of the Eastmain-1 dam was drained after the flow diversion caused by the impoundment of the Eastmain 1 Reservoir. Three spawning areas were installed in order to maintain the breeding potential of the Acipenser fulvescens at KP 203 and 207 and at KP 0.5 of the Rivière à l’Eau Claire. The commissioning of the Eastmain-1 generating station is slated for December 2006. The use of the three spawning grounds is based therefore on hypotheses that cannot be proven until after it has been commissioned. The proponent’s objective is that at least one of the three developed spawning areas be used.

A genetic study enabled a comparison between populations of Acipenser fulvescens in the increased-flow section (Eastmain River, Opinaca River and Boyd Lake) and between those of the Rupert River (ES5). This study found that the sturgeon from the Eastmain-Opinaca basins and those from the Rupert River basin are two genetically distinct populations, whose differences are apparently stable in time (ES5).

**Proponent’s assessment of future conditions**

Under future conditions, the main source of impact will be the start up of the Eastmain-1-A powerhouse, which will result in a general increase in flows and flow speeds at right angles to the sturgeon spawning ground installed at KP 203, as well as large daily fluctuations of these same parameters during maximum operation of the generating stations. These significant daily fluctuations could occur at any time of the year.

Since it is difficult to evaluate future conditions, due to the fact that those prevailing between 2007 and 2012 are themselves based on estimates, the proponent has agreed to monitor the spawning areas located between KP 217 and KP 193, including the spawning areas of the Acipenser fulvescens (see map 5-3). When the Eastmain-1-A is commissioned, there will be an opportunity to gather the five years of data that is needed to establish the baselines and continue its monitoring after it has been commissioned.

The presence of two genetically distinct Acipenser fulvescens populations between the basins of the Rupert River and the increased-flow section indicate that the diversion could result in a mixing of these populations and, as such, a change in the genetic makeup of the population of the Eastmain-Opinaca system. The proponent anticipates two possible scenarios to this eventuality:

- either the Acipenser fulvescens of the Rupert River succeed, despite constraints related to less local adaptation, in establishing themselves in the Eastmain-Opinaca system, due to the high numbers (numbers of fish migrating downstream in comparison with the local population)
- or the presence of an Acipenser fulvescens population better adapted to the Eastmain-Opinaca system limits the successful introduction of contingents from the Rupert forebay.

At present, it is impossible to predict either of these two outcomes in view of fragmentary knowledge of interactions of this kind in a natural environment. The proponent is of the opinion that it is highly unlikely that the Acipenser fulvescens of Rupert River outnumber those in the Eastmain-Opinaca system, in view of the abundance of the latter and the numerous obstacles limiting the downstream migration of sturgeon from the Rupert forebay. The proponent also believes
that if genetic modification did occur in the population of the Eastmain-Opinaca system, its original characteristics would be preserved, given the presence, in the downstream portion of the Opinaca River, of an *Acipenser fulvescens* population that would not be in contact with that of the diversion.
**COMEX analysis**

In view of the particular situation that occurs when baselines are conditions that have yet to occur, it is difficult for COMEX to render a decision on the survival of the sturgeon spawning grounds in this stretch of the Eastmain River. It is, however, of the opinion that it is important to weigh the monitoring program put in place for the Eastmain-1 powerhouse when drawing up the detailed monitoring program for the project under review. This program anticipates, among others, the telemetric monitoring of sturgeons, an evaluation of the larval drift and a monitoring of the physical integrity of the utilization of the spawning areas that were developed. The proponent has indicated that this monitoring will terminate in 2010. The commissioning of the Eastmain-1-A powerhouse will modify physical conditions downstream of KP 203, and between the KP 203 and the KP 217, which will fluctuate with spillway management. Under conditions such as these, the Environment and Social Impact Review Committee believes that it is important that the follow-up program be continued after the commissioning of the Eastmain-1-A powerhouse by adjusting its content to the findings obtained between 2006 and 2012. The total duration of a follow-up program of this kind will hinge on the findings obtained over time.

It has already been suggested on several occasions that the Crees be involved in all phases of the various follow-up programs. As regards the monitoring of the success of the lake sturgeon spawning grounds, the Environment and Social Impact Review Committee believes that, in view of the importance of this species to the Crees, it is important to extend this initiative by training the Crees, in order to prepare them to determine, on their own, the success of the spawning areas. They would also be able to inform members of concerned communities of the findings obtained and to urge them to cooperate by providing management that would ensure the viability of the new spawning areas.

Lastly, the COMEX is also in agreement, on the whole, with the proponent’s findings regarding the possible mixing of these populations and modification of the genetic characteristics of the population of the Eastmain–Opinaca section. However, should the Acipenser fulvescens of Rupert River introduce themselves into the Eastmain–Opinaca system, the presence of the OA-05 dike, which serves to divert the water from the Opinaca River towards the Boyd-Sakami deviation, poses an impassable obstacle isolating individuals living in the lower reaches of the Opinaca River and protecting the integrity of this genetic line. It is impossible, with current information, to evaluate the degree of genetic modification to the population of the Eastmain–Opinaca sector. However, we cannot ignore the likelihood that a mixing of this kind might occur, if we base our findings on observations made to date on the extension of home range of the sturgeon in the Opinaca Reservoir towards bodies of water of the Boyd-Sakami diversion.

### 5.4.1.3 Spawning areas downstream of the de la Sarcelle

**Baseline**

Since the commissioning of the Sarcelle control structure, in the early 80s, several fish species found in the Boyd-Sakami stretch adopted the immediate downstream area of the structure as a spawning area. Experimental fishing, carried out in the first kilometre downstream from the structure, found that the lake whitefish, walleye and suckers reproduce there and that the spawning areas are located along the shoreline. The Crees have also identified the section as a reproductive area for lake sturgeon and lake trout. Fishing expeditions yielded a catch of adult sturgeon in spring of 2002, but the proponent found neither eggs nor fry for these two species, despite section’s good
spawning potential. The spawning of other species, however, was confirmed. According to EMN findings, overall fishing yields showed a significant increase after the flow was increased in 1981 and have remained slightly higher than yields observed in a natural environment (OED28). In 1996, or 15 years after the impoundment, the walleye and longnose sucker are the most abundant species in this area.

**Proponent’s assessment of future conditions**

According to the proponent’s modeling, future flow conditions for spring and autumn were evaluated for a predicted flow total of 1,510 m$^3$/s, which represents approximately 400 m$^3$/s more than under current conditions for the same time of the year. The findings of this modeling indicate that there will be little change on the left bank, except that the average current speed will slow from 0.89 m/s to 0.68 m/s, and the depth will increase by 8 cm. Conditions remain favourable for walleye, lake whitefish and sucker.

On the right bank, spawning grounds for the walleye, white sucker and lake whitefish located at the generating station’s tailrace canal, will be lost at the time of its construction. Even though these spawning areas are returned to the water in operation, they are considered permanently lost, due to disturbances to the bed and considerable changes to flow conditions.

In order to offset these permanent spawning habitat losses, the proponent foresees the development of multispecies spawning grounds equal in area to what was lost. This project will be carried out after the Rupert River diversion and prior to the commissioning of Eastmain-1-A and Sarcelle generating stations. It will be designed to accommodate the spawning needs of the lake sturgeon, walleye, lake whitefish and white sucker.

**COMEX analysis**

COMEX is of the opinion that mitigation measures catches, for the restoration of the area immediately downstream of the future Sarcelle powerhouse, in habitats conducive to spawning for species that currently use it, are acceptable and sufficient to minimize the impact of the construction and operation of this generating station. However, similar to spawning habitats developed in the diversion bays (see section 5.1.1.1), the proponent must ensure the success of these habitats and take corrective measures in the event of failure.

COMEX is satisfied with developments proposed by the proponent. In addition, traditional Cree knowledge suggests that spawning areas may exist elsewhere in the Boyd and Sakami lakes. However, special monitoring must be conducted on this species in the Boyd-Sakami stretch to ensure the existence of a recruitment of young fish in this section and verify if, to the contrary, this recruitment is solely assured by the downstream migration of individuals from the Opinaca Reservoir.

**5.4.1.4 Export of mercury downstream of the Eastmain-1-A**

**Baseline**

Current conditions regarding fish mercury concentrations in the Eastmain 1 Reservoir mirror conditions that will occur with the commissioning of the generating station of the same name, in the Rupert diversion. They were established by the proponent using a semi-empirical model. It should be noted that the Rupert diversion will be commissioned before the fish mercury concentrations in most species living in this reservoir have reached the calculated maximum. In the reservoir, the
maximum increase factors under current conditions are: approximately three for lake trout; four for whitefish; five for walleye and six for northern pike (see chart 5-8). The proponent expects that the maximum values of fish mercury in the reservoir will be comparable to those of the Opinaca Reservoir, with, however, a more rapid return to values found in bodies of water under natural conditions.

Table 5-8: Eastmain 1 reservoir, maximum total mercury concentrations forecast for the main fish species (baselines and future conditions)

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>LAKE WHITEFISH (400 MM)</th>
<th>NORTHERN PIKE (700 MM)</th>
<th>WALLEYE (400 MM)</th>
<th>LAKE TROUT (600 MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BASELINES(^a) FUTURE</td>
<td>BASELINES(^a) FUTURE</td>
<td>BASELINES(^a) FUTURE</td>
<td>BASELINES(^a) FUTURE</td>
</tr>
<tr>
<td>INITIAL VALUE (mg/kg)</td>
<td>0.11</td>
<td>0.11</td>
<td>0.61</td>
<td>0.61</td>
</tr>
<tr>
<td>MAXIMUM VALUE (mg/kg)</td>
<td>0.45</td>
<td>0.49</td>
<td>3.45</td>
<td>3.77</td>
</tr>
<tr>
<td>MAXIMUM INCREASE FACTOR</td>
<td>4.1</td>
<td>4.5</td>
<td>5.7</td>
<td>6.2</td>
</tr>
<tr>
<td>TIME TO REACH MAXIMUM VALUE (years) (^b)</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>TIME TO RETURN TO WITHIN THE RANGE OF NATURAL VALUES (years)</td>
<td>13</td>
<td>14</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

\(^a\) these values would be reached without the Rupert diversion
\(^b\) time calculated from the summer following the impoundment of the Eastmain 1 reservoir
Source: EI 1, volume 3

Proponent’s assessment of future conditions
The semi-empirical model used by the proponent predicts that the result of the Rupert diversion will be an increase of approximately 10% in the maximum values of fish mercury concentrations in the Eastmain 1 Reservoir, in addition to the increase caused by the reservoir itself.

The mercury exported downstream from the Eastmain 1 Reservoir originates in the reservoir, which is itself affected by mercury exported from the Rupert diversion bays. Downstream from the Eastmain-1 powerhouse, the mercury concentrations in the Coregonus clupeaformis and Catostomus catostomus will be 3 to 4 times higher than concentrations measured in the reservoir. In fact, these species will experience modifications to their diet, which will become piscivorous due to the high availability of small fish, more vulnerable to predation during their passage in the turbines.
The commissioning of the Eastmain-1-A powerhouse will not modify the accretion rates of mercury concentrations in fish living downstream. Given the proximity of the generating stations, the latter could be considered a unique outlet channel, serving to enlarge the area where this particular mercury bioaccumulation phenomenon occurs. According to the proponent, this phenomenon could also affect the lake sturgeon, which has a diet similar to that of the longnose sucker and frequents the section, at least to reproduce. The proponent suggests, however, that the mercury concentrations of this species will not reach those of the longnose sucker, since it covers a large area and frequents slow flow areas for feeding. The proponent concludes therefore that mercury concentrations in sturgeon living in the Eastmain River downstream of the facilities, is comparable to those observed in the same species in Eastmain 1 Reservoir.

**COMEX analysis**

COMEX finds that the problem of increased fish mercury concentrations is not limited to the Eastmain 1 Reservoir and diversion bays, but must also be taken into consideration downstream of these bodies of water, given the mercury export through, among others, the downstream migration of fish in the turbine of the generating stations or the control structures. It would appear that the bioaccumulation is permanent; this phenomenon is magnified by dietary changes of non-piscivorous species, and must be included in a follow-up program of mercury concentrations following the commissioning of all elements of the project. The monitoring of fish mercury concentrations in the diversion bays must therefore include stations downstream of the Eastmain-1-A powerhouse, which will include fish species that may be affected by this phenomenon.

Even though this phenomenon is particularly marked downstream of the powerhouse, due to the action of the turbines on the fish that pass through it, we should also question the extent of this export phenomenon downstream of the control structure for KP 314 on the Rupert River, as well as downstream of the release facilities for flows from the Lemare and Nemiscau rivers and the Sakami structure. COMEX is of the opinion that the mercury concentration follow-up program must also include the stations downstream from these structures. As discussed previously, COMEX firmly believes that the Crees must be involved in the planning, implementation and distribution of the findings obtained through this program.

### 5.4.2 LAND AND SEMI-AQUATIC ANIMALS IN THE INCREASED FLOW SECTION

In the increased-flow section, the headwater levels of the Opinaca Reservoir of the Boyd-Sakami diversion system and the Robert-Bourassa and La Grande-1 reservoirs will remain within the beach of current fluctuations, even though they are generally located in the upper section of that fork. Large animals are not expected to suffer any impact.

Inventories taken by the proponent along the banks of Boyd and Sakami lakes found a low density of beaver colonies. The population is estimated at 27 colonies for a total of 110 animals. The density of colonies found in the 2 km peripheral strip of the lakes is nearly twice as high as on the shores. Density is weak on the edge of these bodies of water, since the areas do not support the growth of vegetation conducive to the establishment of beaver colonies since the EOL diversion.

When the Rupert diversion is commissioned in December 2009, some habitats of Boyd and Sakami lakes may undergo change, since water levels there will be slightly raised, by approximately 60 cm in Boyd Lake and 45 cm in Sakami Lake, which is in the current drawdown beach. This impact will
be felt for several weeks only. According to the proponent, the beaver will adapt to new conditions. At the request of the users, the program for the intensive trapping or relocation of the beaver by the tallymen will be introduced for the beaver colonies on the shores of Sakami Lake. The proponent does not foresee any particular impact on the beaver during the operation period.

COMEX analysis
COMEX is of the opinion that there will not be any significant impact on the land and semi-aquatic animals in this section, due to slight modifications to the area in terms of the home range of these species of animals.

5.4.3 BIRDS

Baseline
The primary characteristic highlighted during observations made in the spring 2002 on the Opinaca Reservoir and lakes Boyd and Sakami is the presence of large groups of Canada goose. They occupy vast peaty bays of variable ecological quality. The relatively large size of the groups observed in spring surveys supports the belief that they were migrating towards territories located further north.

Nevertheless, in the same sections of peaty bogs, many Canada geese were also observed during the brood rearing period. It was in the section of the Opinaca Reservoir and lakes Boyd and Sakami that the greatest number of Canada geese was observed during the brood rearing period for the entire study area. It should be noted that the brood-rearing habitats are generally located within a 4 km radius of the nest, often on swampy islets. Consequently, the adjoining peat beds of the Opinaca-Boyd-Sakami sector could represent important nesting areas for the Canada goose.

Inventories taken in 2002 reported over 20,000 Anatidae species belonging to 21 species on Boyd and Sakami lakes. Among this group, over 90% were Canada goose. More than 44,000 birds, also belonging to 21 species, were observed on the Opinaca Reservoir. The large majority was the Canada goose, as is true on the diversion lakes, but significant flocks of American black duck and the green-winged teal were also observed.

Seven breeding species were observed on Boyd and Sakami lakes. Most of the 180 broods observed belonged to the American black duck and the green-winged teal. Five breeding species are found in the Opinaca Reservoir. Among the 129 broods observed, 57 belonged to the Canada goose and 49 to the American black duck.

Significant concentrations of waterfowl observed in July in major bodies of water including the Opinaca Reservoir (6,058 birds) and lakes Boyd and Sakami (2,517 birds) demonstrate that these areas constitute important moulting areas. Inventories taken by the Canadian Wildlife Service of Environment Canada revealed that in the Opinaca-Boyd-Sakami sector close to 80% of moulting Canada geese belonged to the maxima race, resident subspecies (which nests and winters in the same location), and are from the northeast United States.

Observations made during the fall migration indicate that this corridor is used far less in the autumn than in spring. In fact, some 1,600 birds were observed on Boyd and Sakami lakes and a few more than 2,500 on the Opinaca Reservoir.
Proponent’s assessment of future conditions during the construction phase

Two new generating stations, in addition to a weir and a canal at the mouth of Sakami Lake, will be built in the increased-flow section. The proponent claims that the construction of these facilities will affect 73.5 hectares of previously disturbed land environment, in addition to approximately 2 km of shoreline with no developed riparian habitats.

At each construction site, the areas used are too limited to affect waterfowl nesting, particularly since these areas have already been disturbed by the presence of infrastructure. Nevertheless, overall construction activities could cause birds to flee the work area.

Once construction is complete, the proponent will be responsible for the vegetation colonization of the work areas. Current mitigation measures regarding land clearing, construction machinery and traffic are also planned.

Proponent’s assessment of future conditions during the operation phase

In the operation phase, the proponent anticipates a slight loss of land biotopes due to the maximum raised water level of lakes Boyd and Sakami during high runoff. It does not believe this impact will result in any significant modification to the riparian environments and that, consequently, no impact on the waterfowl is anticipated in the increased-flow section. The proponent therefore does not foresee any mitigation measures.

The proponent plans to monitor waterfowl use of the Opinaca-Boyd-Sakami sector during spring migration and brood rearing. This monitoring program, including an inventory during the construction period, another during the diversion, and two additional inventories in the operation phase, will be conducted over a four-year period.

COMEX analysis

COMEX is of the opinion that the anticipated impacts on the waterfowl in the increased-flow section are of little significance. The construction of the Eastmain-1-A and la Sarcelle generating stations and the Sakami structure will disturb waterfowl habitats in a temporary, non-recurring way. During the operation phase, the raised water levels will not be sufficient to reduce the nesting habitat of the geese and ducks to a significant degree, particularly since the water levels should remain relatively constant during the summer months.

As indicated in the birds section of the Rupert Bay section (see 5.3.1.3), the Cree communities located along James Bay and Rupert Bay have indicated that, since the construction of the reservoirs in the La Grande complex, fewer geese stop on the shores of the bays during migration. The Crees claim that the geese now frequent the reservoirs during their migratory stopovers. This is supported by results of traditional hunting forays along the shores, which are less profitable than in the past.

Prior to the development of telemetry tools for tracking birds during their migration, little information was available on the migratory corridors used by the waterfowl nesting in the northern territories. Since these territories cover a vast area and are sparsely populated, the only available information was provided by the Native residents of these remote regions.

The Crees have hunted the Canada goose, mainly along the shores of James Bay and Rupert Bay, for many generations, in spring and in fall. Until official inventories were taken, traditional hunting
activities and the related lore enabled ornithologists to estimate the population of Canada geese migrating the length of the east corridor of James Bay.

However, it is not possible to state accurately whether the migration of the geese takes place solely along the coastal corridor, since too few people traveled inland when hunting was so plentiful on the coast. Some geese undoubtedly frequented the thawed bodies of water scattered inland, however without forming large groups in the same areas. With the creation of the reservoirs and diversion lakes located inland, these same geese undoubtedly came across sections where they could gather and be safer.

Technology and telemetric monitoring have traced two migratory corridors used by the geese (one along the coast and the other further inland) (PAP27). Since no waterfowl inventory was taken in this section before the creation of the reservoirs of the La Grande complex, it is impossible to confirm or refute inland relocation of the migratory corridors of the geese.

Moreover, since the La Grande complex went into operation, a road network enables the Crees to move about the territory more easily, any time of the year, and to observe these waterfowl groups in migration.

Consequently COMEX is of the opinion that it is not possible to confirm or refute the contention that the construction of the La Grande complex reservoirs has diverted towards the reservoirs some of the geese that previously migrated along the coast.

5.4.4 SPECIAL-STATUS PLANTS

Information in the literature and inventories taken by the proponent in 2002 and 2003 indicate that no special-status plant species was observed in the increased-flow section. No impact is therefore anticipated.
5.5 THE LA GRANDE RIVIÈRE ESTUARY AND THE JAMES BAY COAST SECTION

5.5.1 FISH

5.5.1.1 Fish communities

Baseline
Over the past 25 years, the La Grande Rivière estuary has undergone significant physical modifications including total diversion of the flow during the winter of 1978-1979, when the Robert-Bourassa Reservoir was being filled, followed by a gradual increase in the flow at the La Grande-1 site. It is also important to stress the unstable condition of the fish habitat in this stretch under current conditions, due to significant daily fluctuations due to flow, flow velocity and water levels.

A portrait of the fish community of the La Grande Rivière estuary was taken during the monitoring program carried out at two experimental fishing stations, one located immediately downstream from the La Grande-1 generating station and the other near Chisasibi (Fort Georges station). The La Grande-1 station was sampled in 1994, 1996 and 2000, and the Fort Georges station was sampled every year from 1977 to 1984, and in 1988, 1992, 1994, 1996 and 2000. This sampling plan should make it possible to determine the impact of the major construction phases of the La Grande complex, that is: the impoundment of the Robert-Bourassa and La Grande 1 reservoirs, followed by the commissioning of the the Robert-Bourassa, La Grande-2-A and La Grande-1 generating stations.

A constant increase in fishing yields has been observed since 1994 downstream from the La Grande-1 generating station in summer, which mirrors, according to the proponent, the situation in the La Grande-1 Reservoir. The northern pike, lake whitefish and longnose sucker dominate the fish community, while the burbot, white sucker and lake cisco, brook trout and round whitefish are considerably less abundant. At the Fort Georges station, the longnose sucker has dominated the fish community since 1977. In addition, there has been a relative decline in the abundance of the walleye and lake cisco, while the brook trout and round whitefish have become more abundant since the Robert-Bourassa generating station went into operation. These fluctuations may be attributable to significant drop in summer water temperatures, from 16°C to 11°C, following the commissioning of the powerhouse.

The situation differs considerably in autumn. In view of the fact that the La Grande Rivière opens into James Bay, some anadromous species, such as the lake cisco and lake whitefish, enter the river in autumn to reproduce or to overwinter. According to the proponent, the lake whitefish, lake cisco and brook trout apparently spawn immediately downstream of the La Grande-1 generating station. The location and extent of the spawning areas at this location is not known. The coastal waters of James Bay are frequented by the lake whitefish, lake cisco and brook trout, which swim up the various tributaries of the bay to spawn or overwinter. In addition to these are marine species such as the fourhorn, shorthorn and Arctic sculpin the American and Northern sand lance, Greenland cod and slender and spotted eel blenny.

The CH1 tallyman notes that the majority of fish species found on the right bank of the La Grande Rivière estuary are using the same habitats they frequented prior to the commissioning of the La Grande complex and that their populations remain stable. However, the tallyman confirms
Environmental Monitoring Network (EMN) data that illustrate reduced numbers of the walleye and lake cisco.

**Proponent’s assessment of future conditions**
The proponent finds that the Rupert River diversion will have no significant impact on the fish community and its habitat in the La Grande Rivière estuary, nor along the east coast of James Bay. The hydrologic modifications will fall within the beach of hourly and daily flow fluctuations on the river since the construction of the La Grande complex, in 1978, on the basis, however, of a mean flow increase of approximately 450 m$^3$/s.

The proponent deems that spreading rock blankets on the left bank of the La Grande Rivière, downstream from the La Grande-1 development, will benefit the fish, since it will contribute, in the long term, to a local reduction of inflows of solids into the river.

**Analysis of the Environmental and Social Impact Review Committee**
The Environmental and Social Impact Review Committee agrees with the proponent’s findings to the effect that the Rupert diversion will not cause any significant impact on the fish community and its habitat in the La Grande Rivière estuary and along the James Bay coast, in view of the fact that the ensuing hydrologic modifications fall within the beach of current flow fluctuations.

5.5.2 **PLANTS**

**Baseline**

**The La Grande Rivière estuary**

According to the findings of the environmental follow-up conducted from 1979 to 1999, the riparian vegetation in the estuary downstream of Chisasibi does not appear to have sustained any impact following stream flow increases and fluctuations caused by the commissioning of the La Grande complex. However, riparian habitat upstream of Chisasibi is in a constant state of instability, due to flooding and exposure cycles caused by the operation of the Robert-Bourassa, La Grande-2-A and La Grande-1 generating stations. The lower section of the riparian environments is less resistant to the mechanical action of the ice, which may rake or tear out vegetation and attached soil. These effects lead to the gradual inroads of grassland at the expense of scrubland, in the lower section of the riparian environments located upstream of Chisasibi.

With regard to aquatic vegetation, grass beds are located primarily on the right bank, where the slope is somewhat gentler and where shoals conducive to the development of submerged vegetation are found. On the left bank, the grass beds are largely confined to the channels located between the islands and stable terrain. As is true for riparian vegetation, aquatic vegetation appears more stable in the section of the estuary downstream from Chisasibi. Further upstream, some instability is noted in terms of the distribution of aquatic vegetation, the species represented and their recovery.

**East coast of James Bay**
The east coast of James Bay is favourable to the development of vast submerged eelgrass beds and salt marshes, which are vitally important to several species of migratory birds, such as the Anatidae species and shorebirds. The Zostera marina particularly, is an indispensable food resource for the migrating Canada goose and brant (OED10). The eelgrass beds colonize the fine sediments of the sections protected from direct wind or wave action at a depth of 0.5 m to 4.0 m compared with mean
low water. They are found primarily in the Dead Duck and Aquatuc bays and Many Island, and the length of the coast between Kakassituq and Attikuan points (see map 5-4). They are not found in the mouth of the main rivers, due to sediment instability and weak salinity of the water in the growing season.

Any significant change to the freshwater plume of the La Grande Rivière following the construction of the La Grande complex, might have affected the eelgrass beds, the wildlife species that use them and, consequently the geese hunting activities of the Cree. This prompted the SEBJ to monitor, between 1988 and 2000, the eelgrass beds on the east coast of James Bay, in the plume zone of the La Grande Rivière, namely from Dead Duck Bay to Attikuan Point (OED29 OED10). These studies reveal that the general distribution of the grass beds has undergone little change over the years, since the main concentrations remain in the same locations. From 1998 to 2000, a marked decrease in the eelgrass was observed, both in terms of its distribution and abundance. This decrease, also reported by the Crees of Chisasibi, appears to have manifest itself beyond the study area, namely in Rupert Bay at Point Louis-XIV. The proponent believes that this decline may have been caused by the proliferation of a microorganism (Labyrinthula eelgrass), stimulated by abnormally high summer temperatures, which would have reduced the resistance of eelgrass to this microorganism (OED10). The proponent also mentioned that in 1999 and 2000, the eelgrass showed signs of recovery, since stems were observed in several bays from where it had completely disappeared in 1998. It is too early to come to any firm conclusions about this situation.

In 2004, another study was carried out to assess changes to the abundance of Zostera marina 2000 (PD4). This study was based on a qualitative evaluation of the recovery of eelgrass at 75 stations, which was the object of a comparable assessment in 2000, and on certain control points monitored from 1988 to 2000. The findings illustrate that in 2004, from north of Grande Rivière to Kakassituq Point, the eelgrass displayed abundance comparable to conditions that existed prior to the decline (1998-1999), in 70% of the grass beds. In 2004, north of Attikuan Point, the grass beds had increased in abundance; however abundance was not comparable to conditions prior to the decline. In 2004 as well, immediately south of La Grande Rivière, between its mouth and Tees Bay, all of the grass beds were comparable to their state prior to the decline.
However, from Tees Bay to north of the Eastmain, there was scant recovery, and only 25% of the grass beds had regained their original abundance. Aside from the grass bed located at Dead Duck Bay, none of the grass beds was continuous.

In its impact study and during a presentation made during the Chisasibi public hearings (PAP120) the proponent concluded that the operation of the La Grande complex generating stations had not had a negative impact on the eelgrass beds on the north-east coast of James Bay. The proponent’s conclusion is based on the findings of previously mentioned studies:

– most of the stations assessed in the plume of Grande Rivière experienced increased production of eelgrass in 1995;
– Tees Bay, located approximately 10 km south of the mouth of the La Grande Rivière, was unaffected by the eelgrass decline in 1998, since the relatively cold water of Grande Rivière, less conducive to the proliferation of Labyrinthula, would have served to protect the eelgrass;
– in the Many Islands Bay, located north of Grande Rivière, most of the grass beds were restored in 2004, or 5 years after the decline.

**Proponent’s assessment of future conditions**

**The La Grande Rivière estuary**

In the estuary, riparian and aquatic vegetation will not be affected by operation of the Rupert diversion. In this estuary, fluctuations to hydrologic and hydraulics parameters that may affect vegetation will remain within the beaches of current fluctuations.

In the river reach, riparian and aquatic vegetation will retain the same level of instability due to daily fluctuations, water flows and levels. This instability currently manifests itself by significant changes in the distribution, species composition and recovery of aquatic vegetation. Moreover, the mechanical action of waves, modulated by changing water levels, rakes or crushes the lower section of the riparian vegetation. The same phenomenon will occur after the Rupert deviation is put into operation. Lastly, the significant fluctuations to hydrologic and hydraulics parameters will prevent any vegetation colonization of the rock carpets to be installed on both the left and right banks. The proponent therefore concludes that the Rupert deviation will have no significant impact on the riparian and aquatic vegetation of the La Grande Rivière estuary.

**East coast of James Bay**

In the coastal environment, modification of the plume area of La Grande Rivière constitutes the sole potential source of impact. Since the planned extension of the plume, in both summer and winter, will remain within the current fluctuation limits, the proponent does not anticipate any negative impact on the eelgrass beds or salt marshes on the east coast of James Bay.

**COMEX Analysis**

**The La Grande Rivière estuary**

COMEX agrees with the proponent’s findings as regards vegetation development in the La Grande Rivière estuary. It is probable that fluctuations to hydrologic and hydraulics parameters that could affect vegetation will remain within the beaches of current fluctuations downstream from Chisasibi. With regard to the estuary upstream of Chisasibi, the proponent acknowledges that the riparian and aquatic vegetation will remain in the same current state of instability, due to daily fluctuations to the hydraulics parameters. This conclusion is shared by COMEX.
East coast of James Bay
Due to its importance to the goose population, the decline of eelgrass was included in various briefs during public hearings in Waskaganish and Chisasibi. Various stakeholders claimed they had observed a decline in eelgrass on the James Bay coast for several years. They associated this decline with the commissioning of the La Grande complex. Some of them claim that the decline in eelgrass was responsible for reduced numbers of geese in the same section.

The proponent’s studies revealed that the eelgrass beds on the east coast of James had experienced a significant decline since 1988. The climate and isostatic rebound exert an overriding influence on the Zostera marina (DCAP3). Climatic influence may be manifest by significant, annual fluctuations in the production of eelgrass and as a result of the isostatic rebound, the eelgrass is gradually disappearing from shallow depths and re-establishing in deeper water.

Based on studies conducted by the proponent (EOD10), the opinion of two independent specialists (G. Ingram and Y. Gratton), briefs and lengthy testimony during public hearings, COMEX arrived at the following conclusions with regard to the project’s impact on Zostera marina:
– it is possible that the operation of the La Grande complex generating stations has had no negative impact on the eelgrass beds on the east coast of James Bay and that the decline observed in 1998, is associated with a phenomenon unrelated to these installations (i.e. the Labyrinthula zostera microorganism). However, this has yet to be proven.

Various factors have been shown to influence the development of eelgrass beds (isostatic rebound, sunlight, water temperature, ice, etc.). COMEX is of the opinion that the Rupert diversion should not alter the current condition of Zostera marina on the east coast of James Bay, in view of the fact that the hydraulics modifications that will occur will fall within the beach of current fluctuation. Taking into account observations made by the Crees (M92), the Environmental and Social Impact Review Committee is, however, of the opinion that the proponent should conduct, together with the Crees, long-term follow-up on the status of the eelgrass beds on the east coast of James Bay, in order to ensure a more accurate assessment of the possible effects of the commissioning of the La Grande complex, and eventually, the Rupert diversion.

5.6 SECTORS AFFECTED BY STRUCTURES AND RELATED ACTIVITIES

5.6.1 FISH
Baseline
The 2005 results of electrofishing in the downstream reach of the Rupert River indicate that the main species of fish found in the streams, which will be crossed by access ways leading to the weirs of the Rupert River, are sculpins (40%), longnose dace (35.8%) and brook trout (13.5%). These species of fish alone represent nearly 90% of captures. However, for gill-net fishing, the dominant species were the pearl dace, walleye and northern pike. These species constitute 70% of captures. The characterization of the 33 streams that are to be crossed by the access ways leading to the weirs of the Rupert River has allowed to determine that most of the habitats affected will be channel-type lentic environments. Most streams crossed are small (0.5 to 2.5 metres wide), except for three (3) streams, which were 4 or more metres wide.
Fifteen (15) fish species live in streams in the diversion bay section. In the streams of the forebay, the most abundant species is the lake chub, followed by the mottled sculpin, longnose dace and brook stickleback. These species represent more than 75% of captures. The brook trout is the most common among the larger species, with 6.5% of captures. In the streams of the tailbay, which has only nine species, the dominant species remain the mottled sculpin and suckers, followed by the longnose dace, burbot and lake chub. These species constitute nearly 95% of captures of this sector. The brook trout is not found in the captures made in the tailbay. Most of the streams are small and the habitats affected primarily correspond to channels.

Still further north, for the sector of the Muskeg-Eastmain-1 Road, the proponent has not carried out the biological characterization of the streams. He assumes that the fish species found should be the same ones as found in the Rupert bay diversion, given the geographical proximity of these sectors, the similarity of morphological characteristics and the conditions of habitat, as well as the presence of a hydrological link.

The Sarcelle-Eastmain-1 315-kV line crosses six bodies of water, the most important being Boyd Lake, located near the Sarcelle control structure. The Opinaca, Petite Opinaca, Eastmain and Acotago rivers will also be crossed by the line. In the Eastmain River, the Opinaca Reservoir and several lakes in the study corridor, walleye, northern pike, lake whitefish and white sucker are the main fish species identified. The brook trout and trout perch were also identified in the rivers near the Eastmain-1 hydropower development. The presence of other species, such as the lake sturgeon, was confirmed in the remaining stretch of the Eastmain River.

Future Conditions Evaluated by the Proponent

According to the proponent, the main sources of impact on the fish and its habitats during the construction of permanent and temporary routes involve water structures and encroachment at the crossing points.

The construction of hydraulic structures planned on the reduced flow water way of the Rupert River will require setting up temporary roads. The total area of encroachment caused by the crossing points is estimated at 1,290 m². However, the environment will be restored after work is completed, unless a specific request is made by the tallymen.

For all permanent waterways crossed by the access routes leading to the structures in the Rupert diversion bay section, a total area of 728 m² of fish habitat will be encroached upon. Five permanent structures have been planned, namely a bridge downstream from the Lemare dam and one over the Nemiscau River, as well as three prefabricated arches to cross Arques Creek, a stream west of Chlorite Lake and the instream flow release structure of Nemiscau-2. The bridge that is to cross the instream flow release structure of the Lemare dam will not require the installation of a pillar in the water. Consequently, the proponent does not foresee any impact on the aquatic environment. However, the crossing of the Nemiscau River requires the construction of a new bridge, involving four pillars in the water, covering a total area of 218 m². A walleye spawning ground was identified 160 metres south of the future bridge site. However, the pillars will not encroach on this spawning ground. We should mention that the culverts and fill making up the current river crossing point will be removed and excavated respectively, and a spawning ground of 2,800 m² will be set up at this site to optimize the dismantling. The work will not be carried out during the spawning season to avoid any disturbances. The proponent does not foresee any impact on the aquatic environment from the prefabricated arches. This type of structure has supports either side of the stream and
does not affect the waterbed. The proponent specifies that there will therefore be no increase in the flow velocity, as well as no obstacles that will affect the movement of fish in these areas.

Flooding in the areas of the Rupert diversion bay section will require moving a few towers of circuits 7059, 7069 and 7070. Thus, some creeks will have to be diverted to make way for the construction of new supporting structures. However, the proponent believes the impact will be minimal, given that these streams have no specific characteristics in terms of fish populations, and only 60 metres will be affected. Moreover, they will flood following the Rupert diversion.

The construction of the 315 kV Sarcelle-Eastmain-1 line will be greatly facilitated by the use of existing and planned access ways, such as the sites for circuits 7061 (735 kV line) and 615 (69 kV line), the roadway that leads to the Sarcelle regulation structure, as well as the planned centreline for the Muskeg-Eastmain-1. These access ways will be used preferably to any others in order to disturb the natural environment as little as possible, in particular by reducing deforestation areas and the number of new stream crossing points. However, setting up the line will require the crossing or the bypassing of just over than 140 creeks, six (6) bodies of water, including Boyd Lake, and the Opinaca, Petite Opinaca, Acotago and Eastmain rivers. In the latter case, the crossing point will be approximately 600 metres long. However, there are no known spawning grounds at these crossing points. The solution that has been chosen for crossing the creeks primarily involves installing temporary decks and culverts. Any crossing structures will be set up in accordance with the proponent’s standardized environmental clauses. Lastly, line operation and maintenance will have little impact on the natural environment. The impacts will be periodic, since they will result from the vegetation control work involved in creating the right-of-way, as well as from line maintenance and repair activities. Applying common mitigation methods for deforestation, construction machinery traffic and contaminant control will limit the impacts to the natural environment.

Among the other works, the proponent plans to build a bridge spanning 22 metres over the Acotago River. However, since there are no plans to put pillars in the water, the proponent has indicated that this structure will have no impact on the aquatic environment. The rebuilding of the superstructure of the existing bridge over the Opinaca River will not require any intervention to its infrastructure, which includes two abutments and two pillars in the water. Lastly, different routes will be used as part of this project and will require work and improvements. Any impact on fish habitat would be primarily due to replacing a few culverts.

In general, the proponent will limit any impacts to fish habitat by applying the Regulations respecting standards of forest management for forests in the public domain. In addition to adhering to this regulation, common mitigation measures will be put in place during the work, including the proponent’s standardized environmental clauses, which will also reduce any impact on the fish.
COMEX analysis
COMEX recognizes that the impacts on the aquatic environment will be primarily associated with the temporary and permanent roadways that will be crossing the streams. It shares the proponent’s conclusions on the low impacts for the aquatic environment during construction of bridges downstream from Lemare dam and the Acotago River; the rebuilding of the bridge over the Opinaca River; the movement of towers, and the construction, operation and maintenance of the Sarcelle-Eastmain-1 315-kv line.

By respecting the standards in the Regulations respecting standards of forest management for forests in the public domain and applying the proponent’s standardized environmental clauses, any impacts should be sufficiently mitigated during construction. During public hearings, the DFO submitted a brief in which it expressed concerns about the free movement of fish in the areas affected by the structures and related activities. Indeed, the Regulations respecting standards of forest management for forests in the public domain is a good planning tool, but it does not always guarantee the free movement of fish. Since this brief was submitted, the proponent has had ongoing discussions with this Department and an agreement was reached on setting up a follow-up program for the waterway crossing points without impassable obstacles near the structures (DCAP22). The prefabricated arch structures shall also be integrated into this program if their presence in any way reduces the width of the waterway while free of obstacles to fish movement.

5.6.2 LAND AND SEMI-AQUATIC WILDLIFE

Baseline
This section describes the impacts of setting up the workcamps, Sarcelle-Eastmain-1 315 kV transmission line, Muskeg-Eastmain-1 roadway and access roads leading to the diversion bay for the four species being targeted: caribou, moose, black bear and beaver.

Caribou
In the roadway corridor leading to the diversion bays and the site for setting up the Rupert workcamp, a single caribou trail was seen. In all, the habitats found are of low or medium suitability and calving potential is average in most of the corridors studied. No caribou trail has been surveyed in the Muskeg-Eastmain-1 roadway corridor.

In the corridor under study at the Sarcelle-Eastmain-1 line, whose southern part follows the Muskeg-Eastmain-1 roadway corridor, the proponent has indicated the overall quality of the habitat as low due to the rare winter habitat suitability for woodland caribou. No caribou trail has been surveyed.

Moose
In the roadway corridor leading to the diversion bays and the site for setting up the Rupert workcamp, no moose trail has been surveyed by the proponent. Approximately 49% of the area of these corridors represents low suitability habitats.

The study of the Muskeg-Eastmain-1 roadway corridor showed that this zone has the highest density of moose in the James Bay region. In it, the proponent has surveyed eight moose trails. This sector is part of the territory under the responsibility of Weh-Sees Indohoun Corporation, where moose hunting is prohibited to non-Natives.
In the Sarcelle-Eastmain-1 line corridor, a high concentration of wintering grounds have been observed in the southern portion of the corridor, that is in the same sector that the Muskeg-Eastmain-1 roadway is being set up. The proponent specifies that the wintering grounds may be relatively remote from year to year (RP12).

**Black Bear**
Seven-five percent (75%) in the roadway corridor leading to the diversion bays and the site for setting up the Rupert workcamp has a medium to high potential for black bear. In spite of the support habitats for this species, the bear harvest index is zero in the trapping grounds in which the Muskeg-Eastmain-1 roadway corridor is located. The suitability of the habitat is high in the northern part of the Sarcelle-Eastmain-1 line corridor.

**Beaver**
The proponent has surveyed fifteen (15) beaver colonies in the roadway corridor leading to the diversion bays and the site for setting up the Rupert workcamp. Most (53%) of the area is of low suitability for this species. In spite of the support habitats for this species, no beaver colony has been surveyed in the Muskeg-Eastmain-1 roadway corridor. According to the proponent, beaver density is low in the Sarcelle-Eastmain-1 line corridor.

**Future Conditions Evaluated by the Proponent**
During the setting up of the Sarcelle-Eastmain-1 line, construction of roadways and setting up of the workcamps, the main impacts were related to deforestation, excavating and fill materials, transportation and traffic. For the majority of species found in the sector, these developments will entail disruptions, risks of collisions and possible mortality for the animals as well as the loss of their habitats.

During operating period, the transmission line and permanent roadways will have the most impact on the species found in the area (See Section 6.4.2).

The proponent reckons that the transmission line and Muskeg-Eastmain-1 roadway will have very little impact on the moose surveyed in this sector, since suitable habitats are found on the fringe of these infrastructures (RP12). As well, only slight impact is foreseen on the species of caribou, black bear and beaver.

The proponent has not foreseen any specific monitoring system for land and semi-aquatic wildlife in the sectors affected by the transmission line and roadways for the project.
COMEX analysis

COMEX considers the impacts on land and semi-aquatic wildlife in the sector where the Sarcelle-Eastmain-1 transmission line and the project roadways are found as being acceptable. However, given the increased movements following the disruption that this large wildlife will experience in the sector of the Muskeg-Eastmain-1 roadway and the southern part of the Sarcelle-Eastmain-1 line, it would be best to have appropriate signage in place along the road to limit the risks of collision.

5.6.3 AVIFAUNA

The deforestation planned for the construction of roadways, work camps, transmission lines and borrow pits will affect avifauna habitat. Deforestation work will be carried out based on how project construction is progressing.

The proponent has estimated the areas to undergo deforestation around the roadways of the Rupert diversion bay section and Muskeg-Eastmain-1 roadway to be approximately 478 ha (402 ha for access roads to the diversion bays and 76 ha for the Muskeg-Eastmain-1 roadway). The areas required for the construction of the work camps is approximately 150 ha. In the region under study, the average density of forest bird breeding pairs is 2.67 pairs per hectare. Therefore, an estimated 1,200 breeding pairs could be affected by deforestation of the roadways, and approximately 400 breeding pairs could be affected by the deforestation for the work camps. However, it should be noted that deforestation activities will not necessarily take place during the breeding season, and that, consequently, these figures represent a maximum estimate. As well, once the work camps and access roadways are no longer needed, their locations will be restored.

Moreover, the use of borrow pits will result in more habitat loss. Although the proponent has provided an estimate of the potential areas for borrow pits (3400 ha), it is impossible to say at this stage whether they will be completely or partially used. Additional borrow pits will probably be excavated during the construction phase. Consequently, a larger number of forest bird breeding pairs could be affected by deforestation. However, once the work has been completed, replanting will take place in these areas.

The deforested areas required for the construction of transmission lines have not been included in the calculations, since these spaces are quickly colonized by low vegetation, which will serve as bird habitats.

Only two raptor nests were found inside the roadway corridors. They will be destroyed during deforestation activities. However, the presence of replacement wooded environments nearby will reduce these impacts, since these birds can easily rebuild their nests in the immediate environment.

COMEX believes that, in spite of the number of forest bird breeding pairs affected by deforestation, the impacts will essentially be temporary, since a large part of the bird habitat will be restored at the end of the work.
5.6.4 SPECIAL-STATUS PLANT SPECIES

Since no special-status plant species was surveyed either at the site for setting up the Rupert River workcamp, in the Muskeg-Eastmain-1 roadway corridor, in the roadway corridor leading to the Rupert diversion bays or in the Sarcelle-Eastmain-1 315-kV line corridor, no impact is anticipated for these sectors.
6 • ANALYSIS OF HUMAN ENVIRONMENT ISSUES

6.1 CHANGES TO THE CREE WAY OF LIFE

Although the Crees have lived in the James Bay region for over 3,000 years, their first contact with Europeans and the European way of life did not occur until the 17th century. The first European explorers, specifically employees of the Hudson's Bay Company (HBC), introduced tools, services and methods that contrasted with traditional Cree society. The presence of the HBC, founded in 1670 and which held a monopoly on the fur trade for over 300 years, marked the start of the transition.

In the mid-20th century, the increasingly marked presence of missionaries and the involvement of the federal government in the Cree communities, along with the implementation of federal transfer payments in the 1940s, initiated a settlement process and signaled the start of the Crees' adaptation to new economic and social conditions. However, as we will see later, it was mainly the signing of the James Bay and Northern Québec Agreement (JBNQA) which, according to some, brought on a “radical change” in the Crees' way of life (RP 25, p.8).

Before the signing of this historic document, the Crees lived in a part of Québec that was isolated from the rest of the province. At the time, there were nine Cree communities, with a population of approximately 6,000, and probably fewer than 100 non-Natives, who held community assistance positions in the territory. The Cree economy was based on 300 years of hunting, fishing, trapping and fur trading, primarily with the Hudson's Bay Company. It was a hard way of life where people were dependent on the generosity of the land and on their own initiative. To survive, they had to travel great distances, often many hundreds of kilometres, by canoe and on snowshoes. They finally adopted the bush plane around the middle of the 20th century.

During the 1960s, health and educational services, both federal and provincial, were established in the communities, but infectious diseases ran rampant and the infant mortality rate remained high. Older students were sent to boarding schools, outside the territory. The Cree economy, in the early 1970s, comprised a mixture of fur trading (although prices had scarcely increased since the 1950s) and social security programs such as old age pension and social assistance. However, at the same time, some Crees took jobs in the emerging mining and forestry activities in the southern portion of the territory, around the new towns of Chibougamau, Chapais and Matagami.

Many Cree came to realize that their future could not depend solely on the fur trade, but must also include their participation in development projects in the territory. This was a period of great upheaval: The Hudson’s Bay Company closed its trading posts in Nemaska and Waswanipi, and the Lac aux Dorés community, later to be renamed Oujé Bougoumou, was relocated to make way for a mining project. It was during this period, at the same time as the announcement of the first major hydropower project, that the Crees became organized, setting up the Grand Council of the Crees of Québec, to ensure recognition of their rights to their ancestral lands and to slow the erosion of their traditional way of life.
The 1970s saw growth in the scale of development projects and an acceleration in land use planning. Forestry operations switched from the use of small lots to the planned use of a larger portion of the exploitable forestry area, and major hydropower development projects extended over several drainage basins. All these developments, together with new mines, led to the construction of a road, airport and telecommunications infrastructure, which opened up the territory to a larger number of tourists, hunters and fishers, and consequently the construction of cabins and hunting camps by non-Natives.

The events during this period led to the signing of the James Bay and Northern Québec Agreement. In 1975, after two years of negotiations, the Crees signed this Agreement with Canada, Québec, the Inuit of northern Québec and certain Québec government agencies, including Hydro-Québec, given its hydropower development projects. This signature by the Crees was based on a vision of the future developed in part by the Cree leaders of the time. This vision foresaw that every Cree would have the choice between following the traditional way of life or acquiring the knowledge and skills required to participate in the development of their institutions, their communities and the territory. A more detailed version of this vision can be found in the Paix des Braves Agreement, signed between the Crees and Québec in 2002.

The JBNQA, which has been called the first “modern land claim agreement,” acknowledges significant control by the Crees over education, health and local government, as well as their participation in a form of government by a regional zone council. The agreement gave rise to the Income Security Program (ISP) for Cree hunters, fishers and trappers, created government obligations regarding economic and community development, and also jointly set up with Québec and Canada an environmental and social protection regime. The JBNQA set the conditions for forestry and mining operations and a description of the hydropower projects planned for the La Grande Rivière, La Grande Rivière de la Baleine and the Nottaway, Broadback and Rupert rivers (NBR project).

The implementation of the JBNQA proved arduous, with several disputes over interpretation brought before the courts. The Crees filed motions in court to have their economic, community and territorial development rights recognized. These disputes were resolved by the signing with Québec of the Paix des Braves Agreement, which established a new relationship between the two parties. However, the efforts expended by the Crees to settle these disputes delayed the consolidation of their communities and the improvement of the health and education systems.

In order to promote the development of Cree communities and the Cree economy, the Paix des Braves Agreement provided for long-term funding that takes into consideration the income generated by the development of the territory’s resources. It also resolved other issues, including the Crees’ right to participate in development of the territory. In return, the Cree “agree to the completion of the Eastmain-1-A and Rupert diversion project,” subject to the project being “submitted to the applicable environmental legislation and the environmental and social protection regime stipulated in chapter 22 of the [JBNQA].” The agreement also stipulates that the planned completion of the Eastmain-1-A and Rupert diversion project would involve shelving the NBR project.

During the closing decades of the 20th century, following numerous projects completed in the territory, the Jamesian community prospered and became a major player in regional development.
Government services and the industrial sector took on greater importance. Similar changes took place in the Cree communities with the construction of schools and medical clinics, and the establishment of local governments. Thanks in part to improvements in health services and social conditions, the Cree population grew to almost 12,000 by the turn of the century. In 2000, the Cree School Board, the Cree Board of Health and Social Services, and the local and regional governments employed approximately one-third of the Cree labour force. Another third continued to hunt, fish and trap while benefiting from the ISP, while the remainder of the population was reduced to unemployment or working in the small Cree private sector.

The growth of employment in the Cree communities has led to other changes in their hunting-based economy and in passing on traditional knowledge. Families live increasingly in single-family homes and the elders live separately, often by choice. Whereas the parents previously spent all their time hunting, they began working “9 to 5.” To acquire experience in the forest, the children must often rely on the extended family or on special school programs. All these changes are beginning to redefine relationships within the extended family. Gradually, as people become more financially well-off and the community grows, the family relationships change and social solidarity becomes more haphazard. For example, there is less reliance on family relations for organizing weddings.

At the start of the third millennium, the progression of Cree institutions in the community is slowing down. A group of Crees has emerged who hold jobs that earn them a steady income and who are interested in encouraging their children to pursue an education. However, this same group is also interested in preserving its access to wildlife resources and maintaining its way of life based on the use of ATVs, motor boats and snowmobiles to ensure rapid access to hunting opportunities in their free time.

The members of the community who dedicate all their time to hunting and fishing are, to a certain extent, dependent on the salaried workers in their extended families. In fact, it is often the latter who provide them with the funds needed to purchase the equipment essential to earning their living in the forest and to supplement the ISP, which the Crees deem to be insufficient to ensure the viability of traditional activities. They have to travel great distances to get to the hunting grounds, and the travel costs are higher than those in the south, and more family members are participating, which increases the cost of equipment and food. The Cree population is expected to exceed 15,000 by the end of the decade. Since the IPS is insufficient to cover the costs, program participants must turn to the sale of handicrafts/artwork, temporary jobs and borrowing from their families. This fairly large integration of salaried workers into the extended family implies that they do not form a specific class in Cree society. In return for their financial contribution, they are offered traditional foods and hunting and fishing opportunities. This is also why, in certain communities the rights of tallymen are more defined, since they have new value in community relations. The Crees who are looking for work, and these often include a large number of young people, have not yet managed to define their way of life and are more dependent on development of the private and community economy. The ongoing growth in jobs and investment opportunities depends largely on the development of all sectors: hydropower, mines, forestry, tourism, commercial sectors and retail sales. Such growth emphasizes the importance of the educational
system, to prepare the Crees for specialized or professional jobs in commerce, technology, management and administration. It also stresses the need for a working knowledge of French and English.

6.2 CONTRIBUTION OF THE JAMESIANS TO THE AREA

Since the arrival of Europeans in North America, they have been a continuous, albeit minor presence in the James Bay area. However, it was not until after the First World War, more specifically in the 1920s and 1930s, that the permanent communities became established in the southwest portion of the territory: The parishes of Beaucanton, Val Paradis and Villebois were founded following the Québec government’s efforts to colonize the northern regions.

It was mainly the mining developments in the early 1950s, and the establishment of the towns of Chibougamau, Chapais and Matagami, which led to an increased presence of newcomers on the territory. Later, the development of the forestry industry contributed to populating the region. In the 1970s and 1980s, the major hydropower projects on the La Grande complex consolidated, on a broad, structured basis, the presence of non-Natives.

At the start of this period (1971), the Québec government created the Municipality of Baie-James (MBJ), whose territory overlapped that of the JBNQA to south of the 55th parallel north. This agency shares the municipal management of Category II lands with the Cree Regional Authority, while being responsible for the municipal administration of Category III lands. The administration of Category I lands falls to the Cree band councils. It was with the creation of the MBJ that the designation of “James Bay region” emerged to refer to northern Québec. In order to fully implement its administrative tasks and planning, and to promote development of the territory, the MBJ set up several local and regional development agencies.

After the 1980s, the end of the major hydropower projects, the decline of the mining industry and, more recently, that of the forestry industry led to a significant drop in the number of Jamesians. There were more than 26,000 in 1981; their number had dropped to about 16,000 in 2001, which represents a decline of 37%. Conversely, the Cree population, during the same period, saw an increase of 70%.

As can be noted on reading the 2004 2009 five-year development plan from the Regional Conference of Elected Representatives of the James Bay, like the Native population (M24.2), the economic prosperity of the Jamesians depends on the development of all of the territory’s resources: hydropower, forestry, mining, tourism.

6.3 GENERAL HEALTH CONDITION OF THE CREES

6.3.1 GENERAL HEALTH

CURRENT CONDITIONS

The Cree Board of Health and Social Services of James Bay

Under the JBNQA, the responsibility for health and social programs was transferred from Canada to Québec, in the aim of granting administrative control to the Crees (ES37.1, p. 55-60). This agreement
is unique, with no other Canadian province having administrative responsibility for healthcare services and social services for Native communities. On other Native reserves, these services remain the responsibility of the federal government. It was further to several healthcare services and social services reforms in Québec in the 1970s that the Cree Board of Health and Social Services of James Bay (CBHSSJB) was created as a healthcare institution. However, it was only in 1985 that the CBHSSJB became a cohesive system of clinics and social services under the Act respecting the Ministère de la Santé et des Services sociaux.

Currently, the CBHSSJB has a regional hospital, located in Chisasibi, and nine medical clinics, located in the Cree communities. Under CBHSSJB management, the social services centre, located in Chisasibi, operates transitional residences for adolescents in Chisasibi and Mistissini, and a regional youth rehabilitation centre in Mistissini. There are also two Centres locaux de services communautaires (CLSC) in the communities of Chisasibi and Mistissini. In the coming years, the CBHSSJB intends to take on various challenges, including building nine multiservice centres that will provide specialized services to the disabled, the elderly or individuals with decreased autonomy. There are also plans to build facilities in each community to treat patients with chronic illnesses.

**Improvement in certain health indicators**

First, it is important to state that the concept of health is no longer considered on the sole basis of personal characteristics (deficits and disabilities). According to the World Health Organization, health corresponds to a state of complete physical, mental and social well being, as determined by a set of biological, behavioural, economic, social and cultural factors (M47, p. 3). In addition, the CBHSSJB considers the Crees' concept of health to also include spiritual health (M3, p. 5). Accordingly, between 1970 and 2003, the health of the Crees improved due to better health and social services. The Cree population grew by 160 % and the mortality rate dropped by 30 % (PAP61, p. 3). The infant and infectious diseases mortality rates dropped by 70 %. Moreover, the injury mortality rate among the Crees decreased by half and is currently comparable to that for the rest of Québec. The difference between the Crees and other Québécois lies in the types of injuries, with the Crees more likely to be killed in a motor vehicle accident and less likely to die from a fall or suicide.

**Main health problems among the Crees**

Diabetes is unquestionably the main health problem among the Crees. In addition to being a recent chronic disease among the Cree population, the cases of diabetes diagnosed in people aged 15 or over on the Cree territory climbed significantly between 1983 and 2003, from 1.9 to 13 %. This health problem appears particularly serious among the Crees when comparing their situation with the rest of Québec. The prevalence of diabetes in people aged 20 or over was 12.8 % for the Cree population in 2000 and 5.1 % for the rest of Québec in 1999-2000. Note that almost half (43 %) of all cases of diabetes diagnosed on the Cree territory were in people under age 40 at the time of diagnosis. While over half of diabetics will have serious complications during their lifetime, the Cree population also risks experiencing other major health problems related to diabetes.
Intimately related to the problem of diabetes, overweight is considered to be another major health problem. The data reported in the impact assessment indicate that in 2001, 87% of Cree adults and 56-62% of children living on the territory were overweight or obese. According to several stakeholders, the two main factors having contributed to the increased proportion of adults suffering from overweight are dietary changes and physical inactivity (M47, p. 11). The construction of roads on the territory, related to the development projects implemented in recent decades, largely improved access to food from more southern regions. Despite an interest in traditional food, numerous lifestyle changes have led the Crees to eat more commercial foods and less fish and traditional game animals (M3, p. 7-8; M47, p. 11). They are also more sedentary than before and many practice their traditional activities less often. In 1991, 65% of the Cree population was considered moderately or completely inactive (ES37, p. 41). These data are cause for concern, since obesity and physical inactivity are two of the main risk factors for diabetes.

Respiratory problems are still more frequent among Cree communities than elsewhere in Québec. For example, the respiratory diseases mortality and hospitalization rates, standardized for age, are three times higher on the Cree territory than the Québec average. The most widespread respiratory problems are pneumonia and the flu, with young children and the elderly being most at risk. Note that the overcrowding in Cree housing and the smoking rate are often linked to respiratory problems. The rate of Cree smokers is higher than the Canadian average, i.e. 37% vs. 21.5%. However, most are moderate smokers. The Cree population also has a larger proportion of social smokers (people who do not smoke every day) than the rest of Canada. Statistics Canada has evaluated that the number of people per housing unit among the Crees is twice as high as for the rest of Québec (RP13, p. 46). Problems of mould and air pollution inside the houses, mainly in Chisasibi (ES38, p. 11-12), have been reported.

Prevalence rates for other diseases have evolved since the early 1980s to closely resemble those currently seen in the rest of Québec. For example, cardiovascular disease rates have increased significantly over the years to overtake respiratory diseases and injuries as the main causes of death. Previously, the cardiovascular disease rate among the Crees was lower than the Québec average. However, recent data show that the cardiovascular mortality rates are largely identical to those for the rest of Québec.

Social problems
In light of the information presented in the impact assessment, in the early 1980s we note a significant increase in social problems, such as family violence and child neglect. These problems may be due to the stress associated with internal changes to Cree culture, to acculturation, to unemployment, and to the use of alcohol and other substances. The proponent also indicates that the Cree communities on the territory are now grappling with social problems, including juvenile delinquency, alcohol and drug abuse, family violence, attempted suicides and child neglect (RP25, p. 10). These problems appear to be directly related to the rapid transformations in Cree society and are
apparently caused by cultural and value changes, a loss of pride related to the inability to feed one’s family off the land, and changes promoting individualism over community life.

The availability of alcohol year round on Cree territory is a relatively new phenomenon and has been largely facilitated by the construction of roads since the 1970s. The proportion of adults who drink occasionally increased from 35 to 59% between the early 1980s and 2001. Although young people are more likely to drink than their elders when the latter were the same age, the proportion of drinkers in the Cree population is still lower than in other regions of Canada. In fact, it is the heavy drinking by certain Crees that is mainly perceived as the problem by the Cree community. The four main social problems perceived by residents of Cree communities are alcohol abuse, drug abuse, unemployment and family violence.

During the public hearings, several Crees mentioned that suicide was one of the main social problems perceived within Cree communities, particularly in Chisasibi. However, it is important to note that the suicide rate among the Crees (11% between 1985 and 2001) is lower than the rates in Quebec (18.7% in 1997), Canada (13.2% in 1996) and in other First Nations in Canada (27.9% in 1999). However, these statistics do not account for attempted suicides, which were cited more specifically in Chisasibi, where there is a lack of resources to adequately intervene. The individuals who commit suicide generally have other personal or family problems, often related to alcohol abuse. Alcohol is a factor in 80% of suicides.

The two main diagnoses among Crees who used mental health services between 1986 and 1988 were depression and alcoholism. However, there have been no new studies or data since this time on the mental health of the Crees. It has also been shown that a strong social support network contributes to good mental health and to better social cohesion between community members. Traditionally, mutual cooperation has always been considered an important value for the Crees. For example, in 2001, 16% of Cree people spent more than 5 hours per week caring for the elderly, compared with 5% for the rest of Quebecers. Moreover, close to three-quarters of Cree adults have access to emotional support, an important factor in mental health (ES37, p. 51). Finally, spirituality and religion also promote good mental health among the Crees. They have a special spiritual link with life, and the Church is considered an institution for passing on traditions and traditional values (RP25, p. 25). Close to 25% of Cree adults attend church once a week (ES37, p. 51).

Work integration problems of the Crees

Apart from the problems discussed in section 6.6 of the report, there are other factors that make it difficult for the Crees to fit in on construction sites, adding to the inherent problems of working on remote sites. According to the perception survey conducted among community leaders, adjusting to life on the work site is sometimes a complicated affair, specifically due to workers being separated from their families and communities, the presence of alcohol on the jobsites and social relations with non-Native workers (RTP19, p. 52). First, like the other workers, the Crees working on the proponent’s jobsites are separated from their families for long stretches because of their schedules and the nature of their jobs (RTP19, p. 60). The long absences, combined with short and often intense family visits, occasionally create tension within families and require interventions by...
social services. At the public hearings, a social worker from the CBHSSJB also reported that certain Cree workers were neglecting their families by visiting less often, even when they are on leave, and were not sending them enough money to meet their needs (VAP40, p. 71). This could lead to separations and a range of social problems. These are only a few examples of the types of problems experienced by certain families.

Second, certain Crees have reported that the sale of alcohol on the jobsites was a major problem for their people. They claim that drinking is responsible for numerous personal, family and community problems. Albeit draconian, some of them feel that the best way to resolve this problem would be to totally ban the sale of alcohol on construction sites (RTP19, p. 64). This problem was mainly cited at the hearings in Chisasibi, given the availability of alcohol in nearby Radisson. This easy access to alcohol was cited as one of the causes of this community’s many social problems.

Finally, Cree workers complained that they were the victims of racism by non Native workers during the construction of the Eastmain-1 hydropower development project (RTP19, p. 58-60; RP25, p. 25). Certain Cree workers also said they were made to feel inferior by their non Native colleagues, whereas others said they were ridiculed because they spoke a different language (VAP38, p. 23). These behaviours affect the well-being of Crees in the workplace, making it more difficult for them to fit in and keep their jobs. These behaviours often stem from a lack of openness and understanding between people of different cultures.

**ANTICIPATED IMPACTS**

**General health**
Besides the problem of eating fish contaminated with mercury (see section 6.3.2), the proponent does not anticipate any further impact on the general health of the Crees during the project construction and operation phases. However, in its brief tabled at the hearings, the CBHSSJB disagrees with this assertion, as the project will result in numerous losses for the Crees and will have psychological repercussions (M3, p. 5). One of the main concerns expressed by the Crees at the public hearings was the psychological impacts of the project, as well as those which stemmed from past hydropower development projects. In fact, the flooding of the territory and the changes to the traditional way of life and values were among the most significant sources of psychological impacts reported by the Crees. In their opinion, the cultural shifts and the changes to the territory led to a profound sense of loss and sadness. Accordingly, they feel that the project will compound the impacts experienced in recent years.

Finally, certain Crees expressed their frustration and disappointment with the proponent’s failure to consult them in the past and expressed a desire for things to change. They want to be consulted on the different phases of the development projects implemented on the James Bay region, both during planning and construction/operation. To a certain extent, this could lessen the impacts on their well-being, since it has been shown that being able to express one’s opinion on a project decreases negative feelings and, consequently, the impacts on general health. In fact, according to Health Canada, control over a situation is considered one of the indicators for assessing the psychological well being of a population (M47, p. 14).
**Social problems**

During the construction phase, the proponent emphasizes that, while banned in nine of the ten Cree communities, the sale of alcohol in the camps and higher salaries could lead certain Crees to drink excessively, an opinion shared by several Cree residents at the public hearings. The CBHSSJB agrees and stated that the development projects lead to easier access to alcohol and drugs, resulting in other social problems such as child neglect, violence, sexual assault, vandalism, etc., specifically during the construction phase (M3, p. 8). It stated that these problems occurred more frequently in the communities during the construction of Eastmain-1 and during the studies related to the project. As for the operation phase, the proponent does not anticipate any impacts related to social problems among the Crees. The COMEX feels that it is essential not to overlook the problems that will stem from the significant decrease in jobs available at the end of the work (see section 6.6 of the report).

**Mitigation Measures**

As for the general health of the Cree population, the proponent does not suggest any particular mitigation measures for either the construction or operations phases. On the other hand, with regard to the social challenges related to alcohol consumption in the communities, the proponent intends to implement various mitigation measures to limit or eliminate alcohol abuse in work camps. By providing greater control over access to alcohol, the proponent expects to be able to decrease alcohol-related problems within the Cree population. Here are the measures applied to the development of Eastmain-1 and planned for the project under study:

- Upon arrival, workers will attend an information session on the living conditions and rules in effect in the work camp. They will be provided with a copy of the regulation in English or in French. Generally, the Cree employment counsellor will lead the meetings organized for the Cree workers. In all cases, the workers will be advised that infractions of the rules are subject to sanctions up to and including expulsion from the site or criminal charges.
- Alcoholic beverages may only be sold to work camp residents upon presentation of a resident card. There will be limits on the amount of alcohol each worker may purchase.
- A security service will intervene in the event of unacceptable behaviour. Crees will be part of this team, facilitating intervention in the event of incidents involving Cree workers.
- Camp access will be strictly controlled. Only workers and registered visitors will have access. It will be forbidden to take alcoholic beverages outside the work camp, and exiting vehicles will be subject to random search.
- The rules will forbid workers from going to Cree villages without prior authorization from the camp manager.
- Committees composed of representatives from the site and neighbouring Cree communities will be created as necessary, in order to harmonize relationships between workers and the communities.
Also, the proponent advocates an approach based on integration, prevention and support for all site workers. It is also committed to implementing other measures to promote moderation in consumption of alcohol for all workers (RP13, p. 199-200), such as banning the sale of alcohol before noon and cancelling the “two for one” promotion.

Moreover, to ensure that Cree workers do not turn to health services in the villages located near work camps, the proponent plans to ask contractors to remind their employees that they must bring their own medication with them to the site, in sufficient quantity to last the duration of their stay (DCAP15, 36-37). The proponent also mentioned that the Eastmain, Nemiscau and Rupert work camps have their own clinic, which has the required emergency medication; in all work camps, serious cases are evacuated to southern hospital centres.

Measures for facilitating integration of Cree workers
The proponent plans a series of additional measures aimed at fostering the integration of Crees on worksites: mentorship program, in cooperation with key Cree employers; information meetings, second language courses, authorization of one-day family visits, Native days, shows by Native groups, broadcasting Cree regional radio programs, mixing of workers in dormitories and mixed sporting activities (hockey and baseball).

Despite the fact that the CBHSSJB considers all of these measures to be appropriate, it still signalled that health services in work camps must be better adapted to the needs of Cree workers (M3, p. 8). It stresses the fact that staff hired at the camp clinic should be very comfortable in English and that a certain number of Crees be hired to work there. In addition, Cree workers need social services in these work camps. It also made some other requests to the proponent, including setting up spiritual resources for Crees, counselling services and employee assistance programs.

Follow-up programs
The proponent suggests implementing two follow-up programs (DCAP15, p. 110-111). The first would address relationships between Cree villages and work camps. It would involve identifying the problems encountered and evaluating the effectiveness of guidance measures. The second follow-up project would verify the consequences on Cree workers who participated in building the project. Various elements will be evaluated, including worker interest, difficulties encountered and the effects on family relations, as well as consequences on traditional activities and lifestyle changes.

The proponent does not, however, propose any program for follow-up the determinants for the health of the six Cree communities affected by the project during the operations phase. In this context, the CBHSSJB (M3, p 10) and Health Canada (M47, p. 2) suggest that the proponent develop and implement a follow-up program to evaluate the effects of the project on key determinants of health: revenue and social status; employment and working conditions, relationships and social support; institutions; services; education; personal behaviour; etc. This follow-up program would make it possible to track their evolution, given the ongoing uncertainty as to the project’s real influence on these determinants. It will also help ensure that all of the necessary measures are taken to guarantee that the Crees’ health is maintained or improved.
Conclusion
It is difficult to distinguish which health impacts on the population are directly linked to a project and those that are attributable to other causes. COMEX nevertheless considers that the proponent should give the CBHSSJB its full collaboration so that the latter can document the project’s effect on the key determinants of Cree health by targeting certain indicators pertinent to the project’s effects. In this context, COMEX would like the proponent, in partnership with the CBHSSJB, to implement a follow-up program to evaluate the effects of the project on some health determinants.

By considering the various measures that the proponent undertakes to implement to prevent alcohol abuse on construction sites as much as possible, COMEX believes the prevention services proposed by the proponent are adequate. There is still a need, however, for support and psychosocial assistance for Cree workers and their families. From this perspective, it would be advisable for the proponent to hire qualified personnel to intervene with Cree workers when they encounter psychosocial difficulties (alcohol consumption, difficulty integrating into the worksites, etc.).

6.3.2 MERCURY AND HEALTH

6.3.2.1 Management of fish consumption

Snapshot of current mercury management from a public health perspective
The Crees’ exposure to mercury present in the environment through fish consumption is a phenomenon that has been known since the 1970s, before hydropower resources were developed in the territory. The phenomenon’s origins lie in contamination by atmospheric industrial emissions transported over long distances and the natural presence of inorganic mercury in the area. Most of the epidemiological data relative to the effects of mercury on the health of the Cree population date to prior to construction of the La Grande complex.

More than thirty years later, the Cree population is still faced with the challenge of implementing a strategy for managing risks associated with exposure to mercury while maintaining Cree fisheries in the James Bay territory. The situation has existed since subsistence fishing ended in 1975-76 at the request of Health Canada, after mercury was discovered in the fish of the Waswanipi region. Efforts were subsequently made to resume fishing activities while simultaneously considering data on the mercury in the fish and results of epidemiological studies.

In the early 1980s, the proponent became a significant player in managing this public health issue, as reservoirs in the La Grande complex were found to be favourable to the bioaccumulation of methylmercury in the flesh of fish. The increase in bacterial activity, due to the availability of organic material recently flooded by the impoundment of reservoirs, is behind the increase in mercury contamination in the food chain. The proponent has also noted, and is supported by studies, that this contamination is not limited to reservoirs but could also be exported downstream, causing an increase in the extent of sectors indicating mercury concentration in fish above levels observed in nature.
The construction of the La Grande complex coincides with a period of rapid change in the Cree lifestyle, diet and practice of traditional activities. Paid work, both in the Cree community and on construction sites, as well as changes to daily life caused by a number of factors, such as use of motorized means of transportation, have made practicing traditional activities less frequent and less physically demanding, which for them has resulted in dietary change and the appearance of new health problems, such as diabetes and cardiovascular illnesses. This situation has come to pass gradually, despite the considerable efforts dedicated to harvesting game meat and fish for local distribution, supported by agreements signed with the proponent and others. In effect, the new road network makes regular hunting and fishing activities more accessible and largely facilitates the transportation and distribution of the harvest.

The increase in paid work in the communities meant that a growing proportion of the population had the chance to take advantage of another choice in primary diet and no longer had to depend primarily on hunting and fishing to fill its dietary needs. The increasing availability of food from the south in addition to traditional food increases the average caloric intake in Cree communities. These changes, combined with restrictions on fish consumption, have resulted in a significant drop in fish consumed. In a certain part of the population, we now see a marked reluctance to consume fish, independent of its source.

Over the years, actors that had participated the most actively in information campaigns and mercury level measures for the Cree living in the territory are the Cree Board of Health and Social Services of James Bay, the Cree Regional Authority (CRA) and Hydro-Québec. The CBHSSJB is responsible for managing public health in Cree communities, while the proponent has, in particular, proceeded to acquire data on mercury contamination levels in fish and developed an information guide on frequency of consumption by fishing site and species captured. The proponent also participated in estimating acceptable daily doses of methylmercury for different population groups (children, adults, women of child-bearing age), on which consumption recommendations are based. In 1986, the proponent and the Quebec government were signatories with the Crees of the Mercury Agreement (R24). The objective of this agreement was to reduce the potential effects of mercury on Cree health as much as possible, as well as their traditional way of life and their traditional hunting and fishing activities.

The message delivered to Cree fishers was first based solely on fish consumption restrictions, with no regard for species. More detail was subsequently added to distinguish consumption frequency according to whether the species consumed are predatory or non-predatory. In the 1980s, the context of subsistence fishing was reconsidered and the CBHSSJB targeted a clientele chosen from Cree fishers for whom the mercury levels in hair exceeded 15 ppm in women of child-bearing age and 30 ppm for other adults, to advise them on their fish consumption habits. The conclusion was that the negative aspect of these informational programs had discouraged people from eating fish while the problem should also have been considered in a more inclusive context, in which consumption of fish figured in part of a program dedicated to diet in Cree communities. During public hearings, the review bodies had the opportunity to see that the different messages conveyed over the last thirty years had sown a certain amount of confusion as to the actual toxicity of mercury and the extent of the problem.
As for the contamination level currently observed in the Crees, recent studies looking at Crees in the Oujé-Bougoumou (1.6 ppm) and Nemaska (0.9 ppm) communities indicate that the average level of mercury in the hair of individuals tested is comparable to those of Sept-Îles Innus (0.9 ppm) or residents (0.8 ppm). The same tests, carried out on recreational anglers in Matagami and James Bay reveal that the average values for mercury in the hair were 2.1 and 3.6 ppm respectively (PAP62).

**COMEX analysis**

From 1986 to 1996, the CRA and the CBHSSJB participated in implementing the first Mercury Agreement. In the framework of this Agreement, the mercury exposure of most pregnant women was followed, and fish consumption during pregnancy was advised against. Certain groups of adults who had been identified as active anglers were also followed. Generally, it seems that fish consumption and therefore exposure to mercury diminished considerably between 1986 and 1996. Since this time, the data available indicate that fish consumption has continued to decrease. It is clear that sizeable fishing effort has been maintained regionally, but it is based more on the use of techniques employed by recreational anglers. Species targeted are lake trout, northern pike, and walleye, three species known to have high body burdens of mercury. Before these apparent contradictions, COMEX has deduced that current fishing practices and consumption habits must be further documented by public health organizations before an effective information and education program on mercury contamination can be developed.

Ten years after the end of the first Mercury Agreement, the health benefits of fish consumption are being recognized, while, however, respecting the rules for consumption set out for the various species and different bodies of water. COMEX observes, however, that the proponent has, in the past, made decisions in the field of public health, while it was the responsibility of the organization created by the JBNQA to protect the health of the Cree and lead initiatives in this area. While the proponent must handle its share of responsibility in the area of mercury contamination, it is preferable that all aspects of health protection be devolved primarily upon organizations that are mandated to do so, such as the CBHSSJB. In light of its responsibilities, this organization should, among other things, focus on fish consumption and the mercury problem, including the maximum recommended quantities for fish consumption for various segments of the population, within the context of subsistence fishing, not only for communities that practice their traditional activities in zones affected by hydropower projects, but for all Cree communities.

COMEX believes that, to protect public health, it would be advisable to establish a long-term collaboration between the proponent and the CBHSSJB, including the sharing tasks according to each one's skills and responsibilities. The CBHSSJB would thus analyze the issue of fish consumption and would also have to select the most effective means of communication for informing the population. To ensure this approach's success, it must be clearly understood that the proponent is responsible for continuing its follow-up studies, providing timely information on the evolution of mercury levels in fish and providing Cree authorities with technical and scientific support in cooperation with them.
During public hearings held in Montreal, differing opinions as to the toxicity of mercury were expressed, as well as threshold values used in calculating the frequency of fish consumption in order to protect public health. COMEX notes that determining the threshold values that correspond to effective health protection is still a subject to debate between the proponent, the CBHSSJB and Health Canada and that these entities must resolve the question.

**Impact of the project on fish consumption and communication management**

According to the proponent, (see section 5.1.1.1), mercury levels will increase in fish found in the Eastmain-1 Reservoir, as well as in the bays and sections downstream from control structures in the Rupert, Lemare and Nemiscau rivers, over distances that vary according to the configuration of the rivers and the dilution from tributaries. The increase factor will oscillate between 3 and 5 and 6.2 for the Eastmain 1 Reservoir and the abatement of the ranges of values encountered in regional bodies of water is assessed at about thirty years. The project adds an additional year to restrictions on reservoir fish consumption for the lake whitefish, walleye and lake trout. These predictions are based on observations made in places similar to the La Grande complex and on a model validated by the scientific community.

Like other hydropower developments undertaken in the James Bay region, the mercury issue is among the negative impacts of the project under study. The proponent has already had discussions with Cree authorities in order to find ways to approach and manage this problem, which, while it is reversible in the medium term, has lasting consequences on the territory’s use. In 2001, the proponent and the Grand Council of the Crees signed an agreement concerning this aspect in particular (M70.3). The agreement was centered around two main axes, development and restructuring of fisheries, for which a fund of $22 million is allocated, and the implementation of research and follow-up programs, with a budget of $8 million (M70). A fund of $3 million is pledged in the Boumhounan Agreement. It would seem that the research and follow-up budget is largely dedicated to pursuing a research program on contamination levels in the Cree community for a host of contaminants, one of which is mercury. This study will make it possible to update data on Cree contamination levels, as existing data do not reflect the dietary evolution. The signing of this agreement, which will last for 12 years, confirms that mercury contamination is now seen as both an environmental problem and a sociocultural one.

In its impact assessment, the proponent presents new restrictions on the consumption of various species of special interest, for the diversion bay area and downstream from it. One meal per month or less will be recommended for walleye, northern pike and lake trout from the bays and the Eastmain-1 Reservoir. These new restrictions, calculated generally for adults, are suggested by Hydro-Québec to the CBHSSJB which should, if it accepts them, see to it that Cree communities are properly informed. These restrictions will be valid for a period of four to thirteen years, depending on the species and fishing site. After this time, recommendations on the frequency of fish consumption will be generally lifted by the CBHSSJB, while not automatically recommending restriction-free consumption, however. The exact formulation of recommendations on consumption and the update calendar will be established in concert with CBHSSJB management, which will also be responsible for distributing it. In its impact assessment, the proponent also indicates that specific consumption
restrictions will be suggested, as part of the recommendations made in cooperation with the CBHSSJB, to avoid possible foetal overexposure to methylmercury.

It is also clear that the negative perception certain Cree have of traditional food, specifically fish, should be considered to be an impact of hydropower development in the region, as well as industrial development in north-eastern North America. This should be taken into consideration in these organizations’ orientation and communications programs on public health protection.

**COMEX analysis**

COMEX fully recognizes the extent of the issue, which exists naturally and is exacerbated by hydropower development projects. It is also sensitive to difficult adjustments and the dietary recalibration imposed on neighbouring Native communities. It is of the view, however, that on the basis of information that has been brought to its attention, this problem can be resolved with sustained management, planning, follow-up and communication, with support resources and the cooperation of all stakeholders.

For COMEX, the ultimate objective that the organizations responsible for public health must pursue is maintaining the practice of traditional activities. COMEX recognizes that it would be important to correctly inform the Cree, particularly those who practice traditional consumption, of the risks associated with the quantity and frequency of consumption, and the type of fish consumed. Here, the CBHSSJB must, in the short term, develop a policy and communication strategy with the support of other organizations such as the Cree Regional Authority (CRA) or the Cree School Board. For effectiveness, messages to be transmitted to the Cree must be clear and simple to apply and the effort for distributing the information should be sustained.

In its impact assessment, the proponent has committed to follow the evolution of mercury concentration in fish in the various zones being studied. COMEX estimates that, when the follow-up reports are submitted, a section of the report should include a statement on the progress of research on the mercury issue in the perspective of the general health of the Cree, as well as an evaluation of the effectiveness of information campaigns on mercury and fish consumption. A portion on the Cree population’s use of piscivorous resources should also be presented. These latter aspects should be handled by the CBHSSJB and CRA.

The COMEX believes that the duration of the new Mercury Agreement is much shorter than the period of evolution of mercury levels in fish in reservoirs, from the initial increase to values comparable to those in natural bodies of water. In this context, one year before the Agreement expires, the proponent, in cooperation with the Cree bodies concerned, must submit a schedule of activities regulated by the agreement with, in parallel, a status report on the evolution of mercury levels. This would make it possible to determine whether the agreement should be renewed, as well as the directions it should take.

COMEX sees that the problem of mercury contamination in fish is multi-faceted, and must be addressed through a holistic and concerted approach. The mercury problem is part of a set of economic and cultural changes that have already taken place and the multiple and complex impacts
on the daily life of the Cree. It must therefore be handled by Cree organizations mandated by their citizens to take care of their health services. To do this, the CBHSSJB is in the best position to manage this file and to implement, with sustained support from the proponent, the health programs and policies and research initiatives on mercury and Cree health, as well as the means of communication that are the best suited to informing the population.

6.3.3 THE WATER SUPPLY

6.3.3.1 Impact on the domestic uses of water in the streams

Current conditions
The watersheds of the study area, and particularly those that are directly affected by the project, are located in sectors where the quality of the water is not affected or is only slightly affected by industrial or municipal activities. Therefore, those who use the water perceive it as being of good quality and, traditionally, the Cree drink it and use it for other domestic purposes.

According to the proponent, the natural waters of the streams that are the most affected by its project are of two types, A and B. The water of Lake Mistassini and the Rupert River is of type A, whereas the water of the tributaries to the Rupert River, particularly the Nemiscau and Lemare, is of type B.

Type A water is characteristically poor in phosphorous and organic matter, with little color and highly transparent, with a neutral pH and an average buffer capacity. Type B includes water that is poor in nutritional elements, has more color, is only slightly turbid and is relatively transparent; the pH is rather acidic and the buffer capacity is very low. The Rupert River is also characterized by an upstream-downstream turbidity gradient that corresponds to the increase in turbidity, which is particularly obvious from KP 158 downstream from Lake Nemiscau.

Impacts feared by the proponent
In general, the proponent believes that the modifications to the water characteristics of the rivers affected by the project will serve to preserve water quality that is adequate for maintaining the various uses of the Crees who use this water.

Diversion Bays and increased flow sectors
According to the proponent, during operations, the four principal mechanisms that may modify the quality of the Rupert diversion bay water are the gradual mixing of waters of different qualities, the cleaning of flooded lands, the decomposition of submerged organic matter and the increase of the phytoplankton biomass.

In the short-term, the last three mechanisms will have a temporary impact on the quality of the bay water. In permanent terms, however, the proponent expects that the mixing of the two types of water will constitute the principal mechanism modifying the quality of the diversion bay water. The proponent expects that their main reach will be characterized by approximately 90 % type A water and 10 % type B water. In the large bays located a certain distance east of the main reach of the bay waters, there will be little or no mixing and water quality will remain unchanged.
With respect to the Chisasibi water intake, located in the La Grande Rivière downstream from the La Grande-1 Reservoir, the proponent has indicated that under baseline and operating conditions no modifications in water quality are expected. Likewise, during the operating phase, the project will cause no modifications in the quality of the water in the reservoirs for this basin, which means that the quality of the water used by the Village of Radisson, for which the water intake is located in the Robert-Bourassa Reservoir, should not be modified.

**Reduced flow sector**

According to the proponent, the principal mechanisms likely to have an impact on the quality of the water in the Rupert River are the mixing of the water from the bays with that from the tributaries downstream from the diversion dam, the rapid zones, the erosion of the exposed shores and the headward erosion of the lower reaches of the tributaries due to a decrease in water level and a reduction of the flow in the main reach.

After diversion, the quality of the water will remain almost unchanged in the upper reaches of the Rupert River, from Lake Nemiscau to KP 314 (ES24, p. 56). This lake is divided into two water masses with distinct characteristics. One, type A, in the southern portion, is influenced directly by the Rupert River. The other water mass, occupying the north-east, is similar to type B, translating the flow of the Nemiscau River.

The proponent expects that the construction of a hydraulic structure at the outlet of Nemiscau Lake, at KP 170, will serve to maintain the average level of Nemiscau Lake essentially at the current mean summer level at all times and that the turnover time for the lake will increase from 3 to 9 days approximately. Therefore, the proponent does not anticipate modifications in the bank dynamics and the lake will continue to intercept alluvia, primarily sandy in nature, from the upstream segment. However, as in the case of the water from the Rupert River, downstream from Lake Nemiscau, there will be an increase in color and total organic carbon and a decrease in pH (ES25, p. 25).

In the lower reaches, from KP 0 to KP 170, the water will be slightly richer in organic matter and the average turbidity downstream from Lake Nemiscau will increase. This increase should be visibly perceptible to users for a long period of time. For purposes of comparison, the turbidity values should be similar there to those that currently characterize the lower segment of the Broadback River and less than in the lower reaches of the Nottaway.

With respect to the Waskaganish intake, the population is provided with water taken at km 5.7 of the river and treated in a plant in the village (see Section 6.3.3.2).

**Lemare and Nemiscau rivers**

Since the equivalent of the natural hydrograph of the flows in these rivers should be restored, the proponent does not expect any reduction in their level or their turbulence. The proponent does not expect any increase in the erosion rate or the residence time. The proponent does, however, expect the waters of the Lemare and Nemiscau rivers, immediately downstream from the bays, to change from type B to a mixture of primarily type A water, gradually diluted by the tributaries of the residual watershed, which are type B. In the long-term, the water of the Lemare and Nemiscau rivers will remain slightly more mineralized that it was before the diversion, as well as slightly less colored and less rich in organic matter.

Since Lake Champion is supplied partially (70 %) by the Nemiscau River, the changes in the quality of the water in that river from type B to type A will be felt. Moreover, flow regulation of the
Nemiscau River will reduce the probability of severe low water levels, thus ensuring a constant and minimum flow of water into Lake Champion.

**Mitigation measures and environmental follow-ups**
The proponent will build eight hydraulic structures on the downstream reaches of the Rupert. These structures should slow any geomorphological effects such as erosion of the shores and headward erosion of the tributaries. The proponent proposes to seed grasses along almost 400 ha of exposed shores to slow the impoundment of sediment. Based on past experience, the proponent is of the opinion that the rapid zones in the Rupert, Lemare and Nemiscau rivers will cancel out the effect of the organic decomposition in the bays by re-oxygenating the water and restoring the pH.

During the construction and operation of the hydraulic structures, the promoter plans to do a follow-up of the turbidity and the suspended matter in the reduced-flow reach of the Rupert River, between KP 5 and 170. The proponent also proposes to do a follow-up of the turbidity and suspended matter in the estuary of the La Grande River during the installation of the granular blankets and following the diversion of the Rupert River. In this case, the follow-up efforts will be concentrated along the left shore of the estuary and near the Chisasibi water intake.

**Concerns of the users**
Most of the tallymen consulted individually stated that, generally, the water in the Rupert, Nemiscau and Lemare rivers is good to drink, regardless of where they are (RP12, p. 223). During the public consultations conducted in the communities, this assessment of the water quality was stressed on a regular basis. In the particular case of Old Nemaska, the users said that they drink water from the lake on a regular basis, that they take the water from different points and that there is no replacement source for drinking water nearby.

On numerous occasions, those who attended the consultations came to express their concerns with respect to the impacts the project might have on the quality of the water. Most people are convinced that water quality will be altered permanently. This perception seems to be influenced by experiences related, among other things, to the complete diversion of the Eastmain River.

**COMEX analysis**
At present, the water in the study area concerned by the project is of a quality that is suitable for maintaining aquatic life and is used for various domestic purposes. The proponent is of the opinion that these uses can be maintained. Nevertheless, despite the responses provided by the promoter, most of the Cree consulted are convinced that the quality of the water will be altered in a permanent manner following the construction of for the project.

Turbidity is caused by the presence of suspended matter and the color is related to the decomposition of organic matter. As a result of water flowing from tributaries that drain settings that are rich in fulvic and humic acids, changes in water color may also be noted. If the color changes on a long-term basis, the average turbidity in the main reach of the Rupert increases gradually from downstream of Lake Nemiscau; if the turbidity values are similar to those that currently characterize the downstream segments of the Broadback and Nottaway rivers, these two variables could influence the perception of water quality and, as a result, the Crees use of the water.
The water from the Rupert River is currently used for various domestic purposes. After the diversion, there is a concern that, as a result of the change in color and turbidity caused by modifications in the flows of the river and its tributaries, the water will no longer be considered acceptable for the current uses, which could limit the use the Crees make of the water. The proponent should, therefore, do a follow-up of the quality of the water and transmit the pertinent information to the users.

### 6.3.3.2 Supplying Waskaganish with drinking water

Drinking water for the Waskaganish community is provided by a pumping station located at KP 5.7, which supplies the village’s drinking water treatment facility. The current production capacity of that plant is 800 m³ per day and its reserve capacity is 460 m³. According to some people, this capacity can no longer serve an eventual peak demand, such as a major fire in the village, for example.

The proponent has made a commitment to build a new facility (M70.5, p. 14). In order to respond to the needs of the population, as forecast for 2025, the proponent plans to increase the capacity of the system to a minimum of 2,200 m³ per day and the reserve to 800 m³ (RP14, p. 4-61). The proponent also plans to make certain modifications to the water intake pumping station by increasing its power. This work will be done before the Rupert River is diverted. The proponent has indicated that the modification of the water intake and the construction of a new drinking water facility at Waskaganish, along with the instream flow, should ensure a supply of drinking water in keeping with the standards in effect, which will not be inferior in terms of either quality or quantity to the supply from the existing drinking water plant. The current facility will operate throughout the construction and the start-up of the new facilities.

Under current conditions, minimum submersion height of the water intake is 1.1 m in the summer. The reduction in flow caused by the diversion of a portion of the water will result in a reduction of this minimum submersion height, which will be 0.3 m in the summer and 0.2 m under winter conditions. According to the proponent, this new situation poses no risk for the operation of the water intake, which will still be submerged. Moreover, the minimum flow after the diversion, which will be 193 m³/s, will be amply sufficient to satisfy the maximum demand of 3,600 m³ per day, namely 0.04 m³/s.

With respect to the water intake for the Waskaganish drinking water facility, the proponent also proposes to monitor the parameters that pertain to the drinking water, in keeping with the criteria of the Ministère du Développement durable, de l’Environnement et des Parcs.

**COMEX’ position**

COMEX is of the opinion that the construction of a new drinking water treatment facility by the proponent and the increase in the capacity of the pumping station will make a significant improvement to the drinking water supply system for the Waskaganish community. It would also like to point out that this project is subject to the approval procedure provided in Chapter 22 of the JBNQA and the standards provided in Québec’s Regulation respecting the quality of drinking water. Therefore, the authorities in this matter will have to make a decision with respect to the project once it has been finalized in cooperation with the Waskaganish authorities.

On the other hand, the changes to the hydrodynamics of the river and the erosion of the shores could change the sediment dynamics. Particular attention must be paid to these phenomena to ensure
that the two water intake channels are not threatened by possible silting up. The proponent should monitor this.

6.4 **ISSUES CONCERNING THE OCCUPATION OF THE TERRITORY**

6.4.1 **THE CREES USE OF THE TERRITORY**

The use of the territory is an intrinsic part of the Crees’ identity. The values specific to the Cree culture are closely linked to the respect paid to the “Earth” and its resources. A large majority of the Crees interviewed during the perception investigations as well as during the public hearings indicated that the land still holds an important place in their lives and they spoke of the forest as a haven of tranquility and cultural and spiritual healing. Although modern life has resulted in important changes in the traditional Cree life, the Crees still believe that life in the forest is an important cultural activity even if they only spend short periods of time there. For the Crees, these are times when family bonds are strengthened and health is improved (RTP19).

Over a period of just a few years, Cree society has moved from a way of life based almost solely on traditional hunting, fishing and trapping activities and a sharing of resources to a market economy involving adequate training and paid employment. The Crees presence on the land has, as a result, been modified under the influence of several factors, including work schedules and the need to remain in the village during the school period. Since the acquisition of all of the practices, knowledge and rules of life in the forest requires a lengthy stay on the land, it is increasingly difficult for young people, who are pursuing their studies and cannot spend large periods of time in the forest outside their school vacation, to acquire all this traditional knowledge. External factors such as the decline in fur prices, the continuously high cost of the fuel and equipment needed for forest activities and the subsidies paid to beneficiaries under the Income Security Program (ISP) for Cree hunters and trappers, which the Cree consider insufficient, significantly reduce the financial benefits of life in the forest. According to several Crees, this situation discredits, to a certain extent, the importance that should be attributed to the tallymen and those who live in the forest and possess a great deal of traditional wisdom (RTP19). Moreover, the Cree population has more than doubled over the past 30 years, while the land has become increasingly open to forestry, mining and hydro-electric activities.

Fewer and fewer people choose to live solely in keeping with the traditional Cree lifestyle. Nevertheless, several people work on a seasonal basis and spend weeks and even months in the forest. Moreover, several people indicated that they would like to return to live on the land when they stop working (RTP19).

6.4.1.1 **Impacts on hunting, fishing and trapping**

The signing of the James Bay and Northern Québec Agreement (JBNQA) led, among other things, to the implementation of a new territorial system, dividing the James Bay territory into Category I, II and III lands. In this way, the James Bay Crees acquired exclusive hunting, fishing and trapping rights on the Category I and II lands, and exclusive rights to use certain fauna species on the Category III lands, in addition to other rights.
The territory was divided into hunting grounds on paper in the 1930s when the beaver reserves were created to control the harvest of that animal and enable the beaver populations, which had been practically decimated, to colonize the streams in the territory. Consequently, the hunting grounds are generally defined in terms of the hydrographic network. The borders of certain traplines are, however, still the object of discussions among tallymen. As part of the project, 36 hunting grounds distributed over six communities border bodies of water for which the flow will be modified or which will be subject to the flooding of land areas (see Maps 6-1 to 6-7).

The tallymen ensure the proper management of wildlife resources on each of the hunting grounds. This is generally a function passed down from father to son or to the family member most interested in managing wildlife resources on the trapline. The tallymen still manage the beaver populations, as well as those of other animals, and each year they share the resources to be used and the areas to be preserved. Although the tallymen are still figures that are respected by the entire community, their role has changed and some disagree with their management mode (RTP19).

Hunting, fishing and trapping activities are practiced throughout the year. Hunting moose and geese are the activities most commonly practiced by the entire community. The importance of these hunting activities for the Cree community is reflected even in the school and work calendars which include specific periods known as the “goose break” in the spring and the “moose break” in the fall. Trapping activities are practiced by the tallymen, the ISP beneficiaries and occasional trappers. Fishing activities are practiced almost everywhere on the lakes and principal rivers, often on sites used by the community.

At present, the hunting grounds located in the diversion bays (Mistissini community) and instream (Nemaska and Waskaganish communities) sectors are little affected by the presence of infrastructures. These include principally the Route du Nord, the James Bay Highway, the Nemiscau-Eastmain-1, Waskaganish and Nemaska roads, the power transmission lines, Albanel and Nemiscau substations and the roadside stop at km 257 of the Route du Nord and the infrastructures for Hydro-Québec’s Nemiscau camp (residences, camp, airport). A few non-Cree camps are dispersed throughout this territory. Generally, there are only a few per hunting ground on Category II lands, with the exception of site M33 in Mistissini, where 22 non-Cree camps are located. The Cree hunting camps, the villages of Nemaska and Waskaganish and the Waskaganish airport complete the portrait of the existing infrastructures in this sector.

In the increased flow sector (communities of Eastmain, Wemindji and Chisasibi), it is not so much the presence of infrastructures as the traces left by hydro-electric operations that mark the territory. Since the 1970s, the diversion of rivers and the flooding of large land areas to create reservoirs have considerably modified Cree use of the territory. This territory includes several dikes, the James Bay highway, the Nemiscau-Eastmain-1 road, the road for the Sarcelle control structure, Transtaiga and the Chisasibi road. It also includes power transmission lines, the Muskeg, Radisson, La Grande 1, La Grande 2, La Grande 2-A and Chisasibi substations, the Sarcelle control structure, the Eastmain 1, Robert-Bourassa, La Grande-2 and La Grande-1 powerhouses, as well as the Eastmain camp and the village of Radisson. Finally, numerous Cree camps, the village of Chisasibi and the Chisasibi airport are also located in the study zone. Among all these infrastructures, a large amount of the equipment used for the La Grande complex structures is concentrated in the sector of the Chisasibi community.
Impact analysis

The proponent made its impact analysis of the use of the territory based on information obtained during interviews involving each of the tallymen for the 36 hunting grounds and the members of their families who use these hunting grounds. Meetings and investigations involving other people who use the territory provided a description of the use of the Rupert and Boatswain bays, the mouths of the La Grande and Rupert rivers, the shores adjacent to the villages of Waskaganish and Chisasibi as well as the Smokey Hill and Old Nemaska sites. The studies concerning the La Grande complex served to complete the determination of how the Cree have been using the territory since the start of hydropower development in the region.

The interviews of the tallymen were intended to collect data concerning the principal components of the use of the land and the practices for using the resources as well as elements that could be affected by the project. The summaries of the interviews essentially concern the number of regular users of the hunting ground, the means for moving about on the territory, permanent and temporary camps, hunting, fishing and trapping activities, and the resources and sites of value. Based on these summaries, the proponent prepared a report for each of the six Cree communities affected. Therefore, the assessment of the residual impact applies to all of the hunting grounds affected per community, although the traelines that will be more affected were identified.

The proponent’s impact study evaluates the residual impact on the hunting territories of the communities of Mistissini, Nemaska and Waskaganish as average in importance. The proponent is of the opinion that there will be few repercussions on the availability of resources in the hunting grounds affected as a result of the creation of bays and the reduction of the flow in the Rupert River. It is also of the opinion that the project will not prevent the pursuit of hunting, fishing and trapping activities. The proponent acknowledges that, on portions of the territory or on sections of the river, the users will have to adapt to new settings and change their travel routes and their hunting, fishing and trapping habits. Some permanent and temporary camps will have to be moved and several valued sites will be affected by flooding, by the construction of infrastructures or by the effects of the modification of the flow.

In the increased flow sector, the residual impact on the hunting grounds of the Eastmain and Wemindji communities is considered minor. The proponent is of the opinion that the project will not prevent the pursuit of hunting, fishing and trapping activities, that the impacts will be more limited and will affect only certain hunting grounds. Flow modifications will, nevertheless, affect most of the users who will have to adapt their movements in keeping with the new navigation and ice conditions. The users of the remaining stretch of the Eastmain River will, in addition to having to adapt to new navigation conditions, have to find new fishing sites. The community fishing site located downstream from the Sarcelle control structure will have to be moved since the hydraulic and hydrologic regimes there will be modified. Access to the RE1 and VC37 lands (community of Eastmain) will be facilitated by the construction of the permanent Muskeg-Eastmain-1 road. Winter maintenance of this road, which leads to the future Sarcelle powerhouse, will ensure safe travel to the VC23 site (community of Wemindji) and other sites in the community of Eastmain. According to the proponent, the residual impact on the hunting grounds of the community of Chisasibi is negligible. No perceptible modification will affect the navigation and ice conditions. Only the mitigation measure concerning the implementation of granular blankets will affect certain hunting grounds used by the community of Chisasibi resulting in transportation and traffic annoyances.
It should be noted that the proponent plans to do a follow-up of various aspects concerning hunting, fishing and trapping activities with the users of the territory. This follow-up will specifically concern the use of the hunting grounds and camps, the use of wildlife resources, the means for accessing the camps, the exploration of new settings and the assessment of the mitigation and compensation measures. This follow-up will be conducted throughout the construction and diversion activities and will continue for ten years after operations start.

Moreover, both the proponent’s efforts with respect to consulting the tallymen and their cooperation should both be noted. The tallymen were consulted on numerous occasions so as to include specific information concerning their use of the hunting grounds. Nevertheless, certain non-tallymen denounced the fact that only tallymen and their families were consulted and said that they would have liked to take part in this consultation since they are also involved in hunting and fishing, specifically on the Rupert River.

The tables of Appendix 3 provide details about the existing infrastructures, the potential infrastructures and borrow pits included in the project, the anticipated impacts on the biophysical and human environments, and the mitigation measures and follow-up specific to each of the hunting grounds planned by the proponent, on each of the hunting grounds.

Impact assessment indicators

One of the issues, considered among the most important by the Cree, is that the project should not risk changing their traditional way of life. During the hearings held in the communities, the Cree regularly mentioned that the land represents a pantry from which they can obtain healthy food. The land is also viewed as a credit union since, with proper management, they know that they will always be able to survive thanks to the animals and fish. For them, the impacts of the projects will only be acceptable if they do not harm the potential for hunting, fishing and trapping.

Nevertheless, identifying quantitative and discriminating impact assessment indicators for a subjective issue is not easy since the impact on the use of the territory can only be truly assessed with the agreement of those who use the territory and will depend to a large extent on their ability to adapt. Since the impacts are not necessarily comparable from one community to another, the analysis will be presented by community, using pertinent indicators and focusing on the principal hunting grounds affected.

Mistissini

The hunting grounds affected by the creation of the Rupert diversion bays (see Map 6-1) will experience the most important impacts of this project and hunting grounds M25 and M18 will be the most affected. There is virtually no infrastructure on these traplines, which are used by the Mistissini community and are located very close to the Nemaska community, with the exception of a power transmission lines, its maintenance road and the permanent and temporary Cree camps. Hunting ground M25 will undergo the most important modifications. Just over 15 % (214.9 km²) of its total area will be flooded by forebays and tailbays. Half of this 15 % will consist of bodies of water that are already present (see Table 2-14 in Section 2.4.1.5). Almost 5 % (56.4 km²) of the total area of M18 will be modified by the project. The Eastmain 1 Reservoir also touches the northern extremity of M18.

The loss of territory is all the more important since it affects spaces that are valued by the users. These valued sectors, located around Des Champs Lake and Goulde Lake, on M25, as well as a series of
lakes north of Arques Lake, which lies astride M25 and M18, are used intensively for hunting and fishing. Several fishing sites (close to about 30 on hunting ground M25) and goose hunting sites, as well as the edges of certain moose hunting grounds, will be affected by the modification of the environment. Since all of the hunting grounds are considered good for trapping small game, the trapping area lost may be considered equivalent to the land area flooded. These valued sectors are used extensively, particularly by those who use M25. In the flooded sectors, the presence of five permanent camps, more than 36 temporary camps (including a community camp north-west of Arques Lake), numerous burial and birth sites, and a vast travel route network provides evidence of sustained use by numerous generations. It should be noted that the permanent and temporary camps affected, except for one, and the flooded burial and birth sites are located on hunting ground M25.

The presence of new bodies of water will involve changes to the travel route network. The proponent is of the opinion that the navigation difficulties associated with very large bodies of water (waves, strong winds) should not be noticeable in the diversion bay sectors, particularly since the water levels will be relatively stable during the summer. In fact, in the Mesgouez Lake sector, the Rupert River has characteristics similar to those expected in the upstream bay, which does not prevent the users of hunting ground M33 from traveling about by boat there. In the tailbay, the navigation conditions should be favorable, except at the northern extremity of the bay, between KPs 40 and 20, where current speed will be faster. Moreover, according to the proponent, the land clearing program to be undertaken to build navigation corridors should facilitate boat travel in the bays. With respect to snowmobile travel, the users will have to re-organize their trips in keeping with the new bodies of water. The presence of access roads, combined with existing snowmobile networks, will facilitate access to certain sectors. The entire forebay will be accessible by snowmobile, except between KPs 100 and 90 (between the Misticawissich River and Goulde Lake) where current speed will prevent the formation of permanent ice cover. In the tailbay, as a result of the instability of the ice cover, travel could be more risky certain winters, particularly downstream from the transfer canal, north of Arques Lake and near the crossing of the 735 kV line (7059). Aspects pertaining to navigation are discussed in more detail in Section 6.4.3.

In addition to the flooding of the territory, the users of the hunting grounds will have to deal with the annoyances associated with the clearing of the land, the construction of roads and structures, transportation, increased traffic and the presence of workers during the construction phase. During the operating phase, the access roads, dikes and other hydraulic structures as well as numerous borrow pits and quarries will change the landscape of hunting ground M25 considerably. It will then include almost 80 km of permanent roads, approximately 32 km of temporary roads, the dam and the Nemiscau-2 flow release structure, the Kayechischekaw stream flow release structure, 44 dikes, one transfer tunnel, nine canals, six quarries, 103 potential sand pits and the Rupert camp. To a lesser extent, hunting ground M18 will be modified by 12 km of permanent road, approximately 20 km of secondary road, the dams and the Nemiscau-1 and 2 structures, 12 dikes, two canals, two quarries and 26 potential sand pits. Although these new accesses will facilitate travel on the hunting grounds, they may also give more people access to sectors which would otherwise only be accessible by boat or snowmobile. The issue of opening up the territory, which is closely tied to its use, is the object of a complementary analysis in Section 6.4.2.

The notion of duration in the term “temporary camp” is confusing. These are above all potential camping sites which can be used by hunting, fishing or trapping expeditions, although the camp is not generally equipped with permanent structures.
Hunting grounds M33 and M26 will be much less affected. Slightly over 2% (15.8 km²) of the area of M26 will be flooded by the forebay. The flooding will particularly affect the mouth of the Misticawissich River and, to a lesser extent, the shores along approximately 20 km. The proponent has planned no infrastructure for this hunting ground. A small percentage of hunting ground M33 will be flooded (1.5% or 34.8 km²). Nevertheless, a section which is valued, particularly for moose hunting and sturgeon fishing, will be affected by the modification of the environment. In this sector, an important sturgeon spawning area, used by large numbers (including those who use trapline M25) for fishing will be flooded. Those who use hunting grounds M33 and M26 will also have to adapt to new navigation conditions, principally in the sector upstream from the Rupert dam.

Finally, a portion of the areas of the R21, R19 and N25 hunting territories of the Nemaska community will be flooded by the diversion bays. They will be flooded by 1.7%, 0.4% and 0.1%, respectively. Other impacts will affect these lands and are discussed in the section on the Nemaska community.

All of those who use the hunting lands that will be flooded should change their consumption of fish caught in the diversion bays. The effects of the increase in methylmercury in the flesh of fish from the bays following the flooding and measures taken to reduce the impact of consuming fish are discussed in detail in Section 6.3.2. Restrictions with respect to consuming certain types of fish should keep most fishers away from the bays for a certain period of time, particularly since the Cree fear not only the effects of mercury but also the change in the taste of the fish following the modification of the territory.

Mitigation measures and environmental follow-ups
The proponent has specified several mitigation measures from the time the project was prepared. Many other measures were included in agreements between the users and the proponent to compensate for certain specific impacts.

In order to reduce the impact on fish communities, for each of the spawning areas affected by the diversion bay impoundment, the proponent will set up at least one spawning area for the specific species or to encourage use by several species. While we do not currently find any sturgeon in the lakes of the Rupert diversion bay section, the proponent expects that the latter may progressively colonize in the diversion bays. Setting up a multispecies spawning ground downstream from canal S-73 could also serve as a spawning area for lake sturgeon. Furthermore, the proponent agrees to follow up on the mercury levels in the main fish species fished in the diversion bays, until consumption restrictions return to values comparable to those prevailing at this time. Users who prefer to move their fishing activities, given the increase in mercury concentrations in the diversion bays, can send requests to the Eastmain-1-A Rupert Mercury Fund, to facilitate access to alternate fishing sites. This $3 million fund will be available to users for a period of twenty years.

To mitigate the impact on animals, that could be drowned during the winter impoundment, the proponent proposes an intensive trapping program for beavers and bears, prior to impoundment, in collaboration with the tallymen. During impoundment, helicopter fly-bys will make it possible to find endangered animals and, if applicable, move or capture these animals. The proponent also
proposes to landscape ten hectares of wetlands suitable for goose hunting in certain borrow pits (DCAP2). This measure is described in detail in Section 5.1.1.3. In order to limit the nuisance of construction activities for users, the proponent plans to inform the families affected of the schedule and nature of work so that they can plan their activities accordingly. Hunting and trapping activities in the Rupert diversion bay section will be disrupted during the first years of operation, but, when the vegetation returns, animals should colonize again on the edge of the diversion bays. This $32 million fund, available during a period of 15 years, can fulfill a very wide range of requests. The Eenou Indohoun Fund is also available to promote traditional Cree activities and to mitigate the impact on users who are directly affected.

Measures related to moving or setting up new camps and for moving temporary camp equipment have been developed based on user requests. The main permanent camps on trapline M25 should be moved, as well as the main workcamp and the goose hunting camp of the tallyman on trapline M18. The tallymen also requested that access to these new locations be set up, with boat launch ramps or ground access. In general, the feasibility of requests for setting up ground access (ATV, snowmobile) should be evaluated by the proponent (DCAP15). The proponent also agrees to meet the specific requests of users on traplines M26 and M33. Beyond the measures provided for in the project, users will be able to make requests to the Boumhounan Remedial Works Fund for any work to improve the conditions for practising traditional activities. Furthermore, a claims procedure for property damage suffered by the Crees is planned for the project.

The Cree are worried that opening new accesses and the increased presence of workers on hunting grounds will result in an increase in hunting and fishing pressure (RP17). To control the harvest of workers, the proponent agrees to recommend a review of the mandate of the Weh-Sees Indohoun Corporation in this section to the appropriate authorities. At the request of the tallyman, a checkpoint will be set up slightly north of the Albanel substation during the construction period to control access to the Rupert camp and, as a result, access to the adjacent hunting ground. The proponent also agrees to install appropriate signage and measures to manage traffic to ensure the safety of users of roads and snowmobile routes (RP15).

Finally, the proponent will prepare a map with cleared navigation corridors that also show the average summer water levels. If wood accumulations hinder boat movement, he will also clean the wood debris from navigation corridors and near the boat launch ramps. With the help of users, the proponent will determine safe snowmobile corridors for crossing diversion bays (DCAP15). The navigation and ice conditions in the diversion bays will be monitored for two years after the impoundment.

**Conclusion – Mistissini**

The exploitability of hunting grounds M25 and M18 will be reduced significantly. Due to high mercury concentrations, fishing activities should be relocated for a period of at least 10 years for most species, and up to 30 years for the harvesting of certain piscivorous species. While the animals will probably colonize the new banks fairly quickly, it will not be possible to recover or even mitigate the loss of land areas for hunting and trapping. Nevertheless, waterfowl hunting could recover in the short or medium term in diversion bay sections based on the speed of colonization of riparian
vegetation. Furthermore, the diversion bays, given their size and alignment with the other reservoirs in the La Grande complex, could attract even more waterfowl during migration and moulting periods.

According to the impact assessment, the proponent has already included significant remedial measures and many other measures have been concluded directly with users of the hunting grounds. All of the measures and funds aim to facilitate the operation of sections not affected by the project in order to ensure the continuation of traditional activities. The review bodies are of the opinion that only users of the area are truly able to judge the effectiveness of measures and that a follow-up on the satisfaction of tallymans should be conducted.

Nevertheless, all of these measures, including the possibility of returning fishing and hunting to flooded sections, would never fully compensate for the losses associated with the disappearance of sites with special significance for users. Workcamps, burial sites and birthplaces, and valued areas have their own histories. They are associated with relationships, acquired knowledge and family memories. During hearings in Cree communities, many people expressed their sadness and deep pain in thinking that the land could be flooded and that Rupert River could be cut off.

The family of tallyman on trapline M25 also provided a testimony. This large family came to clearly state what they thought about the project, what it chose for the future of the Cree community. It is a big sacrifice to agree to abandon part of the land from ones ancestors, a land where still today, many people still actively practice traditional activities. “My father is abandoning his land so that everyone can build a better future for the children” (VAP1, p. 103). “He hopes that this agreement will be beneficial for all young people and will succeed in helping them make their dream of developing the Cree Nation come true” (VAP1, p. 104). However, the family of the tallyman is not free from worry. The members worry about what will happen after the project, the relationships they will have with the proponent after the assessment process and the construction phase. They wonder about the guarantees regarding the effectiveness of mitigation measures and whether traditional knowledge will be taken into consideration in the follow-up studies. They also hope to participate in the decisions on the choice of mitigation measures and studies. Furthermore, they hope that the sacrifice of their elders on behalf of the Crees and Quebecers will be officially recognized by the government.

The tallyman on trapline M18 also spoke during the public hearings. He mentioned that he shared the opinion of the eldest son of the tallyman on M25 (VAP3).

While they realize they will be affected by the project, the users of hunting grounds in the Mistissini community believe they will be able to continue using the resources on their land, but that they will have to reorganize their activities. They mentioned that they will have to develop their own strategies to adapt to the new conditions (RP17).

The proponent’s project, as presented in the impact assessment and additional studies, respect the commitments undertaken in the Boumhounan Agreement. Among others, it has been agreed that Hydro-Québec guarantees the project will not have an impact on the levels or natural currents of Mistissini Lake or Woolet, Bellinger or Mesgouez lakes. The proponent also guarantees that the aquatic habitat upstream from all forebay limits in the project will not be affected.
COMEX acknowledges that the impact on hunting grounds in the Mistissini community will be significant that the loss of land area for hunting and trapping cannot be compensated. Considering the mitigation and compensation measures, but primarily the fact that the tallymen on the most affected hunting grounds accept the impacts on their lands, COMEX believes that the impacts on traditional activities of hunting, fishing and trapping on the hunting grounds in the Mistissini community are acceptable.

Nemaska
The main repercussions of the project on most of the hunting grounds in the Nemaska community (see map 6-2) result from the reduction in flow in the Rupert River and from the construction of hydraulic structures. The dam and spillway on the Rupert River, and a portion of the diversion bays, also affect lots in the Nemaska community. The impoundment of the Eastmain 1 Reservoir affects a portion of one of the traplines in the community. Due to lower water levels, certain hunting and trapping activities will be affected by bank exposure and some fishing sites should be moved. Given that the mean annual flow will be completely restored downstream from the dams on the Lemare and Nemiscau rivers, the proponent does not foresee any impact on the water levels. Consequently, it will be mainly the activities carried out on Rupert River or on the edge of the river that will be affected by the change in flow.

In the segments not affected by hydraulic structures (KP 219 to 223, KP 253 to 261, KP 275 to 279 and KP 310 to 314), users will have to adapt to a new environment for goose hunting. Nevertheless, waterfowl should continue to use the river. Section 5.2.1.4 specifically covers the impact of the project on waterfowl in the Rupert, Nemiscau and Lemare river sections. During the first years after the diversion, the segments of the river not affected by the weirs will be of little interest for beaver trapping, but will remain interesting for trapping of other fur-bearing species. The small animal population may even increase over the years, given the expected expansion of their habitat. No impact on hunting or trapping is expected in the segments affected by a weir.

The R21 and N25 hunting grounds, situated on both sides of the Rupert River in the section of the closure point, will be particularly affected by this project. They will be affected by the impact of reduced water levels and by the flooding of Rupert River following the creation of diversion bays (1.68 % or 11.53 km² on trapline R21 and 0.13 % or 1.52 km² on trapline N25). Furthermore, the presence of the dam, spillway, spur on KP 290 and access roads will significantly alter the landscape. The tallymen have both mentioned that the entire length of Rupert River is important to them. They practice fishing and goose hunting along the length of the river adjacent to their trapline (ES26). Since the segment directly downstream from the dam will be particularly affected by the lower water levels, the fishing sites in this section will be lost and the goose hunting and trapping activities will be affected. One goose and moose hunting section upstream from KP 314, on the south shore of the river, will be heavily flooded. The distances between the boat landing and the permanent camp at KP 304 (hunting ground R21), and the temporary camp (trapline N25) located at KP 280 will be increased after the banks are exposed. Three sites of temporary camps will be flooded by the diversion bays. The dam construction work will probably disrupt the activities at the campsite on KP 311. Furthermore, the navigation route upstream from KP 314 and on Goulde and Des Champs lakes (trapline M25 in Mistissini) will be lost or disturbed. Finally, three burial sites on trapline M25 in Mistissini, identified by users of trapline R21, will also be flooded.
Nemiscau Lake and the traditional site of Old Nemaska, established on the west short of the lake, are particularly valued by members of the Nemaska community. In summer, many families stay there from several days to several weeks. The site is also used by certain members of the Waskaganish community. Festive and recreational activities, and celebrations take place over several days. Net fishing and angling are very popular activities on Nemiscau Lake. A sturgeon spawning ground a bit upstream from the lake, near KP 216, is heavily used by members of the community. In winter, some elders and ISP beneficiaries live in Old Nemaska for extended periods. In spring, many hunters set up for goose-hunting season and travel the upstream section of Nemiscau Lake, between KP 190 and 216 and between KP 219 and 246 (ES26).

With the installation of the hydraulic structure at KP 170, the water levels will be maintained throughout the Nemiscau Lake section and Old Nemaska. Fishing activities in the spawning ground of KP 216 should not be affected by the changes in flow. However, portions of the banks will be partially exposed in the upstream segment of the lake and, in the section located directly downstream from the weir at KP 223 (between KP 219 and 223), the exposure will be more significant. With the increased water level upstream from the hydraulic structure at KP 223 (PD 5.4), traditional hunting and fishing activities practised upstream from the weir to KP 253 will not be affected.

Many other sections of Rupert River are used by the entire community for traditional activities. Downstream from Nemiscau Lake, the section of the river adjacent to the James Bay Highway is a meeting place used by many members of the Nemaska and Waskaganish communities (ES26). Fishing and rabbit trapping activities are practiced here. This section will be affected by the lower water levels, meaning that fishing activities will have to be adapted based on the new conditions. The section between KP 276 and 281 has been used for a long time by many families for goose hunting in the spring and for fishing sturgeon. The water levels in one portion of this segment of the river, between KP 275 and 279, will not benefit from the influence of the weir located at KP 223. As a result, the shores will be very exposed and users will have to adapt their hunting and trapping activities to the new conditions.

Hunting grounds N25, N24A, N24, N23, R17, R18 and R21 line the Rupert River on both sides, between the closure point surroundings, at KP 314 and KP 94. On each of the hunting grounds, valued sections will be affected by shore exposure or by the lowered water levels.

The impacts on the activities of users of traplines N25 and R21 were identified above.

One of the three sturgeon fishing sites (KP 256) preferred by users of trapline N24A may be affected by a slight drop in water levels. The distance between the boat landing and the two main camps, located at KP 255 and 258, will also be increased slightly after the banks are exposed. The other sections for fishing, trapping, goose and moose hunting identified by the users will not be affected.

The sections identified by users of trapline N24 for practicing fishing will not be affected by the drop in water levels. With the changes to the weir at KP 223, fishing and hunting activities, as well as the camps located in the KP 240 section, will be maintained (PD5.4). Only the section located directly
downstream from the weir at KP 223, used for goose hunting, among other reasons, will be subject to level drops.

Among all of the hunting, fishing and trapping sections identified by users of trapline N23, two valued sites will be affected by drops in the water level. This is the community use section adjacent to James Bay Highway and a sturgeon fishing site at KP 136. Most of the traditional activities of users at trapline N23 will not be affected by the changes in flow on the Rupert because they mainly occur within the trapline, on Broadback River or in the Nemiscau Lake section.

On Rupert River, only one of the fishing sites identified by users of hunting ground R17 will be affected by the drop in water levels. This is the sturgeon-fishing site, located at KP 136, which is also used by users of trapline N23. The other sections on Rupert River used for fishing, hunting or trapping will not be affected.

Hunting ground R18 is located at the centre of land occupied by the Nemaska community. It extends over nearly 80 km between the Nemiscau and Rupert rivers and is flanked by Nemiscau Lake to the west. The users of trapline R18 have stated that the rapids and spawning areas on Rupert River, as well as the workcamp at KP 243, are particularly valued. Spawning areas KP 215 and 218 should not be affected by the drops in the water level, although the section directly upstream, between KP 219 and 223, will experience drops in the water level. With the increase in the weir at KP 223 (PD5.4), the camp at KP 243 and the adjacent hunting and fishing areas will not be affected.

Land areas in hunting ground R19 will also be flooded (4.86 km² or 0.39 %) in the Ruisseau Caché section. Nevertheless, fishing and hunting activities in this section, including a large moose-hunting area along Eastmain River, will mainly be affected by the impacts of the flooding of the Eastmain 1 Reservoir.

During the construction period, work in the aquatic environment may have local and temporary repercussions on water quality. Afterwards, given that river discharge will be lower, we will notice a difference in the turbidity of the water downstream from the weir at KP 170. The turbidity values, from the area of KP 170 to KP 5, should be similar to those from the lower segment of Broadback River, downstream from James Bay Highway. Between the dam and weir at KP 170, the water quality should remain excellent.

Throughout the construction phase, traditional activities will be affected by traffic, the transportation of materials, the presence of workers, the noise and dust caused by activities for the construction of the dam, weirs and their access roads. This construction work may cause inconveniences for users at workcamps located at KP 6 on Nemiscau River and at KP 291 and 311 on Rupert River. The construction of weirs at KP 110.3 and 290 will involve a temporary drop in upstream water levels, requiring a temporary modification to navigation routes. The construction activities for the weir at KP 223 will affect a community use goose-hunting area.

During the first years of operation, the tallymen will have to adapt to the new flow and water level conditions. Two segments may become difficult to navigate. The first section, between KP 136 and 137, is located within a segment of several kilometres where navigation is already difficult due to...
the presence of shoals, rocks and rapids. The second section, located between KP 281 and 290, is heavily used for goose hunting.

The proponent anticipates a small increase in fish mercury levels downstream from the dams on the Rupert, Lemare and Nemiscau rivers. These low levels will not result in any additional consumption restrictions for adults in general over the current situation. Somewhat higher levels are anticipated immediately downstream from the dams. The Nemiscau and Lemare rivers will be more affected by increased mercury levels than Rupert River because their water inflows are from portions of the diversion bays located further downstream. The proponent expects consumption restrictions varying between five and eight years, according to the species, for the lower portion of Lemare River, and restrictions from five to eleven years, according to the species, for the lower portion of Nemiscau River. In his opinion, no additional fish consumption restrictions for the lower portion of the Rupert, even immediately downstream from the dam, will be necessary. Section 5.1.1.1 covers the phenomenon of transporting mercury in rivers with changed flows in the project in detail.

**Mitigation measures and environmental follow-ups**

The proponent agrees to set up new spawning areas to compensate for spawning areas destroyed or disturbed by a structure. This is true for a walleye spawning ground located near the hydraulic structure at KP 170, which will be expanded to compensate for the spawning area destroyed by the construction of the weir at KP 170. This is also true for a walleye and sucker spawning area disturbed by the changes in flow downstream from the dam on the Rupert. He will do a follow-up of the success of reproduction in sturgeon spawning areas downstream from the spur at KP 290, KP 281 and at KP 216, where the flow may be changed, to respond to the often repeated complaints during public hearings about the project harming this valued species. Furthermore, lake sturgeon fry will be stocked between KP 110 and 170 in Rupert River to support the species in this segment. The proponent also agrees to landscape some of the tributaries of Rupert River to increase the potential for brook trout. A follow-up of fish populations in the branches of the Sipastikw (KP 281 to 287) is planned (DCAP15).

The proponent agrees to do a follow-up of the fish mercury levels on the Nemiscau River and to send the results to the users. He also agrees to publish a guide of consumption recommendations for the various sections of the project in collaboration with the Cree Board of Health and Social Services (DCAP15). Finally, users who want to move or adapt their fishing activities will be able to apply to the various funds set up for this purpose by the Bouhmounan Agreement (Bouhmounan fund for remedial work, Eenou Indohoun Fund and Eastmain-1-A/Rupert Mercury Fund).

During the first winter following impoundment, the beavers may be affected by the temporary drop in water levels in sections of the river not affected by a weir. This will also be true in segments upstream from structures, at KP 110.3 and 290, that will be built the next year. An intensive beaver trapping or relocation program will be set up in collaboration with the Cree to prevent affecting the beaver populations on the banks of Rupert River. Furthermore, the proponent will stock the exposed banks wherever good potential for rebuilding exists. This measure should accelerate the recovery of vegetation and encourage the return of fur-bearing animals, as well as the use of sections by waterfowl (DCAP15). At KP 311, a bay will be dyked to encourage goose hunting (RP17).
and the proponent has proposed to the tallymen to redevelop some borrow pits used for the project into goose-hunting ponds.

To prevent conflicts between construction activities for structures, such as the weir at KP 223, and traditional activities, the proponent will inform users of his schedule and of the nature of the work. At the request of users, security fences will be installed near the weirs at KP 170 and 223. He will also inform all users of the dates on which work will be conducted the spillway of the Rupert River will be (DCAP15).

The proponent has come to an agreement with users to compensate for inconveniences at the camps affected by the flooding or proximity of the work. Some tallymen prefer to wait and see the impacts on their camps before deciding whether they want to move them or apply certain mitigation measures (DCAP15). A follow-up of usage conditions at camps affected by bank exposure will be conducted and measures will be taken to correct the inconveniences. Other requests for compensation measures, such as boat launch ramps and access set up have been accepted or their feasibility is being studied.

The proponent agrees to redevelop the portages that may be affected and to set up new ones if necessary. He will follow navigation conditions in the segments between KP 136 and 137 and between KP 281 and 290. Beyond these two segments, the hydraulic structures and the instream flow should help maintain navigability. The navigability of certain tributaries, including the secondary outlet from Nemiscau Lake (left branch, between KP 180 and 154) and Kayechischekaw Ruissseau (north branch) will also be followed in collaboration with the talleymen and measures will be taken, if necessary, in order to maintain navigation. The ice conditions should be similar to those that currently prevail. Nevertheless, the proponent will do a follow-up of the ice conditions at snowmobile crossing points on the river and in the forebay (DCAP15).

**Conclusion – Nemaska**

The majority of hunting and trapping activities on the banks of Rupert River should only be affected temporarily by the change in flows and water levels. The seeding program for banks affected by exposure should accelerate plant development on the shores and encourage the return of animals and waterfowl. Hunters should nevertheless adapt their hunting methods to the new conditions.

Fishing activities will be significantly affected by the impacts of the project. Some sites will be affected by drops in levels, making them less interesting for fishing. Fishermen using these sites should reorganize their activities based on the new conditions. Although, according to the proponent, fish populations in the Rupert River should not be affected significantly by the impacts of the project, he agrees to do a follow-up of fish populations and spawning areas, prioritizing sturgeon spawning areas. The users may have access to various funds set up under the Bouhmounan Agreement to reorganize their fishing activities.

However, the section immediately downstream from the dam on the Rupert will be completely disrupted. There is a risk that the site will no longer be interesting for fishing, hunting or trapping, although the fish and animals will continue to use it. In addition to this deterioration, users will be affected by the flooding of part of their hunting and fishing grounds upstream from the dam and
by changes to their boat and snowmobile relocation routes. Users whose hunting grounds are located on both sides of the dam on the Rupert are members of the Nemaska community who have been the most affected by impacts of the project.

It is clear that the entire community will be affected by changes to the river. Seven of the fifteen hunting grounds in the community are along the edge of Rupert River and many families use these traplines. Furthermore, relocation of the Old Nemaska community to Nemaska is still fresh in memory. During public hearings, many members of the Nemaska community stated that they already feel apprehensive about the impacts of potential changes to the Rupert and the resulting changes and that this affects them a great deal. Rupert River represents a site and way of life for them and they fear that, regardless of the changes made to the river, their way of life will be disrupted. The tallyman on trapline R21 believes that he will not be able to live as a Cree hunter and trapper anymore and that he will have to leave (VAP5 P. 81).

The Nemaska Band Council, along with several members of the community of Nemaska, has expressed opposition to the project (D5). Many people do not trust the proponent’s assessments and believe that this project will have a negative impact on the community. They consider that the value of their traditional knowledge has not been sufficiently acknowledged and that, if used at all, it has been put to poor use.

Nonetheless, some of them appear to be willing to accept the impacts of the project, although they are also concerned about preserving unity within the community and working together to meet the challenges ahead (VAP6 p. 80).

Moreover, certain tallymen, although opposed to the project, have indicated that they are satisfied with the mitigation and compensation measures proposed by the proponent. At the same time, however, they are wary of the proponent’s follow-up actions and would like to participate in all discussions and decisions relating to the implementation of these measures (VAP5). In addition, the COMEX supports the request by the tallymen of hunting ground N23 that the proponent provide all tallymen with a written agreement specifying all mitigation and compensation measures to ensure that all parties are aware of any decisions that are made and to establish a link between the proponent and the tallymen affected by the project.

Most of the tallymen have indicated that they will continue to use their hunting grounds even if the project goes ahead (RP17). However, some of them are worried that they may have to hunt on other traplines if there is a decline in the number of animals that can be harvested and if fishing yields are unsatisfactory. The tallymen’s responses vary widely depending on the proportion of traditional activities they practise on the river compared to the rest of the trapline.

The members of the community fear that the effects of the project on water quality, wildlife, fish and birds will be such that they will no longer be able to carry out their traditional activities. They believe that mercury levels will make the water and fish toxic and forever change the taste of the fish, game and geese. There is a risk that these beliefs will drive the Crees away from Rupert River and compromise the transfer of their vital traditional knowledge relating to this river. To encourage the Crees
to continue to use this land, whether affected by the project or not, the COMEX suggests that users of the territory participate in the implementation of the long-term follow-up programs for the biophysical environment, including water levels and flow, fish, mercury, waterfowl, land animals and riparian vegetation. The proponent should also conduct a follow-up on the satisfaction of hunting ground users with regard to the mitigation and compensation measures.

**Waskaganish**

The hunting grounds of the Waskaganish community (see Map 6-3) will also be affected by the water-flow changes in the Rupert River. The community has eight traplines running along both banks of the river, from KP 123 to the river mouth. Five hydraulic structures are planned inside this territory. These structures are designed to favour or maintain navigation channels and hunting, fishing and trapping activities. The purpose of the rock blanket at KP 20.4 is to maintain water levels in the section from the Gravel Pit site to the foot of the Smokey Hill Rapids, while ensuring the migration of fish and the reproduction of lake cisco at the Smokey Hill spawning ground. The weir at KP 33 serves to maintain water levels for up to 15 kilometres upstream, thereby making it possible to preserve water levels in Kapeshi Eputupeyach Bay (KP 47). The purpose of the other three weirs, located at KP 49, 85 and 110.3, is to maintain water levels up to the next declivity or on the longest possible stretch of the river.

Access to hunting grounds located on the south bank of the river is facilitated by the Waskaganish road, while the James Bay highway and the Route du Nord provide easy access to trapline R13. New temporary roads will have to be built to access the sites where the hydraulic structures will be constructed.

Certain sections in stretches of the river not controlled by a hydraulic structure will be affected by the impacts of the reduction in water flow. Hunters using the sections between KP 7 and 15, as well as between KP 27 and 29 will have to adapt to the new banks, which will be more exposed. However, waterfowl should continue to use the same sections and may also use the habitats created by the newly exposed areas. In the first years following the diversion, these stretches will be less attractive to beavers, but will continue to be favourable for trapping other species. Several fishing sites, notably those located between KP 5 and 15, between KP 27 and 29 and between KP 78 and 79, could also be affected by the reduced water levels, resulting in their abandonment by users. However, the proponent anticipates that the distribution of fish species will be similar to what it is today and that all the spawning grounds will be maintained.

Two sectors are used regularly by various members of the Waskaganish community: the river estuary, bay and islands and the Gravel Pit and Smokey Hill sectors. For many members of the community, the portion of the estuary in front of the village is a popular site for recreational and ceremonial activities. The same goes for waterfowl hunting and net fishing and angling in the section downstream of the first set of rapids (KP 5). This site is also the point of departure for people heading to hunting grounds on the north bank of the river, including land bordering the bay and the bay itself. In fact, the bay and its shores are popular all year round, not only among the families of tallymen, but also among other members of the community, who gather there to practise net fishing, ice fishing, trapping, small-game hunting and, especially, goose hunting in spring (ES26).
The reduced flow of the river, which will be equivalent to roughly 50% of the original flow velocity at the village, will cause water levels in the estuary to drop (downstream of KP 5) in summer at low tide, affecting navigation conditions and recreational activities in the estuary. Only the fishing site directly downstream of the first set of rapids will be affected by the reduced water levels. Elsewhere, fishing activities can be carried out as usual. The proponent does not anticipate any impact on fish breeding downstream of the first set of rapids. Moreover, the drop in water levels and reduced speed of currents in the estuary should favour the expansion of certain low marshes and aquatic beds, which would have a positive impact on fish habitats and waterfowl. The proponent does not anticipate any impact on fishing, hunting or trapping activities in the estuary, the bay, on its banks or on the islands.

The drop in the water level in the bay will be nearly imperceptible to users. In winter, no changes in catch periods, the thaw season or the thickness of ice cover are expected on the bay. In the estuary, freeze-up will occur slightly earlier in the season, but the reduction in frazil produced by the river upstream of KP 5 will delay the formation of ice-cover on the rapids zone at KP 5.

The Gravel Pit site is a very popular gathering place for members of the Waskaganish community, particularly on weekends and during summer and fall vacation periods. Located on the south shore of the river, about 20 kilometres from the village, the site has over 30 camps. In winter, the site is used to reach hunting grounds north of the river, while in summer, it is used to access upstream and downstream net-fishing sites and, especially, to reach the Smokey Hill site. Located in the rapids close to KP 25, the Smokey Hill lake cisco dip-net fishing site has been used by the Waskaganish Crees for generations and is highly valued by this community. During the cisco spawning aggregation period, which runs from late August to late September, members of the community fish there in large numbers and catches can total in the thousands. The site is also used for angling and net fishing in summer and fall. The site also has a cultural camp, where traditional structures such as a miichiwaahp and shaapuhtuwaan have been erected (ES26).

The purpose of constructing a rock blanket at KP 20.4 is to maintain water levels and navigation corridors, to protect the river scenery and hunting, fishing and trapping activities both upstream and downstream of the Gravel Pit site, and to preserve fish migration. However, its influence will not extend as far as the Smokey Hill fishing site. Since this fishing site is located in a rapid - and, therefore, in a declivity - it is impossible to maintain current water levels under reduced-flow conditions. According to the proponent’s modelings, the Smokey Hill Rapids will flow through a slightly narrower channel, resulting in the exposure of a portion of the banks, including the dip-net fishing section.

However, the hydraulic modelings show that the water flow will remain the same as under current conditions and that the changes in mean water depth and wetted area will be minor (PAP 71). Although the water flow velocity over the spawning area will decrease, it will never be zero and the flow will remain riverine. Consequently, considering the natural flexibility of lake cisco in the choice of spawning areas, the cisco population should continue to use the sector (see section 5.2.1.2). The fishing site could probably be adapted to the new conditions and the behaviour of the cisco in
the new hydraulic conditions. The only way to assess the actual impact on the Smokey Hill fishing site will be through monitoring of the site.

Other centres of community activity have also been identified along the edge of the river. One of these is Kapeshi Eputupeyach Bay, located at KP 47, which is used for goose hunting in spring as well as for sturgeon fishing. This section will not be affected by flow changes in the river and all of these activities can continue as usual. Another community site is the section of the river that runs along the James Bay highway, which is also identified in the section on the impacts of the project on the Nemaska community’s hunting grounds. As mentioned in the section on Nemaska, this section of the river will be affected by the lower water levels, which will require that users adapt their fishing activities to the new conditions. A few of the tallymen also mentioned that several members of the Waskaganish community use boats on the river to fish and hunt geese.

Users of hunting ground R4, located on the north bank of the river, across from the village, will have to adapt their hunting methods to deal with the consequences of the reduced flow in the section of the estuary across from the village. The mouth of the river is an area that is particularly prized by the tallymen for goose hunting in spring, as well as for fishing and small-game hunting. The bay and the shores of the bay will not be affected.

According to users of trapline N9, most of their activities are concentrated inland along the shore of the bay (south side of the river), close to the Waskaganish road (ES26). The fishing ground at KP 16.5 (temporary camp) should not be affected by the drop in the water level.

Fishing sites located between KP 5 and 15, within the boundaries of hunting ground R5, will be affected by the drop in water levels, which could compromise harvesting in this area. Hunting and trapping activities along the banks of the river in this section (between KP 7 and 15), could also be affected by increased bank exposure. While some adaptation will be required, trapping and small-game hunting will still be possible. Users who hunt and trap in the area of the Pontax River and the creeks in the central part of the trapline could shift their activities to these areas until vegetation returns to the river banks, restoring an adequate habitat for wildlife.

Hunting ground R11 encompasses the Smokey Hill site and is across from Gravel Pit. Users have mentioned that their activities are concentrated along the river, with the exception of big-game hunting, which they practise in the north-eastern part of the territory. They mainly hunt geese from their camp located at KP 9 (trapline R5), which they describe as a valued site (ES26). This section of the river will be affected by bank exposure, but the geese should continue to come there. However, users will have to adapt their hunting methods to the new conditions and the distance between the camp and the boat landing could be increased. Fishing conditions may also be less attractive in this section. The fishing site located between KP 27 and 28 could also become less attractive as a result of the anticipated drop in the water level in this section. Activities in the Gravel Pit and Kapeshi Eputupeyach Bay area will remain unchanged.

The activities of users of hunting ground N2 are mainly concentrated in the Gravel Pit and Broadback River section. They also trap along the Rupert River and, in winter, they hunt in the Kapeshi
Eputupeyach Bay (KP 47). These users hunt geese inland, in the hunting areas along the Waskaganish road (ES26). None of these sites will be affected by the impacts of the project. The dip-net fishing site at Smokey Hill will be affected by the project, but the only way to assess the actual impacts will be through monitoring. The section between KP 26 and 29 will also be affected by bank exposure and reduced water levels.

Three weirs will be constructed within the boundaries of trapline N1 (KP 33, 49 and 85). Only two short stretches - that between KP 66 and 67 and that between KP 78 and 79 - will be affected by the flow reduction. None of the fishing sites identified by the users of the Rupert River will be affected. A permanent camp located at KP 85 will be affected by the construction activities and the weir planned for this location.

The users of hunting ground R12 also have a camp on the river at KP 85, on trapline N1, which they use for their fishing activities. Only the section between KP 78 and 79 will be subject to drops in the water level, which could affect fishing activities in this bay. Hunting and trapping activities, which are mainly practised inland and on the tributaries, will not be affected.

Users of hunting ground R13 regularly use the section of the river close to Peat Island and the Siptastikw branch, in addition to hunting and trapping along the river and its tributaries and inland (ES26). These areas will not be affected by the drop in water levels. However, the south shore of the bay, directly downstream of the Oatmeal Rapids, will be subject to significant bank exposure. Water levels on the stretch downstream of the rapids (between KP 104 and 107) will drop by approximately 1.5 m. The distance between the permanent camp located at KP 128 and its boat landing will increase.

During the construction work, the fishing, hunting and trapping activities of users of the camps at KP 33, 86 and 109, located close to the weirs, could be disturbed by the construction of access roads and hydraulic structures as well as by traffic and transportation activities. Jobsite facilities could block certain portages or prevent navigation (traplines N1, R11, R12, and R13). During construction, navigation conditions could be temporarily altered on certain stretches (upstream of the weirs at KP 49 and 85). During the construction phase, snowmobile travel on these stretches, as well as on the stretch located upstream of the weir at KP 110.3, could be more dangerous.

Since the eight hunting grounds of the Waskaganish community are Category II lands, the presence of workers at the Kauschiskach camp should not result in any increase in fishing or hunting pressure.

In the river estuary, the water level will drop from 70 cm (at KP 5) to 50 cm (at the village) in summer and at low tide. However, a navigation channel more than 1.5 m deep will be maintained up to the entrance of the bay, and water levels at high tide will be the same as they are today. Accordingly, the Crees will have to continue to mark the navigation corridors in this section, where navigation will be more difficult. Elsewhere along the river, navigation conditions will be similar to current conditions on stretches not controlled by a weir (see section 2.4.2.1). Although water levels will be lower in stretches not controlled by weirs, channel depth will always be at least one metre,
with the exception of rapids. Ice-cover characteristics should be similar to the current situation, with the result that crossing points will be maintained.

Lastly, an increase in water turbidity is anticipated downstream of KP 170. The water will be slightly more coloured and should resemble water in the lower reaches of the Broadback River. Users will be able to continue using water from the river, but the changes could bring them to look for other sources of supply. In the village, construction of a new treatment plant will supply the community with drinking water.

**Mitigation measures and environmental follow-ups**

The proponent will implement compensation measures to favour fishing activities. Work will be done on the tributary at KP 41 on the Rupert River to increase its potential for brook trout, a multispecies spawning ground will be created downstream of the KP 110,3 weir, and a sturgeon fry seeding program will be implemented in the section between KPs 110 and 170. The proponent will monitor fish populations and breeding success in the spawning areas (DCAP15). In this regard, monitoring of the Smokey Hill dip-net fishing site will make it possible to assess the impact and define remedial measures together with the Waskaganish community, in order to maintain fishing activity and access to the boat landing. Should users wish to relocate their activities in the short or long term, they can make use of the funds provided for in the Boumhounan Agreement (Boumhounan Remedial Works Fund, Eenou Indohoun Fund and Eastmain-1-A/Rupert Mercury Fund).

The fall in winter water level in stretches of river not subject to the influence of a weir, together with a temporary fall in water levels in sections upstream of the facilities located at KPs 49, 85 and 110,3, could affect beaver populations. The proponent agrees to carry out a beaver relocation program or intensive trapping program in these stretches, in collaboration with the tallymen in the traplines concerned (DCAP15).

The proponent has proposed to the tallymen that it create goose-hunting areas in certain borrow pits operated for the project. It is planning to create a wetland for waterfowl in the diversion canal of the KP 49 weir (PD1). Bank exposure of the section between KPs 26 and 29 will be mitigated by seeding vegetation that will favour recovery (DCAP15). Also, the extension of the low marshes in the river estuary could encourage the presence of waterfowl in this section. The proponent will carry out a follow-up in this regard. The proponent also undertakes to inform users of the schedule and nature of work to be carried out, and to suspend work at KP 20,4 during goose-hunting and cisco-spawning periods. Mitigation and compensation measures have been agreed upon between the proponent and each of the tallymen. Generally, these measures involve the construction or relocation of camps, and the creation of access roads and boat launch ramps. At the request of users, security fences will be installed close to the KP 110,3 weir (DCAP15). The Boumhounan Agreement provides a claims procedure for damages suffered by the Cree as a result of construction and operation by Hydro-Québec, its agents and their employees.

The tallymen will be able to decide whether they wish access roads to weirs not to be disused. In this case, the proponent has warned that it will not maintain them. It should be pointed out that users of hunting ground N2 have already requested that the access road to the KP 20,4 structure be
preserved. During construction, the proponent will install appropriate traffic signs at crossings of access roads and snowmobile routes.

The proponent will follow water quality. It will submit its findings to users starting in the first year and, if necessary, will develop impact mitigation measures (DCAP15).

Lastly, the proponent, in collaboration with users of hunting grounds, will do a follow-up of navigation conditions in the river. Portages that may be damaged or subject to bank exposure will be rebuilt. It also agrees to prepare maps from aerial photos that will enable the Cree to view sections that are not affected by weirs, including the new wetted perimeter, emergent areas, configuration of rapids and sections that are difficult for motorcraft. The proponent agrees to inform users of the date of Rupert River spillway manoeuvres. Although ice conditions should remain appreciably the same, the proponent will do a follow-up of snowmobile routes and river crossing sites in collaboration with users (DCAP15).

**Conclusion - Waskaganish**

In the proponent's estimation, the effects of flow modifications on hunting and trapping activities in the hunting grounds of the community of Waskaganish will be very slight. Two sections will be subject to exposure and users will have to adapt their goose-hunting practices, among other things. Trapping activities could be temporarily disturbed. However, trapping potential on the banks, and in reaches not influenced by a weir, should reestablish itself quite quickly. As for fishing activity, three sections will probably become less attractive to users, or at least require some adaptation on their part. One of these sections stretches for almost 10 km, between KP5 and 15, and is an area visited by a number of members of the community for fishing and goose hunting. In this area, the distance between the river and the permanent goose-hunting camp belonging to users of trapline R11 should increase over the course of the summer.

Many tallymen of the hunting grounds located along the river, including members of the community of Waskaganish, hunt goose in Rupert Bay. Activities carried on in the bay would not be affected by the project in any way.

Aside from the anticipated impacts, serious questions remain regarding the integrity of the Smokey Hill dip-net fishing site. According to the proponent's evaluation, the rapid should undergo some changes, but these will not hinder the gathering movements of cisco at spawning time (PAP71). The cisco population will continue to spawn in this section, but there are no grounds for asserting that it will be possible to continue dip-net fishing activities in their current location. COMEX considers that the proponent must, in collaboration with the Crees, carry out a follow-up to assess the impacts on the fishing site and identify measures that will make it possible to continue these activities to the satisfaction of the Crees. In order to counteract a reduction in the site's attractiveness for various reasons (quality of fishing or of fish, etc.), the proponent must finance and implement an information program in collaboration with the Crees.

The proponent also predicts a degree of bank exposure in the estuary, caused by a fall in water levels. This section, directly opposite the village of Waskaganish, is heavily used by the community for all sorts of activities, recreational as well as hunting and fishing. It is also used for boat and snowmobile departures for hunting grounds, the bay and its banks. Although the proponent claims that it will
be possible to pursue all activities, members of the community doubt that boat and snowmobile trips will be as straightforward as the proponent suggests. The proponent asserts that the impact on boat travel will be felt only in summer, at low tide, and that a channel of over 1.5 m will be navigable at all times, and that ice conditions should be more stable than at the present time. The proponent, in collaboration with the Cree, should do a follow-up of the evolution of navigation channels and use of the section in order to assess the true impact on navigation in the estuary. Should inconveniences occur, measures should be developed and implemented. Based on the findings of the follow-up program, COMEX considers that the proponent should develop means of ensuring safe navigation in the estuary and in the entrance to the bay.

Furthermore, water quality and the risks of fish mercury are among the major concerns of members of the community of Waskaganish. A number of residents and land users consider that the water will no longer be clean, in addition to being contaminated by mercury, and fear that they will no longer be able to take their water supply from the river, nor eat its fish. It is true that a rise in the turbidity of the river downstream of Lake Nemiscau is anticipated and that the visible change may drive some users away. However, according to parameters on water quality, these minor changes will not have biological consequences. In addition, again according to the proponent’s assessment, no further restriction on consumption of fish from the Rupert River will be necessary, because the increase in fish mercury concentrations will be minor and will stay within the range of average values of the region’s bodies of water.

Like many stakeholders during the public hearings, the band Council of the Waskaganish First Nation spoke out against completion of the project (D5). It must be understood that the community of Waskaganish lives in the area directly adjoining the Rupert River and that the river represents, in their eyes, a symbol of continuity and permanence. According to the Crees, modifying its characteristics artificially is a sacrilege that will have repercussions on all members of the community. Although they do not all live directly from natural resources, they see the river every day, and many of them travel on its waters, and fish, hunt or swim in it. A number of them are anticipating the project’s impacts and already feel affected by potential modifications to the river. With the modification of this river, which is at the centre of their lives, some foresee an erosion of Cree culture (RTP19, VAP31 - 36).

Three tallymen of the hunting grounds bordering the river came forward at the public hearings. One of them spoke out clearly against the project (VAP36, p. 80 - 81). The other two seemed worried, but were prepared to accept the project if the impacts are well contained, particularly with respect to Smokey Hill (VAP32, p. 72 - 76, VAP34, p. 13 - 17). Members of the community of Waskaganish who spoke during the public hearings have difficulty accepting the fact that only the tallymen and their families were approached to identify their hunting and fishing sites, valued sites and compensation measures that would enable them to continue operating there. Many feel that the whole community should have been consulted in this regard, since many of them fish and hunt along the river and all will feel the impact of the diversion.

COMEX suggests that members of the community of Waskaganish be integrated into the various programs to follow the biophysical environment (water levels and flows, fish, mercury, waterfowl, wildlife and vegetation) in order to encourage the members of the community to reappropriate the river.
All the tallymen approached indicated that they would continue to operate in their territory and that they would have to wait to see the project’s repercussions on their hunting ground in order to assess the impact on their practices. Some said that they would perhaps have to frequent neighbouring hunting grounds or those of their relatives to mitigate the impact on their fish harvest, in particular (RP17). The proponent has not assessed the potential impact on neighbouring traplines. COMEX suggests to the proponent that, in addition to following up of the use of hunting grounds, it also follow the relocation of their activities to other hunting grounds in order to meet their basic food requirements.

**Eastmain**

Four hunting grounds of the community of Eastmain (see Map 6-4) lie within the project’s increased-flow section. These grounds border the Eastmain-1 and Opinaca reservoirs and were subjected to significant reductions in land area following the impoundment of one or other of these reservoirs. At the time of the impoundment of the Opinaca Reservoir, access by land or water to the eastern sections of VC34 and VC35 hunting grounds was practically compromised, given the great width of the body of water, the high current speed and the unstable ice conditions. The high cost of air travel limited the use of these sections by families of the tallymen.

There are many infrastructures on this territory: the Sarcelle control structure, ten dams and dikes, the Opinaca and the Eastmain high-flow spillways, the Muskeg substation and seven transmission lines. From the James Bay highway, one road provides access northwards to the Sarcelle control structure and southwards to the OA-11 dam on the Eastmain River. Another road links the Nemiscau workcamp to the Eastmain workcamp and to the facilities under construction (Eastmain-1 powerhouse). Further infrastructures to be built in this section as part of the project under study are the Eastmain-1-A powerhouse, the Muskeg road (linking the Muskeg substation to the Eastmain-1 and Eastmain-1-A generating stations), the Sarcelle powerhouse, and the 315-kV transmission line connecting the new Sarcelle powerhouse to the Eastmain-1 and Eastmain-1-A generating stations.

The main impacts felt in the community's hunting grounds will be the change in the flow in the various bodies of water in addition to the presence of the new infrastructures.

These hunting grounds lie between 100 and 200 km from the village. The construction of roads has facilitated access to these areas, both for the tallymen and their families and for other members of the community. Certain sites are even visited by members of the Waskaganish and Mistissini communities, particularly for fishing and goose hunting (ES26). These are the fishing sites in the vicinity of dikes OA-10A and OA-08B on trapline VC35, and sections of the OA-04 dam and downstream of the Sarcelle control structure, on trapline VC34. The section downstream of structure OA-11, at the boundaries of the VC35 and RE1 traplines, is also frequented for goose hunting by many users.

Among all the community-use sections, only the section downstream of the Sarcelle control structure will be disturbed: the Sarcelle powerhouse tailrace canal will be built at the exact site of a boat launch ramp. Construction of the tailrace canal will destroy a walleye, sucker and lake whitefish spawning area. The fishing site will have to be moved slightly, given the high flows passing through the tailrace canal. Goose-hunting activities in this section will also be disturbed during the construction phase, but could resume subsequently.
Users of the VC 37 hunting grounds will suffer the cumulative impacts of the changes brought about by the recent impoundment of the Eastmain-1 Reservoir and those of the current project. It should be noted that the assessment and mitigation of the reservoir and Eastmain-1 powerhouse project have already been the subject of an environmental analysis and that the Nadoshtin Agreement covers management of mitigation and compensation measures. The impacts of the project under study will be minor, given that the sections of the river and the Eastmain-1 Reservoir have already been disturbed by the Eastmain-1 project. The project will not affect the hunting and trapping sites identified by users. Fishing activities on the Eastmain River, particularly sturgeon fishing, will also require changes in practice in light of the new conditions. Moreover, an adjustment of restrictions on the consumption of fish taken from the river and the Eastmain-1 Reservoir will have to be applied.

It should be noted that restrictions on the consumption of fish taken from the Opinaca Reservoir have been lifted and that current mercury levels have returned to the range of content observed in the region’s bodies of water. Impoundment of the diversion bay and the Eastmain 1 Reservoir will not have additional impacts on the Opinaca Reservoir (see section 5.4.1.1).

The impacts described in the preceding paragraphs will also affect users of RE1 trapline, who share part of the Eastmain 1 Reservoir and the other bank of the Eastmain River. There are already many infrastructures on this trapline. In addition to the impacts on the Eastmain River, users will suffer the impacts of the construction of the Eastmain-1-A powerhouse, 40 km of the Muskeg road and approximately 50 km of the 315-kV Eastmain-La Sarcelle transmission line. These disturbances are temporary. Most hunting, fishing and trapping activities will be able to be carried on in sections of the trapline that are remote from the work.

The entire central part of hunting grounds VC35 and VC34 was flooded by the creation of the Opinaca Reservoir at the end of the 1980s. The activities of users are now concentrated in the western sections of the trapline, since this section is easily accessible via the Sarcelle control structure access road. The proponent anticipates that the main modification within the limits of these traplines will be increased flows in the reservoir’s central channel. However, a drop of about 0.5 m in the mean water level is expected. These modifications will have no effect on the fishing and hunting sites identified by users in the vicinity of the OA-10A, OA-08B, OA-04 and OA-05 facilities. Among the sections identified by users for the practice of traditional activities, the sole site affected by the project’s impacts lies downstream of the Sarcelle control structure. Users will suffer the temporary impacts of land clearing, traffic and transportation connected with construction of the Eastmain-Sarcelle 315-kV transmission line.

The presence of the Sarcelle workcamp could lead to an increase in fishing pressure in the Opinaca Reservoir and Lake Boyd sections nearby. The proponent undertakes to recommend to the competent authorities that a controlled-use area be set up under the Weh-Sees Indohoun Corporation (see 6.4.1.1). Note that the location of the Sarcelle workcamp encroaches on a goose-hunting area favoured by users of trapline VC34. In the Eastmain workcamp section, hunting and fishing activities of non-Natives are already governed by the Weh-Sees Indohoun sector Wildlife Management Plan.

Users of traplines VC37, RE1 and VC35 move onto the Eastmain River in order to access certain fishing sites and camps (ES26). As a result of the increased flow in the stretch downstream of the
Eastmain-1 and Eastmain-1-A generating stations as far as the entrance of the Opinaca Reservoir, access to the traplines by boat will require adaptation on the part of users. Furthermore, this stretch will be inaccessible to snowmobile traffic on account of unpredictable ice conditions.

Navigation will remain difficult on the Opinaca Reservoir, particularly in the Wabamisk Narrows. According to the proponent, there will be no major modifications as far as snowmobile traffic is concerned, except in sections where ice conditions are already unpredictable, since they will now probably be more so.

**Mitigation measures and environmental follow-ups**

In order to ensure that beavers on the periphery of the reservoirs and the resource that they represent should not be greatly affected by changes in water levels, users of each of the traplines will decide whether it is necessary to have the beavers moved or trapped (DCAP15).

In order to facilitate boat travel and to favour goose hunting, the proponent undertakes to remove wood debris along the west bank of the Opinaca Reservoir and to the southwest of the Sarcelle control structure (DCAP15).

It also undertakes to provide helicopter transportation for users to the eastern part of trapline VC34 in order to mitigate the impacts of the disturbance during the construction period and enable them to continue harvesting it (DCAP15).

At the request of the tallyman of trapline RE1, the proponent has moved the route of the 315-kV transmission line in order to avoid a moose-hunting ground. Prior to the construction of the line, it undertakes also to fly over the planned corridor with the tallyman. The route of this line was also modified at the request of the tallyman of the VC34 trapline to avoid a goose-hunting area.

The spawning area affected by construction of the Sarcelle powerhouse tailrace canal will be compensated for by the setting up of a multispecies spawning ground. Also, at the request of users of trapline VC 22 (Wemindji), a boat ramp will be built to the east of the Sarcelle powerhouse (DCAP15).

In order to limit the impacts of the construction phase, the proponent undertakes to inform users of the schedule and nature of work to be carried out close to the Cree camp and harvesting areas. Traffic signs will also be installed to indicate the presence of Cree camps and instructing truck drivers to reduce speed for the safety of land users. A checkpoint will be installed to control access to the Sarcelle powerhouse jobsite, which should limit the presence of recreational hunters and fishers in this section. Moreover, at the end of the Sarcelle workcamp’s operations, the site will be restored to favour goose-hunting activities (DCAP15).

Lastly, the proponent will follow ice conditions at crossing points on the Opinaca Reservoir in collaboration with users. This follow-up will continue for two years following the start of operations in order to identify safe corridors for snowmobile traffic.
Conclusion – Eastmain

The project’s impacts will not greatly affect hunting, fishing and trapping activities on the hunting grounds of the community of Eastmain. The majority of fishing and the goose-hunting sites in or close to the Opinaca Reservoir will not be impacted by the project. Only goose-hunting activities at the planned site of the Sarcelle workcamp will not be able to be carried out during the construction phase. As soon as the work has been completed, the site will be completely restored in order to foster goose hunting.

The impacts of the creation of the Eastmain 1 Reservoir and powerhouse will affect activities on the Eastmain River. Users will once again have to adapt to changed navigation conditions in this valued fishing site. Measures initiated to mitigate the impact of the Eastmain-1 project in the remaining stretch of the Eastmain River, including the development of sturgeon spawning grounds, have been designed in light of the new flow conditions generated by the current project. It should be possible to maintain sturgeon fishing activities in the Eastmain. However, additional restrictions on fish consumption will apply because of mercury concentrations, which are expected to increase after the project comes into operation.

Fishing activities downstream of the Sarcelle control structure will be disturbed during the period of work. They will be able to resume subsequently, particularly since the proponent undertakes to restore the damaged spawning area and install a boat ramp in this valued section.

COMEX suggests involving Cree users in programs to restore spawning areas arising out of the project and in environmental follow ups. Users’ traditional knowledge should be called upon during the development and implementation of these programs, in order to encourage renewed use of the affected sites.

The effects of increased flows on navigation conditions and snowmobile traffic will not be unduly felt, except in the incised passage of the Wabamisk Narrows, where the current is already very strong. Summer water levels will not vary substantially and boat launch ramps already in place will be adapted to future conditions. Ice conditions will remain the same, except in the Wabamisk Narrows where the impassable area will be extended slightly at the beginning and end of winter.

Winter snowmobile access to the stretch of the Eastmain River downstream of the generating stations will be difficult. However, the Muskeg Road will allow users to travel safely in this section. The reduced-flow reach, upstream of the generating stations, between KPs 203 and 215, will remain entirely passable.

COMEX suggests that the program to follow-up and map navigation corridors and snowmobile travel be carried out in collaboration with land users. This should consolidate the use of existing corridors and the exploration of new routes for the harvesting of previously abandoned territories.

Members of the community of Eastmain have suffered the impacts of the complete diversion of a river that was dear to them. They have experienced the effects of hunting- ground flooding, and new areas have just been flooded in a valued section. Consequently they ardently hope that the
communities most strongly affected by the current project do not have to live through the same
distress and that the proponent will be responsive to the needs of communities so far as the carrying
on of their traditional activities is concerned. In spite of all this, community members have adapted
to the changes and seem to accept them, looking towards the future and the future needs of the entire
Cree community (VAP8, 9, 10).

COMEX finds that valued sites will not be greatly affected and that traditional activities either will
be able to continue, or will be compensated for the satisfaction of users.

Wemindji
Users of the hunting grounds of the community of Wemindji (see map 6-5) will mainly be impacted
by construction work on the Sarcelle powerhouse, the Sarcelle-Eastmain-1 315-kV transmission line,
the Sakami weir and canal, and the presence of the Sarcelle and Sakami Lake camp. Increased flows
should not greatly affect users of the hunting grounds, since they make little use of Boyd Lake and
Sakami Lake for traditional activities, especially because navigation and snowmobile traffic conditions
are already difficult and unsafe. The proponent anticipates a slight change in water levels, which
should translate into an average rise of 50 cm in the maximum operating level of Lake Boyd in the
springtime, and of 10 cm in Sakami Lake during the same period. Some bays could be flooded for
short periods. Between June and December, lake levels will be maintained at the current spring
high water levels, and in winter, lake levels will fall slightly. However the drawdown will be less than
it is at present.

No community-use site other than the fishing site located downstream of the Sarcelle control structure
was identified by users of the community of Wemindji. However, it was mentioned that Crees and
non-Natives hunt and fish along the Transtaiga highway (ES26).

The Sarcelle workcamp lies in trapline VC23, close to the border of traplines VC34 (Eastmain) and
VC22. The presence of workers from this workcamp and the construction of the Sarcelle-Eastmain-1
line will cause disturbances for users of trapline VC23, mainly in relation to activities carried on in
the section of the camp that lies close to the access leading to dam OA-05. Since the tallymen and
his family mainly concentrate their operation inland and close to the James Bay highway (ES26),
they will not be greatly affected by the project’s impacts.

Access to the permanent camp of users of trapline VC28, a little to the east of the Sarcelle control
structure, will be maintained even during the period of work, except for periods during which access
might be temporarily restricted for safety reasons.

Users of VC22 access this trapline mainly by floatplane. They also travel there by boat or snowmobile
from the Sarcelle control structure. One of the users of the trapline has a camp bordering Lake
Boyd (ES26). This user hunts and fishes for sturgeon, particularly, in the vicinity of his camp. Rises
in the water level, particularly in spring, could temporarily modify his activities, but the reduction
in drawdown should facilitate navigation on Boyd Lake. The main impact will be on access to the
boat ramp, which will be compromised during construction of the Sarcelle powerhouse. The
proponent will build another ramp a little farther away.
Users of trapline VC 21 make very little use of Sakami Lake for their activities, mainly because travel by boat and snowmobile is unsafe, in particular because of much floating debris and flooded trees. Instead, they operate sections to the south and east of their hunting ground.

A sill and canal will be constructed at the Sakami Lake outlet. A small workcamp will be built in the area (KP 15). One of the permanent camps of the users of trapline VC20 is also found here. The construction activities could disturb this camp and so affect goose hunting in the area. The construction should be completed in a relatively short period of time (10 months). The tallyman plans to use another of his camps during the construction period (RP17). The eastern and western parts of the region, those most frequently exploited by users, are easily accessed by the Transtaiga highway, which crosses the region from one end to the other. This highway is also frequently used by non-Natives and there are more than a dozen non Cree camps located along it.

In general, navigation on the Boyd and Sakami Lakes will remain difficult. Users will have to adapt to the new navigation conditions caused by the increase in current speed, especially on the Boyd River. However, the stabilizing of water levels in summer could significantly improve navigation conditions. In winter, freeze-up will be delayed a few days, and the Boyd River between KP 90 and 110 will be impassable on snowmobile because the faster current will prevent a permanent ice cover from forming and lead to the significant frazil build-up. In some winters, travel will also be more hazardous for snowmobilers in the section between KP 133 and 128.

In winter, access to traplines VC23, VC22 and VC28 will be easier because the access road to the Sarcelle generating station will be maintained and kept free of snow.

The two workcamps could lead to some increase in fishing pressure, especially on water bodies located near the camps - the Opinica Reservoir and the Boyd and Sakami Lakes. However, the public is already able to access and use these water bodies. In addition, the Sagami Lake camp will not house many workers and for a very long period of time, so this will be a limited source of fishing harvesting. The proponent agrees to recommend to the competent authorities that the Weh Sees Indohoun Corporation be allowed to establish a controlled-use area around the Sarcelle camp.

The project will have no effect on mercury levels in the Boyd and Sakami Lakes, and fish mercury levels are already within the range of average values observed in other water bodies of the region.

**Mitigation measures and environmental follow-ups**

The proponent will restore the spawning site downstream of the Sarcelle generating station at the end of the work. At the request of users of trapline VC22, a new boat ramp will be installed nearby (DCAP15).

If the tallyman of trapline VC20 so wishes, the proponent will have some of the borrow pits used by the project later converted into goose-hunting ponds (DCAP15).
In response to the concerns of tallymen, the proponent, in collaboration with users, will inventory beaver lodges during the fall preceding the diversion. The users will decide whether or not to proceed with trapping of the inventoried colonies (DCAP15).

At the request of the tallyman of trapline VC23, the proponent moved the route of the Sarcelle-Eastmain-1 line.

The proponent has come to an agreement with hunting-ground users on mitigation measures and specific compensation for each trapline. The users requested, among other things, that access routes from roads to certain camps be built, in particular so they can reach the camps without using Sakami Lake (RP17).

Two tallymen asked that water levels near certain camps be followed. Although the water bodies on which these camps are located should not experience any increase in water levels, the proponent agrees to carry out this follow-up and to move the camps if necessary (DCAP15).

To limit the impacts linked to the construction phase, the proponent agrees to inform users of the schedule and nature of work carried out near Cree camps and harvesting areas. Road signs will also be installed, indicating the presence of Cree camps and advising truck drivers to slow down for the safety of land users. A checkpoint controlling access to the worksite of the Sarcelle generating station will be installed. This should limit the presence of recreational hunters and fishermen in this area. Moreover, at the end of operations at the Sarcelle workcamp, the site will be restored for goose-hunting activities (DCAP15).

Finally, in addition to following navigation conditions and snowmobile crossing points, in collaboration with hunting-ground users, the proponent agrees to examine the proposal that a map of snowmobile navigation and traffic conditions be created. It also agrees to take measures to cleanup certain shoreline areas of the Boyd and Sakami Lakes (DCAP15).

**Conclusion – Wemindji**

The project’s impacts on the hunting grounds of the Wemindji community will be mainly temporary and local in nature. The construction of the Sarcelle generating station and the Sarcelle-Eastmain-1 line, as well as work at the Sakami Lake outlet, will disturb hunting, fishing and trapping activities in the vicinity.

Given the already difficult navigation and ice conditions on the Boyd and Sakami Lakes, users are worried about the effects of the increased flow caused by the project. They fear there will be an increase in water levels that could flood trapping sites and camps. These fears are even that much stronger because they have already lived through similar situations. Many have indicated during public hearings that they are counting on Hydro-Québec to keep its promises and to respect all new cooperative agreements (VAP11, 12,13).

The proponent indicates that some increase in water levels will occur, especially in the spring. At this time of the year, the maximum level will increase by 0.50 m, on average, in Boyd Lake and 0.10 m,
on average, in Sakami Lake. Levels will remain relatively constant throughout the summer and fall, then gradually drop in winter. According to the proponent, the winter drawdown will be less pronounced than it is now. The sill and canal at the Sakami Lake outlet will allow for water to flow out more rapidly, without generating a noticeable increase in the level other than during the spring period.

COMEX recommends involving the Cree of Wemindji in the follow-up of water levels planned by the proponent. This participation could help allay (or confirm) the land users’ doubts and keep them informed of measures taken by the proponent to make sure its predictions are met.

Some follow-up procedures and measures have been either provided for by the proponent or requested by users concerning travel by boat or snowmobile on the Boyd and Sakami Lakes. COMEX recommends that the proponent involve as many users as possible in the monitoring of navigation and ice conditions in order to identify the safe routes for everyone. Moreover, the proponent agrees to cleanup shorelines that are littered with debris and therefore dangerous for travel by users. This program could be carried out by members of the community, creating both jobs and promoting the harvesting of abandoned areas by land users.

COMEX notes that members of the Wemindji community, despite having lived through the flooding of significant areas of land and the diversion of several rivers, and still feeling considerable regret over this, believe it is possible to go forward with this project, especially if the proponent is truly ready to respect its commitments vis-à-vis the population and the pursuit of traditional activities.

**Chisasibi**

The last part of the increased-flow section is located inside the lands of the community of Chisasibi (see map 6-6). The diverted waters of the Rupert River end up in the Robert Bourassa Reservoir, from which they flow into the La Grande 1 Reservoir, then into the La Grande Rivière, and finally into James Bay. Numerous infrastructures linked to the La Grande complex are located in this region, including the Robert-Bourassa, the La Grande-2-A and La Grande-1 generating stations, various substations, numerous transmission lines and the village of Radisson. The village of Chisasibi is also located within this region. The James Bay and Chisasibi highways provide access to the region, along with the Longue-Pointe road on the north shore of the La Grande Rivière.

Bank stabilization work, mainly on the south shore of the La Grande Rivière, is planned in order to curb active erosion processes and thereby reduce the river’s sediment load. Granular blankets will be installed over 9.2 km of shoreline, i.e. between KP 9.7 and 22.5, on the south shore of the river.

Even with the additional input from the Rupert River diversion (14 % at the outlets of the Robert Bourassa and La Grande 1 reservoirs), the operating levels of the Robert Bourassa and La Grande 1 reservoirs will remain within current operating limits. The maximum level will not be exceeded, although it could be reached a little more often than it is currently. The navigation conditions will therefore be equivalent to existing ones. Since the boat ramps on both the reservoirs and the
La Grande Rivière section were designed based on the current regime, they will not undergo any modifications. The estuary section of La Grande Rivière, downstream of the La Grande-1 run-of-river plant, is affected by the tides and the discharge at the generating station. With the additional input of water, an average rise of 0.20 m is expected to the right of the village of Chisasibi. However, this rise will be barely perceptible because of fluctuations caused by the tides.

On the community of Chisasibi’s land, two areas of community use are located in the project’s area of influence. Like other communities situated near the James Bay coast, the members of this community use areas directly in front of the village up to the La Grande 1 dam, plus the Bay and its shoreline for waterfowl and small-game hunting as well as fishing. For the past several years, the old site of the village on Gouverneur Island has been visited by an increasing number of users during the summer. At the mouth of the Bay, navigation is controlled by the tides, currents, wind and shifting sandbanks. In winter, users have to beware of the uncertain ice conditions. Various land snowmobile routes provide access to the Bay’s shoreline. The La Grande Rivière section, from the village to the first rapids, is usually travelled by boat. This section is not, however, used during winter months (ES26).

The traditional fishing site at the first rapids is another site used and valued by the community. Situated about twenty kilometres upstream of the village, this site was for many years used for the netting, drying and smoking of fish, especially in the summer and fall. Although it is rarely used today due to changes resulting from the construction of the La Grande-1 dam, some Cree still occasionally net fish for lake cisco there (ES26).

The proponent does not foresee any impact on navigation activities in either the La Grande Rivière section or at the mouth of the Bay. The impacts anticipated in this area will be related to the installation of the granular blanket - increased traffic due to the transport of materials on the Chisasibi highway and increased dust and noise. There may also be a temporary increase in the resuspension of sediments. However, this work will be of short duration. The proponent does not foresee any impact on fishing activities at the first rapids site.

The proponent foresees no impact on hunting, fishing and trapping activities in the hunting grounds CH1, CH2, CH9 and CH36 located on the north shore of the La Grande Rivière and the La Grande 1 Reservoir, or on the west coast of the Robert-Bourassa Reservoir.

All stabilization work will take place on the hunting ground CH33 (DCAP15). This area is frequently used by the tallyman’s extended family. Hunting and fishing activities are mainly centred on the Bay’s coastline and near the Chisasibi road. In the spring and fall, some members of the community navigate the La Grande Rivière, between the village and the area of the La Grande-1 generating station, to hunt geese and small game. The Upichiwuun Bay section, in the La Grande 1 Reservoir, is also used by various members of the community for small game and goose hunting, as well as during an angling competition organized by the Chisasibi Cree Trappers’ Association (ES26).
Hunting and fishing activities in Upichwuuun Bay will not be affected. As indicated above, only those disturbances linked to the installation of the granular blanket will cause any inconvenience. This work will be of short duration and, as much as possible, will be carried out by local labour. The granular material will come from borrow pits. Also, roads leading to the borrow pits, at least an access route to the banks, will be built. The tallyman will decide whether or not to keep these roads.

A portion of the granular material will come from borrow pits situated on the hunting ground CH35, directly to the east of hunting ground CH33. Hunting, fishing and trapping activities on this land will not be affected. However, the majority of camps are located on the Chisasibi road and so their users could be disturbed by transport vehicles and traffic.

**Mitigation measures and environmental follow-ups**

The purpose of installing the granular blanket is to prevent any additional deterioration of banks that are already impacted by erosion. To improve shoreline fishing conditions, the proponent has agreed to build small spurs perpendicular to the granular blanket. It will also follow-up on bank erosion downstream of the La Grande-1 generating station and the efficacy of the granular blanket. Finally, the proponent will follow water quality, turbidity and suspended solids in the Grande Rivière estuary (DCAP15).

The proponent has agreed to not include, in its search for borrow pits, an area identified by the tallyman of hunting ground CH33. If the tallyman so desires, goose-hunting ponds can be created in certain borrow pits after completion of the work (DCAP15).

At the request of the tallyman of hunting ground CH35, a road sign will be installed, indicating the presence of Cree camps and advising drivers to slow down. The proponent agrees to follow bank erosion in the area of the temporary camp and to move this shelter if it is threatened. As is the case for hunting ground CH33, the proponent has proposed to the tallyman of land CH35 that certain borrow pits be converted into goose-hunting ponds (DCAP15).

**Conclusion – Chisasibi**

The project’s impacts will only affect hunting, fishing and trapping activities on the hunting grounds of the community of Chisasibi for a short period of time. The proponent and land users have also agreed on mitigation measures and compensation that are satisfactory to all parties.

The additional inflow of water into the Robert-Bourassa and La Grande 1 reservoirs, as well as into La Grande Rivière estuary, should not affect travel by boat or snowmobile since flow management will be done according to the current regime. COMEX recommends that members of the community of Chisasibi participate in bank erosion and water quality follow-up programs on the La Grande Rivière.

Land users in the Chisasibi region have suffered the impacts of projects linked to the La Grande complex, and they still resent what happened to this very day. During public hearings held in the community of Chisasibi, some members of the community expressed doubts about the proponent’s forecasts as well as anxiety over the possibility that the conditions needed for them to practice their traditional activities could further deteriorate (VAP37, 38, 39, 40, 41, 42, 43).
6.4.2 INCREASED ACCESS TO THE REGION

The proponent anticipates the construction of approximately 255 km of highways and roads and the upgrading of 105 km of roads, of which 180 km will be permanent highways and roads. It also envisions the construction of several 315-kV and 25-kV transmission lines, totalling about 16 km, whose corridors can be used by snowmobilers. Nearly 30 km of access roads to related facilities and 25-kV lines linking certain camps to the power grid may also be added. All of the infrastructures built on public land will contribute to opening up the region, making it easier for different users to access certain areas.

Before presenting the impact analysis for this increased access, it should be recalled that public land legislation prescribes that roads have a public vocation and be accessible at all times. This is the case for those built for this project.

Impact analysis

While the impact assessment does not contain any chapter or section focused specifically on the project’s impact vis-à-vis increased access to the region, the subject was addressed in a number of different sections of the study and in additional documents. Due to the scale of land covered by the JBNQA, this issue has been an object of some concern among the Cree, notably in the provisions of the Paix des Braves (R5, Article 3.13), which calls for the creation of a round table of different government authorities and the Cree to identify and focus on questions concerning land access.

This increased accessibility caused by the project will have advantages and disadvantages for the various users. The Cree recognize that the development of the road network in the study area will make it easier for them to access the region. It will also lower the costs associated with this access and facilitate the establishment of various camps along the main highways (see RP12, p. 215). Before the construction of the road network in the James Bay region, numerous hunting grounds could only be reached by floatplane or by long trips in boat or snowmobile.

On the other hand, there have also been disadvantages associated with the new road network. The main one has been an increase in use by both Crees and non Native hunters and fishermen, which has lead to more competition for resources between Cree and non Natives and among Crees themselves. The roads have also become areas for big game hunting, leading to greater pressure on this resource. Increased pressure on fish species has resulted from the greater number of fishermen. There has also been a rise in poaching and increased pressure on all wildlife resources. Vandalism and equipment theft in camps is up, as is the disposal of equipment, garbage and animal carcasses left onsite after the hunt. There is also a loss of tranquility at sites when a road network is built (see RP12, p. 215 and RP25).

The tallymen also report that traveling in vehicles on roads leads to a more specialized type of hunting in which activities are more concentrated in time and space, as is the case for goose-hunting in spring and caribou in winter (see RP25, p. 17). This affects the Cree's hunting and harvesting habits.
Opinions are divided as to the need to have more roads in the region (see RP12, p. 217). Some tallymen support the construction of new roads. For example, the Muskeg Eastmain-1 road was built at the request of the Crees. Other tallymen do not want any new roads at all. They believe the disadvantages associated with building new roads outweigh the benefits.

The promoter has indicated that all temporary roads created for the project will be closed down at the end of the work unless the Crees request otherwise (see RP12, p. 217). At the request of the tallymen, the proponent will study the feasibility of building or upgrading different access routes for cars, all-terrain vehicles or snowmobiles. It should be noted that some of these access routes are fairly long - for example, the approximately 20-km long access road to trapline M18 of the Mistissini community. The tallymen requested this access route so they could reach camps displaced due to the project, as well as access new areas for practicing traditional activities following the loss of land, again due to the project.

During public hearings, the Chibougamau Chamber of Commerce indicated that it would like the Muskeg-Eastmain-1 road to become a public road accessible to all users throughout the year. Some stakeholders also pointed out the need to upgrade the Route du Nord. Some Crees said they favoured restricting the use of access roads to Crees.

During public hearings, some Crees also asserted that the increased land use, caused in particular by this development work, had contributed to the deterioration of existing roads and an increase in traffic accidents. Inadequate maintenance of certain roads as well as the rise in the number of trucks and their high speed, have only reinforced people's insecurity about the dangerous road conditions. As a result, some ask that the proponent make necessary improvements to road infrastructures in order to ensure they are safe for motorists.

Finally, the proponent plans to monitor sport hunting and fishing as well as recreation and tourism development in order to evaluate the effects of the project on land use, as well as the impact of the access roads and the opening up of the region on tourism, vacationing, and sport hunting and fishing.

**Conclusion**

The study area of the project already includes several public roads and COMEX believes that the project will increase access to the territory. The construction of new roads and power lines should therefore exacerbate the problems reported by the Cree with regards to the existing road network.

COMEX believes that the proponent and the tallymen concerned should agree on whether to decommission or maintain the project's temporary roads. However, any new access roads required by the tallymen as compensation are not considered part of the Eastmain-1-A and Rupert diversion projects since their impact has not been assessed. The proponent will therefore have to obtain the authorization and permits required from the relevant government authorities before building these roads.
The increased access to the territory as a result of the project could contribute to the development of recreational tourism activities such as boating and sport hunting and fishing. Wildlife resources could be subject to additional pressure during the construction period as a result of sport fishing and hunting by project workers. While the impact is difficult to assess, COMEX believes that in the medium and long term, increased access to the territory could affect competition for wildlife resources between non-Natives and the Crees (see section 6.4.4.1). Non-Native hunters and anglers will, however, be subject to harvest limits imposed by the regulation in force.

Increased access to the territory will have a spillover effect on other types of projects, notably, mining, forest and industrial development. While these activities may generate attractive economic spin-offs, they may also create environmental impacts that will have to be assessed.

The project roads, such as Muskeg-Eastmain-1, and those leading to the diversion bays, will be public and users will have access year round. The proponent will be responsible for road maintenance and snow removal.

The proponent must be attentive to the problem of road safety and find ways to limit the risk of accidents. For example, the proponent could install snowmobile crossing signs along the project roads (see RP12, p. 216).

**6.4.3 BOATING AND OTHER WATER ACTIVITIES**

This section deals with boating by the Crees and recreational boating by regional non-Natives or tourists. These groups use mostly power boats, requiring a minimum depth of 1 m of water, and canoes and kayaks, requiring a minimum depth of 30 cm.

**6.4.3.1 Boating in the diversion bays**

The diversion bay section contains a number of navigation routes, used by the Crees of the Mistissini and Nemaska communities and by recreational boaters on the Rupert River.

**Impact assessment**

During the construction period, the impact on boating in the diversion bay section is associated with the dam building on the Rupert, Lemare and Nemiscau rivers. The work areas will interfere with boating on these rivers. The proponent states that it will ensure users can safely bypass these areas during the work.

During the diversion bay impoundment, the existing bodies of water will be flooded, creating new bodies of water to which users will have to adapt. The proponent foresees that boating will be possible on most of the diversion bays because the levels will be relatively stable during the summer. The mean summer drawdown of the forebay will be 0.7 m and that of the tailbay 0.8 m. The proponent states that the banks of certain bodies of water will be strewn with floating wood debris, particularly at the foot of bays exposed to prevailing winds.
The increase in water level upstream of the Rupert River will flood eight rapids, between KP 314 and 333, located along a well-known canoe route. This fast-flowing water route will be transformed into a lacustrine route. A portage will be developed to bypass the Rupert River dam.

The north portion of the tailbay between KP 40 and 20 will be less conducive to boating, mainly because of the high flow velocity. Users will also note increased flow velocity in the immediate vicinity of the weir, located upstream of the transfer tunnel and the instream flow release structures.

In the two diversion bays, the proponent will clear multifunctional areas and navigation corridors, established with the tallymen, to facilitate use of the flooded sections and passage between the bodies of water. This clearing will be completed before the diversion bay impoundment. Motorized boating will therefore be possible along portions of the cleared banks.

A five-year program to remove wood debris will be implemented in the diversion bay section and will require the tallymen’s participation (RP12). At the end of the program, the tallymen will be able to turn to the Niskamoon Corporation for any additional work required to correct access or navigation problems.

Discussions between the tallymen and the proponent, as well as with Jamesian stakeholders, revealed some concerns with regards to the navigability of certain corridors and access to highly used areas. A number of measures aimed at mitigating the impact of the diversion bay operation on navigation were therefore agreed upon between the parties. The proponent undertakes to, among other things, prepare navigation maps showing the cleared navigation corridors; to install signage along the navigation corridors, especially in the more difficult segments; to build three boat ramps with navigation information boards, including one near the Rupert River dam; and to install adequate signs in front of the instream flow release structures as well as at the approach of the transfer tunnel. Some portages, including one near the C-R-1-2-3 dyke in the forebay could also be redeveloped.

The proponent has also planned a navigation follow-up program in the diversion bay section, which will report on navigation conditions, particularly in the cleared navigation corridors (DCAP15).

**Conclusion**

In light of the mitigation measures and the monitoring program planned by the proponent, COMEX believes that the project impact on navigation in the diversion bay section is acceptable despite the fact that navigation conditions will change. The diversion bay clearing program, developed with the tallymen, and the wood debris clearing program, are also deemed acceptable.

**6.4.3.2 Navigation in the reduced flow section of the Rupert River and Rupert Bay**

The Rupert River has 68 rapids covering about 10% of portion of the river affected by the project (RP12). Close to 60% of these rapids are Class I or II and are considered easily navigable by experienced canoeists. The class III, IV, V and VI rapids on the Rupert River are deemed impassable. Cree power boats can navigate Class I and Class II rapids, and boaters can also use the portages along these rapids.
In the portion of the Rupert River between Mistassini Lake and the James Bay route, navigation is considered of medium difficulty. The flow ranges from slow to medium. Most of the portages are in good condition although sometimes difficult to find, and there are numerous campsites. Navigation between the James Bay route (KP 108) and the mouth of the Rupert River is considered difficult because of the waterfalls and the many difficult rapids. The flow is average and campsites are somewhat rare. There are about 30 portages from the mouth to KP 314 allowing boaters to bypass difficult rapids and impassable obstacles. While the average length is 250 m, five of these portages are longer than 1 km and three are more than 3 km long.

Interviews with users have confirmed the great value of the Rupert River for canoe and kayak enthusiasts, mainly owing to its natural characteristics and relatively easy access provided by the roads. Because of its distance from major urban centres, the river sees little recreational boating traffic. In 2003, between 50 and 100 excursionists travelled the river on trips of varying lengths. Three companies offer canoe and kayak excursions.

The Crees navigate the entire Rupert River, from its mouth right to the location of the future main dam (KP 314). Rupert Bay is an important navigation area for the Waskaganish community. Different routes are used, depending on weather conditions. Strong currents, shoals and rocks are obstacles with which users must contend. Powerboat excursions generally take place in high tide.

Since 1990, the Crees have been organizing an annual canoe brigade, lasting about a month aimed at initiating some 20 young Crees to traditional life. This purpose of this activity is to relive the famous canoe brigades that punctuated the James Bay rivers during the fur trade era.

According to Transport Canada, only the Rupert, Nemiscau and Lemare rivers are considered navigable (C10). The other bodies of waters, i.e., the rivers' tributaries, are not considered navigable. Under the Navigable Waters Protection Act, the proponent must ensure that these three rivers remain navigable after this project.

**Impact assessment**

According to the proponent, during the construction period, the impact on navigation will be associated with the construction of eight hydraulic structures at the Rupert River rapids. Because certain portages may become inaccessible, the proponent will ensure that users can safely bypass the work areas. Given that the Rupert River spillway will be operational during this construction, navigation conditions on the river will be modified to resemble those that will prevail during the operation period. The proponent bases its analysis of these conditions on the low flows of August and September, when navigation conditions are poorest. In the Rupert reduced-flow section, these impacts vary depending on the stretch of river. As such, in the stretches affected by a hydraulic structure, the water levels will be maintained over 154 km of the Rupert River, i.e., close to 50% of its waters, over 24 km of the Némiscau River and over 2 km at the mouth of the Lemare River.
The water levels will be maintained in the Rupert River, namely, in the Gravel Pit and the Nemiscau Lake sections.

In the stretches controlled by a hydraulic structure, the flow velocity will fall between 58 % and 75 % to levels found in lacustrine environments. The main tributaries of the Rupert, i.e., the Martre, Nemiscau and Lemare rivers will not be affected by the project because they flow into a stretch affected by a hydraulic structure. A rapid located in the area of influence of the KP 110.3 weir will, however, be flooded (RP12).

In the stretches of the Rupert River not affected by a hydraulic structure, the impact on navigation is associated with a reduction in water levels and in the wetted perimeter. The drop in water level, from 1.1 m to 2.1 m, could modify powerboat passage. The most significant drop will take place in the upstream stretch of the river near the dam, where it will average 2.1 m between KP 295 and 314. The anticipated average drops diminish as distance from the dam increases, ranging between 1.1 m and 1.6 m between KP 5.8 and 295. This drop will have no impact on the navigability of the Rupert River.

With the exception of the rapids, the proponent will maintain a navigation channel no less than 1 m deep in the stretches not controlled by a hydraulic structure. According to the proponent’s assessment, the stretches between KP 26 and 31 and KP 96 and 108 will have a minimum depth of 1.2 m and 1.3 m respectively, the shallowest depth anticipated in the Rupert River (RP12). In these stretches, only a few kilometres of river will have minimum depth whereas the others will be sufficiently deep to ensure navigation. In general, a 1.5 m channel will be available almost everywhere on the Rupert River.

The drop in water level in the stretches of the Rupert River not controlled by a hydraulic structure will result in a reduction of the wetted perimeter. However, over 90 % of the current wetted area will be maintained. The gently sloping banks will be more exposed. This exposure will run the distance between the boat landing and Cree camps or other sites along the bank. It will also extend along some portages. According to the proponent, the project will not have a significant impact on the portages and on the boat landing near the Cree camps.

Unable to obtain basic data in order to simulate post-diversion residual water depths and levels, the proponent could not determine the impact of the project on the Rupert River rapids. According to the proponent, most of the Class I and Class II rapids will have sufficient flows to ensure the passage of canoes and kayaks. Some may, however, become impassable for powerboats.

The proponent does not believe the water levels in Rupert Bay will change after the diversion and does not anticipate any impact on navigation. In the estuary of the Rupert River, the high tide will be sufficient to maintain the currently prevailing water levels. Although flow velocity will decrease somewhat, it will not affect navigation.

At low tide, the water levels of the estuary will be slightly below current levels, falling from 60 to 70 cm at the foot of the rapids at KP 5, and 50 cm in front of the Waskaganish village. The level will not change at the estuary outlets. The navigation channel will be approximately 4 m deep. However,
in the transition area between the bay and the estuary, the depth will be 1.5 m to 2 m at low tide, which is sufficient for motorized navigation. At its most narrow part, the channel will be 54 m wide. The Crees have already placed channel markers in the estuary to avoid shoals at low tide.

With regards to the canoe brigade aimed at initiating young Crees to traditional life, the proponent states that the project will have no impact on this activity because the river will remain navigable. The proponent undertakes to work with canoe brigade organizers to ensure it can continue. Moreover, the project impact on this activity will be monitored in order to determine whether a different route needs to be developed.

**Mitigation measures**

The proponent has undertaken to implement navigation measures and to develop and maintain the portages in order to preserve the navigability of the rivers affected by the project. The proponent will assess the need to adapt the existing portages to the new bank conditions and to redevelop them if necessary. The portages bypassing the hydraulic structure sites will be redeveloped or extended. A portage will be developed at the top of KP 110.3 and the one bypassing the first rapids of The Fours (KP 95) will be redeveloped. The proponent will install boat ramps on the Rupert River near KP 110 and 170. Other measures have been agreed upon with the tallymen, notably, extending the hydraulic structure road from KP 290 to KP 281 and construction of a boat ramp downstream of the rapid. The proponent will prepare a navigation map of the Rupert River using aerial photos to view the sections not controlled by a hydraulic structure as well as the new wetted perimeter, the configuration of the rapids and the sections that pose problems for powerboats.

**Follow-up of navigation conditions**

The proponent will monitor the navigation conditions on the Rupert River in order to determine the new navigation conditions (flows, water levels and depth) and will pay special attention to the stretches not controlled by a hydraulic structure (DCAP15). This monitoring will also allow the proponent to identify the necessary mitigation measures. Access to portages and camping, as well as boat landing conditions following bank exposure, will be assessed. Navigation conditions before and after the project will also be compared.

The assessment will also make it possible to determine the new navigation conditions in the rapids, more specifically, in the 24 rapids not bypassed by the portages. This will also make it possible to identify the necessary mitigation measures (RP12).

The proponent has undertaken to follow navigation conditions in specific locations, for example, at the top of KP 131-132. The proponent will also verify access to the tallyman camps from the banks and move these camps if necessary. Boat landing conditions downstream of Smokey Hill will be followed to determine whether mitigation measures are required. Navigation will also be monitored at the rapids of KP 150.7 and 162.5 as well as in the Sipastikw branch, located on the left bank of the Rupert River between KP 287 and 281, where a new portage may be developed if necessary (RP12).

The follow-up program will also include an assessment of the navigation conditions in certain tributaries of the Rupert River, located at the top of KP 107.5, KP 129 (Jolliet River), KP 142, KP 152.5
(secondary outlet of Nemiscau Lake) and KP 222, as well as the north branch of the Rupert River (KP 304.35 - Kayechischekaw brook) located at the top of route du Nord. The initial navigation conditions will be determined before the work begins. By following the navigation conditions after the Rupert River diversion, the proponent will be able to assess the navigability of the tributaries and determine whether mitigation measures are necessary.

**Concerns raised by the population**
Many Crees are concerned about the new travel conditions created by the Rupert River diversion. Most Crees say they use the river to access trapping areas. They fear that the estuary will become very difficult to navigate as problems with tides, winds and navigation channels increase. Moreover, Waskaganish youths stated that they would like to participate in the canoe brigade before the project begins.

**Conclusion**
COMEX shares the proponent’s view that the Rupert, Lemare and Nemiscau rivers will remain navigable. The proponent must, however, ensure that they remain so regardless of the future hydraulic conditions. To this end, a minimum depth of 1 m must be assured to allow passage of powerboats used by the Crees.

Moreover, to ensure safe navigation, the proponent should mark the navigation channel at critical points in stretches not controlled by a hydraulic structure, as well as stretches in the estuary and in Rupert Bay. A program to follow navigation conditions in the estuary and the Bay could be implemented in collaboration with the Waskaganish community.

With regards to recreational boating, the changes made to the Rupert River will not impede the passage of canoes and kayaks, which require a minimum depth of 30 cm. However, navigation conditions will change, making some rapids accessible and others inaccessible. The project will disturb the natural characteristics of the Rupert River, which could cause the number of recreational boaters to drop. Still, since there is little traffic on the Rupert River, the impact is deemed acceptable.

The proponent has undertaken to develop and maintain the portages in order to preserve the navigability of the rivers affected by the project. It would be desirable for the proponent to also improve the portages to make them safe and easily usable by Crees and non-natives alike.

Moreover, COMEX considers that the proponent should implement a follow-up program aimed at maintaining the canoe brigade and work with the Cree communities to encourage young people to participate and to ensure this activity continues regardless of the route used and the rivers targeted.

With regards to extending the hydraulic structure road from KP 290 to KP 281, the proponent will have to obtain the necessary authorizations and permits from the relevant government authorities before beginning construction (see section 6.4.2).
6.4.3.3 Navigation in the increased-flow section

According to users, navigation is currently difficult in the Opinaca Reservoir and in Boyd and Sakami lakes due to currents and strong winds. The proponent, however, has identified a number of navigation routes for powerboats. Although La Grande 1 Reservoir and a stretch of La Grande Rivière downstream of La Grande-1 generating station are used along their entire length for navigation purposes, the Chisasibi community makes greater use of the mouth of this river.

Impact assessment

The proponent foresees no impact on navigation in the increased-flow section during construction. Construction of the Sarcelle powerhouse will not prevent access to the boat ramp near the OA-02 dyke. However, the access road leading to Boyd Lake, located on the right bank of the Sarcelle control structure, will be unusable while the powerhouse is in construction.

During the operation period, flow velocity will increase between the Eastmain-1 generating station and the Opinaca Reservoir. This stretch will nevertheless remain navigable. Water levels will not change substantially in the Opinaca Reservoir and no impact is expected on navigation in this area.

Navigation conditions in lakes Boyd and Sakami will improve over current conditions due to water level stability in the summer. The drawdown will be reduced. However, in Boyd River, the increased flow will result in a substantial increase in flow velocity, which could make navigation between KP 100 and 93 difficult. The proponent will develop new access to Boyd Lake on the east side of the future Sarcelle powerhouse.

The operating levels of the Robert-Bourassa and La Grande 1 reservoirs will respect the current maximum operating levels set out in the JBNQA. The maximum level will not be exceeded but could be reached more often. Use of existing equipment, such as boat ramps, will not change. No impact is anticipated on navigation in the La Grande Rivière.

The proponent has planned a navigation follow-up program for the increased flow section that will describe navigation conditions in lakes Boyd and Sakami (DCAP15). The monitoring will make it possible to determine the mitigation measures required, including the removal of wood debris along certain banks and the placement of navigation maps.

Among the concerns raised by the population, the Crees mentioned that certain boat ramps in this sector will be difficult to access because of the presence of wood debris. (VAP12).

Conclusion

COMEX believes that the navigation conditions in the increased-flow section will change little, and the impact is deemed acceptable. However, to facilitate navigation, the proponent should consider implementing a program to pick up wood debris and map out the navigation corridors.
6.4.4 TERRITORY USE BY OTHER USERS

6.4.4.1 Sport fishing and hunting

Sport fishing and hunting are important components of recreational tourism activities in James Bay (see section 6.4.4.2). It bears mentioning that under the JBNQA, the Crees have special hunting, fishing and trapping rights in the area. They are also represented on the Hunting, Fishing and Trapping Coordinating Committee (HFTCC), an expert resource body made up of native and government representatives to review, manage, and in some cases, supervise and regulate the fishing, hunting and trapping regime instituted by the agreement. While the entire population is free to hunt and fish on category III lands, trapping and harvesting of certain species are reserved for the Crees.

Workers assigned to the project and non-natives on the territory must respect the regulations of the ministère des Ressources naturelles et de la Faune (MRNF) concerning sport fishing and hunting. The proponent and the Crees have, however, agreed to exercise greater control over wildlife harvesting on a part of the territory where fishing and hunting pressure may increase. This is the reason the Weh-Sees Indohoun Corporation was created under the Nadosthin Agreement, during the Eastmain-1 development. Comprised of Crees and the proponent’s representatives, its mission is to control non-native access to fish and wildlife, to propose measures to manage their harvest and to ensure sustainability in the context of the Eastmain-1 and Eastmain-1-A projects and the Rupert diversion. The territory overseen by this corporation covers 8,900 km² and includes category III land, as well as category I and II land of the Nemaska community (see map 6-7). Stricter rules apply to hunting and fishing within the territory overseen by Weh-Sees Indohoun, based on species and area. The Weh-Sees Indohoun Corporation could pursue its mandate during the project construction phase.

The territory of the Weh-Sees Indohoun does not cover certain sections of the project, including part of the 315 kV Sarcelle-Eastmain-1 line; the Sarcelle workcamp and powerhouse; the Opinaca Reservoir and areas further north; the downstream reach of the Rupert River from KP 270 to its mouth; and the Jolliet Lake, KM 257 and Kauschiskach workcamps. In the areas not covered by the Weh-Sees Indohoun Corporation, located on category III lands, sport hunting and fishing will be regulated by the MRNF. It should be noted that the downstream portion of KP 95 in the Rupert River crosses Waskaganish category I and II land, where non-Cree are prohibited from fishing and hunting. This prohibition therefore applies to workers in the Kauschiskach workcamp.

The Weh-Sees Indohoun Corporation has initiated discussions to expand its territory. A number of scenarios are currently being assessed. However, no official decision has yet been made.

The Boumhounan Agreement requires (M70.5, p. 35) that an information centre be set up in the Nemiscou workcamp during the construction period. This centre will provide information on wildlife management and harvesting, on hunting and fishing rules and on services offered by the Crees, including outfitting and guides.
The following is a portrait of sport hunting and fishing harvests. According to moose sport hunting data, hunting area 22, where the project will be carried out, accounts for 20% of the harvests recorded between 1999 and 2002 for the Nord-du-Québec administrative region, while area 16, located further south, accounts for 70% of the moose harvest. In area 22, very few moose were caught in the Rupert diversion bay section and along the Rupert River. According to the proponent, in 2002, four moose were killed by sport hunters in the Weh-Sees Indohoun area, while Crees harvested 3 moose for subsistence purposes during the 2001-2002 season and 31 during the 2002-2003 season. Most of the moose in hunting area 22 were harvested in the sections of the Opinaca Reservoir, Eastmain River and La Grande-3 as well as south of Rupert River.
Caribou sport hunting is concentrated along Transtaïga Road and is not authorized in areas further south, where the project will be carried out.

With regards to sport fishing, the Weh-Sees Indohoun Corporation observed, during the Eastmain-1 development, that the territory it oversees was mostly used by workers living in the proponent’s workcamps. In fact, according to fish statistics compiled in 2003, only 4% of anglers were tourists. In 2002, a survey conducted by the proponent among vacation leaseholders in the study area revealed that 93% were sport anglers (see EI1.4, p. 17-77). Another survey conducted among users of Route du Nord showed that the most frequented fishing sites are those close to roadways. According to the proponent, sport fishing along the Rupert River is relatively rare.

**Impact assessment**

The proponent believes that between 20% and 30% of the workers fish during their free time. Data compiled by the Weh-Sees Indohoun Corporation during the Eastmain-1 development showed that workers’ fishing activities had a limited impact on resources. According to the proponent, the impact on sport hunting will be limited due to the Corporation’s management and control rules and due to the fact that the workers have little free time, making sport hunting unpopular.

In the areas located outside the territory managed by the Weh-Sees Indohoun Corporation, namely, the KM 257, Lake Jolliet and Sarcelle workcamps, the proponent states that sport hunting and fishing will respect the rules in force and that controls will be set up. The proponent also undertakes to promote the establishment of a use area controlled by the Weh-Sees Indohoun Corporation in collaboration with the authorities governing recreational activities in the territory. The proponent considers the impact on sport fishing and hunting during the construction phase to be negligible.

The proponent anticipates the disappearance of a known sport fishing ground downstream of the Sarcelle control structure during the operation period. The proponent states that a similar fishing location could be created downstream of the future Sarcelle powerhouse. The development of a multispecies spawning ground is also planned in this location.

The proponent anticipates the opening of the territory to have a certain impact on sport fishing and hunting but does not expect any wildlife over-harvesting since visitors are scarce. The proponent also mentions that special attention will be paid to fish management in the bodies of water rendered more accessible by the project.

The tallymen are very concerned by competition for resources between the Crees and sport hunters and anglers. According to the Crees, this competition stems primarily from the increased access to the territory as a result of new roads created as part of the project (see section 6.4.2). Still, the proponent believes it unlikely that any increased sport fishing and hunting will compete with Cree activities.
The Cree are concerned by the incompetence and lack of preparation of non-native hunters. In light of the poaching by some of these hunters, the Cree would like to see greater wildlife management and involvement by wildlife officers (see RP25, p. 17). To this end, the Paix des Braves Agreement has made it possible to hire Cree wildlife officers in the territory. However, these officers control both Cree and non-native activities, a source of irritation for the tallymen (see RP12, p. 216).

The proponent plans to follow sport fishing and hunting as well as recreational tourism activities. The purpose of this follow-up is to assess the consequences of the project on the following: territory use; the impact of access roads and the opening of the territory to tourism; vacationing; and sport fishing and hunting. The follow-up will also be used to assess the real impact of reduced flow on recreational activities on the Rupert River.

**COMEX analysis**

The COMEX agrees with the proponent’s impact assessment and believes that pursuing the mandate of the Weh-Sees Indohoun Corporation will help mitigate the project’s impacts on sport hunting and fishing. However, it considers that the Weh-Sees Indohoun territory should be expanded to include the sections near the project’s camps located on Category III lands and that this should be subject to the required hearings with the wildlife management authorities involved.

The COMEX also believes that the increased access resulting from the construction or rebuilding of roads will have certain impacts on sport hunting and fishing. However, these impacts are considered to be acceptable. With respect to sport fishing, the increased access will open up several new sections, which could increase the fishing pressure on certain bodies of water during the construction phase of the project.

With respect to sport hunting, the moose harvest is expected to remain marginal in the sections affected by the project compared with the entire region. The caribou problem remains a sensitive issue, given the crossover between the woodland ecotype and the migratory ecotype in the study area. It is up to the organizations responsible for wildlife management to ensure that the regulations are adapted to reflect the new context. The proponent’s development of a woodland caribou follow-up program should shed additional light on the management of the species.

The COMEX believes that the Cree may feel an impact related to the competition for wildlife resources between the Cree and the other hunters and fishers during the construction period. However, given the limited duration of the work, this impact is considered to be acceptable. It would be interesting for the proponent to conduct a satisfaction survey among the tallymen from the Weh-Sees Indohoun Corporation work location regarding the results of the monitoring work performed. The proponent could also, where appropriate, suggest ways to mitigate the disadvantages identified by the tallymen.

The COMEX observes that the workers have an interest in and an actual need for information concerning wildlife management and harvesting. It concludes that the proponent must maintain this interest and inform the workers of the regulations and procedures to be followed in the area.
6.4.4.2 Development of recreotourism activities

Current conditions
Over the past 20 years, the increased access to the region, mainly attributable to the James Bay highway, the Route du Nord and the Transtaiga highway and to the various access roads leading to the Cree villages, has significantly contributed to the higher frequency of use of the region and to the development of recreotourism activities. Since the James Bay highway was opened in 1986, the number of tourist vehicles has increased from an annual average of 2,987 for the 1990-1994 period, to 4,161 for the 1995-1999 period, which represents an increase of 40%. In addition, from January 1 to September 30, 2003, 85,259 people used the James Bay highway, including a little more than 20,000 visitors, other than residents, to carry out recreational activities such as hunting, fishing and camping, and 27,401 used the highway for business purposes (ES1, p. 8-6 and 8-7).

In its impact assessment, the proponent presents tourism data from the extended study area corresponding to the Municipality of Baie-James (MBJ) region. According to the information provided, the main services offered to tourists are related to sport hunting and fishing, visits to hydropower facilities, culture and heritage, snowmobile activities, recreational boating, bed-and-breakfasts and hotels, campgrounds with services, rest stops and wilderness campgrounds (see Table 6-1). Food and lodging services are concentrated in the towns in the southern portion of the MBJ region (Chibougamau, Lebel-sur-Quévillon, Matagami), as well as in Radisson and in the Cree communities of Mistassini, Waskaganish and Oujé-Bougoumou. Based on a recent survey conducted by the Transat Chair in Tourism among users of the Route du Nord and the James Bay highway, the most popular summer tourism activities are sport fishing, visits to the La Grande complex and discovering the landscape (ES1, p. 8-13 and 8-14). As an indication, there were approximately 12,300 annual visits to Hydro-Québec facilities in James Bay between 1999 and 2003, for a total of about 8,000 different visitors per year, resulting in local annual economic spinoffs estimated at $1M (ES1, p. 8-18 and 8-19).

In fact, James Bay Tourism estimates that hydropower projects have become must-see tourist attractions in the Nord-du-Québec administrative region (M66, p. 5). Furthermore, in the fall and winter, caribou hunting, which is a major contributor to the tourism economy, is carried out along the Transtaiga highway in areas 22A and 22B, primarily in the La Grande-4 sector. The other outdoor activities carried out in the extended study area are snowmobiling and moose hunting, mainly on the periphery of Jamesian urban centres, as well as recreational boating.
Table 6-1: The main recreotourism products and services in the James Bay region

<table>
<thead>
<tr>
<th>TYPE OF SERVICE</th>
<th>PRODUCTS OFFERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPORT HUNTING AND FISHING</td>
<td>• Close to 45 sport hunting and fishing outfitters, including 32 belonging to Cree contractors;</td>
</tr>
<tr>
<td>VISITS TO HYDROPOWER FACILITIES</td>
<td>• Guided tours, interpretation panels and coachline services mainly to the Robert-Bourassa, La Grande-2-A and La Grande-1 generating stations and to the Radisson substation;</td>
</tr>
<tr>
<td>CULTURE, HERITAGE, LANDSCAPE AND CRAFTS</td>
<td>• Cultural activities offered by Cree organizations: visit to an exploration camp at the Robert-A.-Boyd Park; observation of the Rupert River; boutiques and craft centres;</td>
</tr>
<tr>
<td>SNOWMOBILING</td>
<td>• Snowmobile trails developed, marked and maintained by the Fédération des clubs de motoneigistes du Québec;</td>
</tr>
<tr>
<td></td>
<td>• Snowmobile rentals and packages offered by private companies;</td>
</tr>
<tr>
<td>RECREATIONAL BOATING (CANOEING AND KAYAKING)</td>
<td>• Canoe and kayak rentals and expedition packages offered by private companies;</td>
</tr>
<tr>
<td>BED-AND-BREAKFASTS AND HOTELS</td>
<td>• Food and lodging services are concentrated in the towns in the southern portion of the region, including Chibougamau, Lebel-sur-Quévillon and Matagami;</td>
</tr>
<tr>
<td></td>
<td>• Lodging services and basic services are offered in the Cree villages and in the village of Radisson, as well as by the region’s many hunting and fishing outfitters;</td>
</tr>
<tr>
<td></td>
<td>• SÉPAQ has lodging facilities in the southern part of the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Reserve;</td>
</tr>
<tr>
<td>CAMPGROUNDS WITH SERVICES</td>
<td>• There are two campgrounds with services at either end of the James Bay highway, i.e. the Camping du Lac Matagami, at kilomètre 37, and the Camping Radisson, at kilomètre 624;</td>
</tr>
<tr>
<td>REST STOPS AND WILDERNESS CAMPGROUNDS</td>
<td>• The Municipality of Baie-James has set up over 25 rest stops along the James Bay highway, the Route du Nord and the Transtaïga highway, most of which provide access to fishing areas. A number of the rest stops have wilderness campsites.</td>
</tr>
</tbody>
</table>

Source: EI1.4, p. 18-34 and 18-36.

The Cree businesses that offer recreotourism services focus mainly on sport hunting and fishing activities, which take place throughout the entire region (see section 6.4.4.1). Several communities also offer visitors the chance to discover their traditional activities. The Crees hope to develop new markets focused on adventure tourism, ecotourism and cultural tourism. Cree businesses also offer a wide range of recreotourism services in the Cree villages, including adventure tourism and guided tours; art shops and craft boutiques; lodging; transportation; shops and gas stations (RP12, p. 275).
The information provided by the proponent also indicates that the extended study area includes 1,853 vacation leases (1,135 rough shelters and 718 cabins), the vast majority of which (90%) are located south of the 50th parallel, i.e. south of Matagami and Chibougamau. The other vacation leases are grouped together in small concentrations near the La Grande complex, north of lac Sakami and in the Rivière à la Marte basin. A single vacation lease is located in the Rupert reduced-flow section at KP 215. A survey was conducted among 117 holders of a vacation lease north of the 50th parallel in the James Bay region. Given the concentration of the sampling north of the 50th parallel, it was possible to exclude the resort vacationers located near the urban centres in the James Bay region and to concentrate on the project sector. The findings from the 46 questionnaires completed indicate that the primary fear regarding the project is related to the water levels of Sakami Lake. However, 75% of respondents feel that the project would not change their normal leisure activities in the region but that they would like to be kept informed in order to better understand the possible impacts of the project (ES1, p. 8-25 and 8-26).

**Anticipated impacts**

Other than the recreational boating and sport hunting and fishing activities mentioned in sections 6.4.3 and 6.4.4.1 of the report, the proponent’s analysis of the anticipated impacts during the construction phase shows that the recreotourism activities and users of vacation leases are not expected to be affected. Nevertheless, given that some construction work will be located near recreational facilities, the presence of workers and the various construction activities could have a negative impact on tourists and resort vacationers due to the noise, dust and jobsite traffic. These impacts can be limited by applying common mitigation measures, such as imposing a speed limit and installing appropriate signs on the highways and accesses.

In the operation phase, the flow management of regulated bodies of water is not expected to disrupt existing recreotourism activities or have a negative impact on the vacation leases located at the La Grande complex, on the north shore of Sakami Lake and in the Rivière à la Marte basin, or on the single lease located along the Rupert River.

In addition, the permanent roads that will be built will contribute to the increased access to the region and will promote the area’s recreational and tourism potential. They will provide increased access to recreotourism sites that have until now been inaccessible, in particular for sport fishing. However, some Crees perceive this access as a negative impact given that it disrupts the “natural and untouched” aspect of the area, in particular with respect to the Rupert River, which is at the very heart of tourism marketing efforts in the region. This issue was also brought up by several people during the public hearings.

Following a request by the Cree Outfitting and Tourism Association (COTA), the proponent organized a workshop on October 3 and 4, 2005 on the impacts of the hydropower development projects on Cree tourism. This workshop demonstrated that recreotourism development is an important issue for the Cree community and that it is an emerging industry (RP12, p. 279). The Crees mentioned that it was important to ensure that the traditional activities with strong tourist potential would still be possible once the project was completed (RP12, p. 279). The Crees asked the proponent for increased co-operation in promoting tourism activities.
During the public hearings, the COTA noted that the region has the potential for developing ecotourism products and services that encourage a sustainable economy in the tourism industry and also promote the traditional Cree culture (VAP31, p. 122). One of the COTA’s requests to the proponent was that it provide a $1M tourism development fund each year in order to develop Cree culture training programs and to promote the potential of the Rupert River while carrying out the project (VAP31, p. 137-139).

James Bay Tourism, which includes some 130 Cree and Jamesian members, carries out mandates involving regional discussions, hosting, information sharing, signposting, promotion and tourism development. It is currently working on consolidating its various mandates in order to market, promote and support enough high-quality recreotourism activities to meet the needs of its customers in the James Bay region (M66, p. 6). In its 2005-2009 Marketing and Tourism Development Master Plan, the Regional Tourist Association established an initial objective of attracting over 100,000 tourists by 2009. It hopes to diversify the place of origin of its clientele given that between 1999 and 2003, it was composed of 91% of Quebeckers (M66.1, p. 43-44). Two of its priority intervention areas focus, on the one hand, on the development of tourism roads such as the James Bay highway, the Route du Nord and the white adventure or tourism roads for snowmobilers and, on the other hand, on projects designed to structure and consolidate the various focal points in the MBJ region. These focal points are Chibougamau/Chapais/Oujé-Bougoumou, Radisson-Chisasibi, Matagami, Lebel-sur-Quévillon and Val-Paradis/Villebois/Beaucanton (M66.1, p. 35 to 40).

The Association asked the proponent to work closely with it in order to help implement an authentic tourism industry in accordance with the desires of the Jamesian community, which could promote a diversified economy for the region (M66, p. 7). The Association hopes that Hydro-Québec will participate as one of the ten partners identified to create a $1.7M fund needed to implement its Master Plan (VAP28, p. 32).

During the public hearings, various stakeholders requested that the tourism development in the region be considered a potential economic alternative to the project. According to the CBHSSJB, the creation of a conservation park to preserve the natural character of the Rupert River would be highly beneficial to the Crees. However, according to an expert consulted by the Commission, tourism should be viewed as a complementary aspect of the hydropower development projects, which will result in a diversification of the region’s economy. The tourism industry, in particular ecotourism and adventure tourism, is in its infancy in northern Quebec and the potential market share for this type of activity appears to be somewhat small. Finally, it is important to remember that the region’s current economy is mainly dominated by the industrial sector.

**Mitigation measures**

As a result of the various findings that emerged from the workshop organized at the request of the COTA regarding the impact of the hydropower development projects on Cree tourism, the proponent committed to implementing specific measures designed to take into consideration the public’s concerns regarding the project and its impacts on the promotion of the activities of existing outfitters. These measures are also designed to encourage the participation of the Crees in developing and promoting the planned facilities, as well as defining the content of the follow-up studies on the frequency of use of the region (RP12, p. 280).
Therefore, the proponent has already produced an information bulletin in a bid to inform customers attending tourism, hunting and fishing exhibitions of the project’s actual impacts and the extent of those impacts on recreotourism activities. The proponent is also committed to working with the COTA during the development of its follow-up studies regarding the project’s impact on tourism and in order to promote the new facilities. An example of this is the development of a lookout at the Rupert dam and new information panels around the diversion bays in order to promote Cree culture (RP12, p. 280).

The proponent also plans to participate in updating rest stop interpretation panels with a view to improving the understanding of the hydraulic structures built on the course of the Rupert River and to promote the inventories carried out during the project. The proponent commits to installing the interpretation panels and navigation charts on the site of the three boat launch ramps built in the diversion bays (DCAP15, p. 70) and also plans to install four boat launch ramps and a lookout on the Rupert River, as well as a lookout at La Sarcelle (VAP15, p. 172).

The follow-up program

The proponent has planned a follow-up program with the COTA regarding the impacts of the access roads and the increased access to the region on tourism, vacationing and sport hunting and fishing (DCAP15, p. 112). The follow-up will mainly focus on the frequency of use of the region, road traffic and the types of activities practiced.

Conclusion

Other than recreational boating and sport hunting and fishing activities (see sections 6.4.3 and 6.4.4.1), COMEX believes that, in accordance with the proponent’s conclusions, the impact on the development of recreotourism activities would be positive in the long term due in part to the increased access to the region and the promotion of the region’s tourist potential. The commitments made by the proponent regarding the mitigation measures and follow-up studies put in place, in co-operation with the COTA, aim to ensure an adequate conciliation of the project with recreotourism activities.

However, with respect to the COTA’s interest in working with the proponent to promote the tourism activities offered by the Cree businesses in the James Bay region, COMEX believes that the proponent should develop, in co-operation with this association, various promotional strategies to attract tourists who visit the facilities.

COMEX believes that, based on the interest of the Jamesian community, the proponent should also work with James Bay Tourism in order to help it carry out its mandates, which are designed to create a viable tourism industry in the region, thereby resulting in a diversified economy in the James Bay region.

In addition, despite the fact that the proponent does not believe that the higher number of vacation lease applications resulting from the increased access to the region is significant, given that the implementation section of the project is located south of the James Bay region, where close to 90% of the existing leases are already located, it is difficult for COMEX to comment on the impacts of the project with respect to a possible increase in vacation lease applications. Furthermore, according to the *Paix des Braves*, the ministère des Ressources naturelles et de la Faune is committed to consulting the
CRA for all vacation lease applications between now and until the regional public land development plan is approved (BI15, p. 14).

6.5 ARCHAEOLOGY, BURIAL SITES AND HERITAGE

6.5.1 THE PRESERVATION OF ARCHAEOLOGICAL SITES

The archaeological approach
The archaeological approach in Québec is made up of several stages. The first stage, which involves studying the archaeological potential, must be carried out before any major intervention on the site. It consists of gathering baseline data in a specific region, such as the study area of a development project. Based on the analysis of various sources of information taken from several areas, the archaeologist identifies the areas with potential, i.e. where archaeological sites may be found.

The second stage consists of carrying out an inventory of the areas of archaeological potential on the site. It involves the visual inspection of all the areas of archaeological potential, as well as the completion of soundings (e.g.: 0.5 m by 0.5 m) dug into the ground at relatively regular intervals (e.g.: between 5 and 10 m). All archaeological traces are noted, which enables the archaeologist to identify the areas in which the digs are to be conducted.

The next stage involves the archaeological digs. Based on the importance of the clues found during the inventory stage, the archaeologist can recommend deep digs on a site. In this case, the archaeologist first gathers the material that can be seen with the naked eye and then all the fragments, primarily by sifting the soil or by using other techniques. This is a complicated and demanding step given that all of the archaeological traces on the site must be gathered with care and kept in adequate conditions.

When the digs are completed, the archaeologist must collect, classify and conduct an inventory of the material gathered in a databank. This is the analysis stage, where physicochemical analysis methods are used to gather chronological, technological and cultural data. This stage is conducted in a laboratory.

The last stage involves data interpretation where the findings are evaluated and the knowledge acquired is summarized with the ultimate goal of stressing the importance of the past and taking a fresh look at human evolution.

The studies conducted by the proponent
Given the small amount of archaeological research previously carried out in the region, the proponent conducted several archaeological projects. The proponent first identified close to 1,250 potential areas in the project’s study area (see RP13, p. 26). These areas are located in the various sections affected by the project, i.e.: the diversion bays; the implementation sites of the various facilities; the site of future weirs on the Rupert River; the corridors of the Muskeg-Eastmain-1 road and of the 315-kV transmission line of the Sarcelle-Eastmain-1, as well as the borrow pits. The assessment of the implementation areas of the camps and of the other roads planned as part of the project did not reveal any archaeological potential. The proponent considers that 743 of the 1,250 areas of
archaeological potential will be directly affected by the project (see RP13, p. 28) and it plans to conduct an inventory of these areas before the construction work begins.

Between 2002 and 2005, the proponent conducted an inventory of 330 areas of archaeological potential. An inventory of approximately 210 other areas is expected to be carried out in 2006 and the proponent intends to complete the inventory of the areas of archaeological potential affected by the project in 2007. The proponent has indicated that the priority of the areas requiring a one-year inventory will be established based on the construction work schedule and that the inventory program could be revised before the diversion bay impoundment. The completed inventories were carried out in co-operation with the Cree communities involved and the traditional knowledge was integrated into the archaeological studies.

The proponent recommended that the digs be carried out over more than 30 archaeological sites discovered during the inventories taken between 2002 and 2005. So far, archaeological digs have taken place on nearly eight of those sites.

**Impact analysis**

The work related to the construction of the facilities, the implementation of camps and roads, as well as the diversion bay impoundment, will result in the flooding or disappearance of certain archaeological sites. The proponent must complete the inventory of the areas of archaeological potential affected by the project and then carry out the archaeological digs on the sites identified before the construction work begins.

In the operation period, the drawdown and bank erosion could have an impact on the archaeological sites located on the edge of various bodies of water affected by the project. However, the drawdown zone of the Rupert diversion bays is already included in the inventory program concerning the areas of archaeological potential. According to the proponent, the flooding of the banks due to the implementation of hydraulic structures is not expected to have an impact on the archaeological sites of the Rupert reduced-flow section. The proponent stated that the Eastmain 1 Reservoir section is covered by the inventory and digs program of the Eastmain-1 hydropower development project and that the erosion would be slight (see RP13, p. 35). Slight erosion was observed in the section of the Eastmain River between the Eastmain-1 generating station and the head of the Opinaca Reservoir (KP 193). However, the proponent noted that bank erosion will be monitored as part of the Eastmain-1 hydropower development project and that a visual inspection of possible archaeological sites would be carried out, if necessary. The proponent does not anticipate any impact on the increased-flow section.

A prehistoric site (FkGr-13) was discovered at KP 17 of the La Grande Rivière. Given that granular blankets will be installed on the banks of the river, between KP 10 and 22 as well as at KP 34, the proponent expects that the site will be subjected to impacts related to the work involved in installing the blankets. The proponent therefore recommends that the digs be conducted on the site before beginning any work (see RP13, p. 170).

The Boumhounan Agreement provides for the creation of an Archaeological and Burial Sites Fund. The $2.5M fund will be managed by the Niskamoon Corporation. It will be used, primarily, to finance various archaeological research projects, including inventories and archaeological digs, as well as related studies used to analyze and interpret the discoveries. The fund will be used for training and teaching purposes and to assist the Crees in acquiring practical experience. The work planned as part
of the fund is expected to begin following authorization of the project. It will be carried out at the same time as and in addition to the inventories and archaeological digs planned by the proponent.

During the public hearings, some Crees expressed their attachment to the archaeological remains. In their opinion, the remains are used to transmit knowledge regarding Cree traditions from one generation to another. The main concern shared by the Crees is what will happen to the artefacts discovered during the project’s planned inventories and archaeological digs. In general, the Crees would like to maintain ownership of these artefacts and they would like them to be preserved in the Cree communities.

According to the ministère de la Culture et des Communications du Québec, archaeological remains discovered on Category II or III lands belong to the Government of Québec. However, with respect to the preservation of the remains, agreements can be made with the Ministère regarding lending and conservation terms.

**Conclusion**

According to the impact assessment carried out by the proponent and given the proponent’s commitments and the creation of the Archaeological and Burial Sites Fund, the impacts of the project on archaeological heritage, during the construction and operation periods, are considered to be acceptable.

The proponent must, however, complete the archaeological inventories and then carry out the archaeological digs before the beginning of the construction phase of the project. In addition, the information gathered during the various archaeological research projects—those already completed and those to be carried out in the future—should be made available to the Administrator. The proponent must promote the value of this important work for the Crees in both the Cree and the Québec societies. In this respect, the proponent is expected to provide the results of the inventories and the archaeological digs and to participate actively in preserving the remains discovered as part of the project.

The COMEX believes that the proponent should contact the Cree School Board in order to develop a preservation program that would give Cree elementary schools and high schools access to the findings of the archaeological research projects carried out by the proponent as part of the project.

### 6.5.2 THE LOSS OF BURIAL SITES

Based on interviews conducted with tallymen and the primary land users, the proponent was able to locate 35 burial sites, including some dating back 250 years, in the Rupert diversion bay section and along the Rupert River.

**Impact analysis**

Among the sites discovered so far, the proponent believes that 11 burial sites in the diversion bays, 2 sites located near the access road leading to the weir at KP 290 of the Rupert River and another site located near the weir at KP 33 will be affected during the construction period. No impact is expected during the operation period.

The Boumhounan Agreement provides for the creation of an Archaeological and Burial Sites Fund that will be used, primarily, to carry out the burial sites research and marking program. The program
will be defined, co-ordinated and carried out by the Niskamoon Corporation and must comply with the provisions of the Nadoshtin Agreement, signed as part of the Eastmain-1 hydropower development project. This fund will finance the supervision of the work carried out by the Crees in order to precisely locate the burial sites. It will also be used to reach an agreement with the Crees and families regarding actions to take regarding the sites affected by the project and possible alternatives for preserving the memory of the Crees buried at these sites. A report discussing the work carried out on the burial sites will be produced by the Niskamoon Corporation when the work has been completed.

The burial sites are greatly valued by the Crees, as can be seen by the creation of the Archaeological and Burial Sites Fund. In fact, according to the Morantz Report (see RP25, p.14), the Crees feel a strong sense of cultural loss due to the flooding of highly important ancestral sites, such as the burial sites. Some Cree people expressed this opinion during the public hearings.

**Conclusion**

The COMEX agrees with the proponent’s assessment that the 11 burial sites found in the diversion bays will be flooded during the impoundment and that the three sites located near the roads could also be disrupted by the construction work. Given that the Archaeological and Burial Sites Fund provides for the implementation of measures regarding provisions for the sites affected by the project and an agreement about which actions to take with Cree families, the COMEX considers the impact of the project on the burial sites to be acceptable. However, given that some Crees have complained about the lack of information regarding the flooding of the burial sites, the methods of communication between the proponent and the Crees should be improved.

6.5.3 **THE PRESERVATION OF HERITAGE ELEMENTS**

Close to 140 valued sites identified by the Crees were acknowledged by the proponent in the Rupert diversion bay section and the Rupert, Nemiscau and Lemare Rivers. Other than the burial sites, there are birthplaces, wildlife harvesting areas and camps.

According to the ministère de la Culture et des Communications du Québec (see AV7), the project’s study area does not include any heritage sites classified or recognized in accordance with legislation. However, it does include some heritage sites such as the Rupert River; Smokey Hill; Old Nemaska; the Native rock painting site of Lake Nemiscau and the former Hudson Bay Company trading post in Waskaganish.

Rupert River, one of the most frequently used rivers by explorers and for transporting commercial goods, primarily for the fur trade, is a historic navigation channel. It was a popular way of travelling from the St. Lawrence basin to the James Bay basin, giving it historic value. It is also recognized by the Fédération québécoise du canot et du kayak as a remarkable river. The scenic value of the Rupert River was confirmed by the findings of landscape surveys carried out by the proponent with tourists in the region. The river has over 68 rapids, some of which are spectacular, such as the Gorge Rapids (KP 309), located at the intersection with the Route du Nord, and the Oatmeal Rapids (KP 108), located at the intersection with the James Bay highway.
The Smokey Hill site is very important for the Crees from Waskaganish, who use it as a community gathering site. Located on the north shore of the Rupert River (KP 24), near some rapids, it is an important dip-net fishing site for lake cisco. Many members of the community go to the site in the cisco spawning season, i.e. from the end of August to the end of September. There is also a cultural camp where traditional structures have been set up.

Old Nemaska, located on the shores of Lake Nemiscau, was designated a historic site by the Crees. This site was used at the very beginning of the fur trade and it is valued for its historic and cultural aspects. It is the former site of the community of Nemaska, which was moved to Champion Lake. The Old Nemaska site is now used as a community gathering place.

The Native rock-painting site at Lake Nemiscau is the only known site of its kind in Cree territory and the northernmost Algonquian rock-painting site in Québec. It is the second most important site of its kind in the province.

In 1668, a trading post was set up at the site of the village of Waskaganish, at the mouth of the Rupert River. It was one of the first establishments of the Hudson’s Bay Company. Today, only a few remains in the village serve as reminders of that time.

**Impact analysis**

According to the proponent, if the water level of Lake Nemiscau is maintained, the Old Nemaska site will not be affected by the project. No impact is anticipated at the Native rock-painting site or the former trading post located in Waskaganish. Given that the proponent is committed to preserving the Smokey Hill site (see sections 5.2.1.2 and 6.4.1), it will be accessible for recreational or traditional activities. The proponent stated that the Rupert River will continue to be an accessible and historic river.

The proponent carried out a landscape study of the Rupert River. Although the flow of the river will be modified, the proponent has indicated that the instream flow regime and the implementation of hydraulic structures will play an important role in maintaining the current landscape. Nevertheless, the power of the rapids will be decreased in the fast-flowing areas due to the reduction of the flow of the Rupert River. In addition, the landscape of the river, facing Waskaganish, will be modified at low tide. However, the proponent believes that the Rupert River will maintain its interest from a visual perspective.

Given the cultural, community and tourism importance of the Oatmeal Rapids, the Gorge Rapids and the Smokey Hill Rapids, the proponent will carry out, during the operation phase, a follow-up landscape study in order to assess the real impact of flow reduction. This follow-up will focus primarily on the perception of the Crees and the Jamesians regarding the change. The study is designed to identify the possible mitigation measures for improving the quality of the backwaters or for concentrating the flow of water in order to maintain the use of the rapids and to preserve the landscape.

In addition, the Grand Council of the Crees of Québec and the Cree Regional Authority have emphasized the importance of the Rupert River, which they have used for generations and which constitutes an essential aspect of their culture and way of life. This point of view was largely echoed by the Crees during the public hearings. Given the significant attachment they have for the land, several people...
said they felt great sadness and dismay as well as a deep pain and sense of loss when they considered the impacts of the project.

The residents of Waskaganish mentioned that they were worried that the project would permanently destroy several fishing sites, namely the Smokey Hill site, considered by the Crees to be a very important traditional fishing site from both a historic and cultural perspective.

The environmental organization Révérence Rupert was specifically formed to protect the integrity of the Rupert River. In fact, a representative of this organization indicated during the public hearings that the Rupert River is a priceless jewel that must remain a part of Québec’s heritage (see VAP15, p. 143). Other participants in the hearings expressed the opinion that a park should be created to protect the entire Rupert River.

**Conclusion**

Of the heritage sites of interest, COMEX concludes, after analysis, that only the Smokey Hill site and the Rupert River site overall will feel the impact of the project. The proponent has made several commitments (see sections 5.2.1.2 and 6.4.1) to minimize the impact on the Smokey Hill site. Given the uncertainties surrounding the real impact of the project with respect to fishing activities on the current Smokey Hill site, it is difficult for COMEX to evaluate the impact on this heritage site of interest. To minimize the impact of the project on this site, the follow-up program and the measures taken following the initial findings of the monitoring are therefore of vital importance. The same applies to the monitoring carried out at the Gorge and Oatmeal Rapids.

The Rupert River will undergo changes to its natural state. Although the proponent has proposed several mitigation measures to make the impact on both the biophysical and human environments acceptable, the intrinsic value of this river will be modified.

**6.6 PROJECT ECONOMICS IN THE REGION**

First, this section summarizes the economic situation of the Cree and Jamesian communities, presents their visions of development and summarizes the experience each community acquired during the implementation of the Eastmain-1 hydropower development. A few subjects raised at public hearings are then reviewed. The second section describes and briefly comments on the direct economic spinoffs foreseen by the proponent, along with the other benefits that can be foreseen for the communities in the region. The section concludes with some observations and conclusions by COMEX.

**6.6.1 CURRENT REGIONAL CONTEXT**

Two distinct populations have settled in the James Bay region. The Crees call it Eeyou Istchee, whereas the non-Native population, which arrived later, call the area the James Bay region. These two entities have different economic development profiles. Moreover, the two groups have expressed distinct aspirations for their future development (see sections 6.1 and 6.2).
Eeyou Istchee

The Cree society has evolved very rapidly in the last 30 years. Notably, there was an increase in the labour force, which ballooned by 307% from 1976 to 2001, compared with 34% for Québec as a whole. In addition, in their presentations at public hearings, the Grand Council of the Crees of Québec and CRA pointed out that the vast majority of the population (60%) is under age 25 (M46).

Most of the communities of Eeyou Istchee have experienced major economic development since 1975. In 2001, the average income of Cree households, as indicated in the census, is slightly higher than that of other Québec households. However, note that Cree households comprise twice as many people as the average and that occasionally, more than one family is obliged to share the same dwelling. This situation is attributable to a housing shortage. In effect, some problems have not yet been satisfactorily resolved, particularly that of housing. The impact assessment revealed that the existing stock cannot meet the needs of the population and that a good proportion of dwellings required renovation.

During the same period, the Cree went from an economy largely dependent on traditional activities and social assistance, in the early 1970s, to an economy based on jobs related to community and institutional development. Income from waged-based employment has largely exceeded that derived from hunting, fishing and trapping activities. The percentage of Crees enrolled in the Income Security Program (ISP), relative to the population in general, slipped from 21% to 16% in the last five years (2000 to 2005), a significant decline from 39% in 1985 (DAP14). At the hearings, Dr. Ted Moses, former Grand Chief of the Crees and signatory of the Paix des Braves, noted that in reality, whether they are willing to admit it or not, the vast majority of the Cree population is now part of the wage-based economy rather than the traditional economy (M62). In addition, the (tertiary) services sector in Cree communities, which supplied a large portion of the jobs in the last 30 years, is now saturated.

According to the CRA, the Cree communities are affected by a high unemployment rate of almost 25%; the rate is double for the 15-24 age group. In addition, the body mentioned that employment is a central issue in Cree communities; needs in this area are increasing at a rate of 2.5% per year (DAP6).

According to the Cree School Board, 75% of students leave school before Secondary V. Although the school enrolment rate of the Cree population increased considerably from 1970 to 2001, the rate of graduation, particularly from university, is one third of that of Québec as a whole. This low education rate and the fact that English is the second language of the Crees reduce job possibilities, particularly in the hydropower sector, which requires specialized training and where the working language is French, particularly for technical terms.

Development according to the Crees

With the signing of the Paix des Braves, the Crees hoped to take charge of their development and become more involved in the economic development activities on the territory governed by the JBNQA. The leaders recognized that it was not in the interest of future generations to curtail development on their traditional lands: they would either have to participate in development or watch from the sidelines. According to Dr. Ted Moses, the Crees then decided to take on the challenge of development (M62).
The Crees wanted a mixed economy comprising both wage-earning employment and traditional activities, and corresponding to development that:

- integrates the Crees or is generated by them;
- has the least possible impact on the territory and on resources;
- does not compromise the pursuit of hunting, fishing and trapping activities;
- favours local and permanent employment.

The CRA noted the “crucial” importance for the Crees of the large hydropower development projects such as Eastmain-1 and Eastmain-1-A (DAP6). The Grand Council of the Crees of Québec subscribes to this view and considers that the Paix des Braves is conducive to such projects. (M46).

The Cree recognize the need to invest in diversification of the regional economy and of their communities. They are also aware of the importance of working with the non-Native private sector to increase job opportunities. With the help of the federal government, they have a “Territorial Program” within the Cree Human Resources Development agency (CHRD) that fosters such opportunities. The popularity of this program and the Eastmain-1 project increases hiring opportunities for the Cree in the region. The Crees also want to increase their involvement in private companies at both the local and regional levels, but programs to make risk capital available for such opportunities and companies are still unavailable.

**The Eastmain-1 experience**

The Nadoshtin Agreement, signed in parallel with the Paix des Braves, is intended to ensure protection of the rights of Crees and to guarantee them the concrete spinoffs of the implementation of the Eastmain-1 project. According to the Cree managers of this agreement, nearly $380 million in contracts have been granted to over 20 Cree businesses since the start of the project in April, 2002, and about 1000 Crees were hired to work on its implementation, for a minimum of $42 million in salaries. These results exceed the initial objective of $300 million in contracts, and represent substantial economic spinoffs for the Cree communities.

Further, the CRA (DAP6) has made the following observations regarding Cree jobs:

- The number of Cree working at Eastmain-1 was significant;
- A large number of the Cree workers held unskilled jobs;
- The majority of the jobs were offered by Cree business;
- These businesses had to rely on non-Crees because Cree specialists were not available;
- Only 30% of the $1.5 million training budget foreseen in the Nadoshtin Agreement was used.

In the CRA’s view, special attention should be paid to training in all future development. It also noted that the CHRDA has invested nearly $2 million from other sources to train workers for the Eastmain-1 project (OED19). The CRA is dismayed that Canada has ended this initiative.

According to a survey conducted among Cree workers at Eastmain-1, 88% of respondents were in favour of the idea of working for the proponent again (RTP17). Participation at this jobsite enabled the Crees to acquire useful experience, particularly for similar projects.
It is worth noting that to facilitate, simplify and accelerate the Crees’ access to benefits, measures and resources ensuing from all of the agreements between the Crees and Hydro-Québec, management of agreements, including the Nadoshtin Agreement, was conferred on the Niskamoon Corporation (R12) in 2004.

JAMES BAY REGION
Jamesians reside primarily in the southern portion of the territory, particularly in four cities: Chapais, Chibougamau, Lebel-sur-Quévillon and Matagami. The Jamesian population decreased by almost 20% between 1971 and 2001, and, according to forecasts from the Institut de la statistique du Québec, it should continue to decline over the next few decades.

In the early 1970s, the Jamesian economy was based mainly on forestry and mining resource harvesting, resources that had powered the development of the region since the 1950s. The construction of the La Grande complex (phase I and II, 1973 to 1996) had a major impact on the regional economy.

Since 1997, the low price of metals on the global market has led to a significant slump in the regional mining economy. The forestry sector also saw its economy hampered by a number of external factors. These notably include the imposition of a countervailing duty by the United States, and more recently a reduction in the allowable cut by the Government of Québec. The proportion of jobs associated with the primary sector fell sharply between 1991 and 2001, from 15% to 8%. Nonetheless, the unemployment rate in the region fell from 10.1% in 1981 to 9.0% in 2001 (compared with 8.2% for Québec as a whole). This apparent contradiction may be partly explained by the exodus of workers toward other regions that presently offer better opportunities for stable jobs.

The average MBJ household income in 2001 was $54,110, nearly $5000 more than the Québec average. The education rate is comparable to the rest of Québec. Nonetheless, according to the economic development index of the Ministère du Développement économique de l’innovation et de l’Exportation, the Nord-du-Québec administrative region, with an index of 90.9%, ranked well below the other regions (100% represents the average, Montreal is at 108%) in 2004, putting the region in second to last place in Québec (R11, p. 94).

Development according to the Jamesians
Similar to all of the resource regions of Québec, the viability of the James Bay Region depends on the harmonious development of all the resources in the territory. However, the hydropower sector is most important: the region produces 50% of Québec’s electricity. The regional administrators’ quest to diversify sources of development have been set forth in the “2004-2009 Five-year development plan” published by the regional conference of elected representatives of the James Bay (M24.2).

Jamesians and Eastmain-1
During the implementation of the Eastmain-1 project, Hydro-Québec Production foresaw a portfolio of measures intended to maximize the regional economic spinoffs:
  - Creating organizations to optimize economic spinoffs in cooperation with regional authorities;
  - Giving priority to the host region for purchases and contracts of under $1 million;
  - Entitling contractors to obtain a credit of 40% on a predetermined amount of subcontracts to regional businesses.
Regional economic stakeholders mentioned three factors that restricted their participation in this project:

- The CCQ did not manage the pool of workers specific to this region;
- The limited capacity of regional businesses;
- Lack of qualified labour.

**Concerns expressed at public hearings**

The Cree authorities, along with several participants, expressed the need for job creation to promote the well-being of their communities, particularly owing to the substantial growth of the Cree population, the decrease in traditional activities and the large influx of youth on the job market. Some raised the problem of the temporary nature of jobs in construction and the under-representation of Crees at the proponent’s jobsites. One of the most frequently mentioned topics is the need for adequate training programs to allow Crees to eventually hold skilled, permanent jobs in businesses involved in developing the territory.

Some Cree stakeholders mentioned the need to be better informed of the proponent’s criteria concerning the awarding of contracts, and claimed that the proponent favours the tallymen affected by the project. Several people that worked on the proponent’s jobsites raised the problem of language: French is required for some jobs. Other complaints concern the need to obtain competence cards from the CCQ and life on the jobsites which is incompatible with that of the Cree society notably owing to a prolonged separation from their families.

At public hearings in Chibougamau and Montreal, in particular, many briefs and testimonials were presented in support of the implementation of the project, mainly owing to its significant economic spinoffs. Elected officials, development agencies and socioeconomic stakeholders, among others, emphasized the importance of hydropower development, not only for the Nord-du-Québec administrative region and surrounding regions, but also for all of Québec. One of the subjects raised in these two cities was the fragility of the regional economy and consequently the need to maximize economic spinoffs. For some stakeholders, this entails harnessing renewable energy to make it an engine of development and diversification of the regional economy and that of Québec as a whole.

Maintaining stable and well paid technical jobs, along with the need to ensure their attractiveness to youth, were also brought up. The importance of preserving and developing expertise in the field was also stressed, as this is one of Québec’s globally recognized advantages, an engineering success story and an asset in knowledge exporting.

Means to allow greater regional spinoffs were proposed by the stakeholders: permanent presence of Hydro-Québec decision makers and workers in the region and reduction of the minimum amounts of contracts reserved for the region--to allow smaller companies to participate--and inclusion of preferential clauses in contracts for the region.

Another advantage of the project is the positive impacts that the project could have on the increase in the number of tourists that come to visit the dams ($34 million per year and 300 jobs), because
the improvement in the infrastructures, in particular roads, should facilitate visits to the territory. Moreover, several Cree stakeholders at the public hearings expressed apprehension about the negative impacts of the project on hunting grounds and their ability to meet users’ needs.

6.6.2 ECONOMIC SPINOFFS OF THE PROJECT

According to the proponent, the implementation of the Eastmain-1-A and Rupert diversion project will generate economic spinoffs of nearly $2.4 billion for Québec overall. These include direct, indirect and infused spinoffs (salaries, corporate profits, household consumer spending). The Nord-du-Québec administrative region, where the project will be carried out, will benefit from 9% of the spinoffs.

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<th>BENEFICIARIES</th>
<th>VALUE ($ M)</th>
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<td><strong>ALL OF QUÉBEC</strong></td>
<td><strong>2 353.80</strong></td>
<td><strong>100</strong></td>
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</table>

In addition, the proponent estimates that the implementation of the project should generate jobs equivalent to over 27,000 person-years during the construction period.

<table>
<thead>
<tr>
<th>BENEFICIARIES</th>
<th>PERSON-YEAR</th>
<th>PERCENTAGE (%)</th>
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</tr>
<tr>
<td><strong>ALL OF QUÉBEC</strong></td>
<td><strong>27 028</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

For the Cree communities

The Boumhoun Agreement foresees that contracts with a minimum value of $240 million will be offered to Cree businesses during construction of the facilities, which will generate $104.9 million in spinoffs within the Cree territory (See Table 6.2), half in salaries and half in purchases of goods and services. Goods and services originating from regions outside the Cree territory represent $135.1 million (RP13, p. 75). During the period of operation, the proponent expects to allocate $45 million in contracts to Cree businesses, which could represent 282 person-years (DCAP15, p. 73).
The 1052 person years that the proponent plans to generate in Cree communities during construction will be distributed over the entire period of activity, and represent between 12 % and 17 % of all workers, or roughly the same proportion as for Eastmain-1. Note that the project includes works over the whole territory, from the Rupert River to La Grande Rivière, which should allow distribution of jobs over a large number of communities.

Table 6-4: Estimated proportion of Cree jobholders

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CREE WORKERS</th>
<th>PROPORTION OF CREE WORKERS (%)</th>
<th>ALL WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1</td>
<td>0.8</td>
<td>125</td>
</tr>
<tr>
<td>2006</td>
<td>204</td>
<td>16.7</td>
<td>1224</td>
</tr>
<tr>
<td>2007</td>
<td>460</td>
<td>11.9</td>
<td>3582</td>
</tr>
<tr>
<td>2008</td>
<td>805</td>
<td>13.4</td>
<td>5990</td>
</tr>
<tr>
<td>2009</td>
<td>757</td>
<td>14.1</td>
<td>5361</td>
</tr>
<tr>
<td>2010</td>
<td>346</td>
<td>12.6</td>
<td>2754</td>
</tr>
<tr>
<td>2011</td>
<td>28</td>
<td>12.6</td>
<td>223</td>
</tr>
</tbody>
</table>

Source: based on Figure 331-1, RP13, p.93.

Based on experience acquired at the Eastmain-1 facility, and to attain its objective for Cree participation, the proponent foresees the following optimization measures:

- A $1.5 million Training Fund for formal training and training at the workplace;
- Representations with the CCQ to facilitate employment for the Crees;
- Hiring of a Cree job counsellor.

The Boumhounan Agreement also foresees a number of funds, with a total value of $43.65 million, which will have positive repercussions on economic activity and job creation in Cree communities, both during and after construction. Some of these funds, the Boumhounan Fund for remedial works, for example, should extend over 15 years.

Table 6-5 Funds specified in the Boumhounan Agreement

<table>
<thead>
<tr>
<th>FUND</th>
<th>BUDGET ($ M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife Management Plan (Weh-Sees Indohoun Corporation)</td>
<td>0.75</td>
</tr>
<tr>
<td>Boumhounan Remedial Works Fund (over 15 years)</td>
<td>32.00</td>
</tr>
<tr>
<td>Boumhounan Fund for archaeological sites and burial grounds</td>
<td>2.50</td>
</tr>
<tr>
<td>Eenou Indohoun Fund</td>
<td>3.90</td>
</tr>
<tr>
<td>Training Fund (mentioned above)</td>
<td>1.50</td>
</tr>
<tr>
<td>Eastmain-1-A/Rupert Mercury Fund</td>
<td>3.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>43.65</td>
</tr>
</tbody>
</table>

Other spinoffs

At the Sarcelle site, the Boumhounan Agreement offers the Crees the choice between maintaining the existing regulation structure or participating in the construction and operation of a new hydropower generating station. The Crees have chosen the second option. According to verbal
information, the conditions of a business partnership for the La Sarcelle powerhouse are still under discussion between the Cree representatives and Hydro-Québec.

In the Cree Employment Agreement (Apatisiiwin Agreement), signed in March 2004, Hydro-Québec reiterated its commitment to take measures to ensure that by March 31, 2017, 150 Crees would hold permanent positions on the staff in the James Bay region. In 2004, 50 Cree students were enrolled in training for this purpose. The Apatisiiwin Corporation can also finance projects intended to improve the land use conditions for hunting, fishing and trapping.

The *Paix des Braves* foresees indexing of the annual amount paid by Québec. For each fiscal year, this indexing is established based on the increase in value of hydropower generation and forestry and mining activities on the territory. According to the proponent, the implementation of the Eastmain-1-A and Rupert diversion project will translate into an annual electricity output of 8.7 TWh. This increase should improve the indexing factor of the annual amount paid by Québec and consequently improve the potential of economic actions in the Cree communities.

The Boumhounan Agreement renews the Cree’s right of first refusal, enshrined in the Nadoshtin Agreement, of surplus assets designated by the proponent at the end of the works. This represents another economic advantage for the communities, organizations and trappers.

The Agreement Concerning a New Relationship between Hydro-Québec/SEBJ and the Crees of Eeyou Istchee, signed in March 2004, (R13) foresees the formulation of conditions to increase the participation of Cree businesses in contracts pertaining to operation, maintenance and repairs of hydropower developments.

Moreover, the projected increase of 893 MW of installed capacity on the territory will facilitate the integration of projects in the wind sector envisioned for the James Bay region. Lastly, marketable timber recovered during land clearing activities (see section 2.2) will be sent to Nabakatuk Forest Products in Waswanipi at the proponent’s expense, represents a major advantage for this Cree industry.

For Jamesians

Given the experience acquired and the optimization measures implemented during construction of the Eastmain-1 facility, which will be reinstated for this project, the proponent estimates that companies in the James Bay region can participate to a proportion of up to 4.5% of investments in the project, or $126 million, generating spinoffs of $106.65 million for the region. This amount includes direct spinoffs of $87.34 million, indirect spinoffs of $4.14 million and induced spinoffs of $15.18 million.

The capacity of companies and the availability of skilled workers are factors that limit greater participation of the region in the economic spinoffs of the project. The regional economic players, in particular the different focus groups are working with the proponent to find solutions to this problem.
Other economic spinoffs originate from the agreement concluded with the MBJ, which foresee a financial partnership of about $300 million over 50 years, if the project is implemented, for investment in the economic development of the region.

**Boom and bust economy**

Upon the request of the review bodies, the proponent has studied the potential influence that the “boom and bust” phenomena may have at the end of the project’s construction, particularly in Cree communities. (RP13, p. 99 to 103). According to current forecasts, the project will create 1052 person-years for the Cree over five years (Table 6.4). However, the number of jobs should decrease significantly in 2011.

According to the proponent, this decrease will be offset by the implementation of remedial works ($32 million for 15 years), and jobs related to the restoration of certain areas and maintenance of roads, camps and equipment, etc. It noted that many funds agreed to by Hydro-Québec and the Crees also offer job opportunities. The proponent notably mentioned its commitment to allocate $45 million in contracts to Cree businesses during the operating phase of the project.

The *Paix des Braves* enables the Crees to diversify their areas of activities by encouraging them to become more involved in forestry and mining development. This agreement provides Cree authorities with the financial means to support the long-term development of their communities. Lastly, the proponent pointed out that the expertise acquired by Cree businesses working on the project, along with the improvement in the education rate of participants in the various training programs, should increase their competitiveness at obtaining contracts or jobs.

**Follow-up by the proponent**

The proponent plans to monitor the economic spinoffs of the project annually during construction. This follow-up will notably cover the contracts awarded to Cree and Jamesian businesses, the hiring of regional workers, availability of labour in the communities and the efficiency of the optimization measures in the region. If will also conduct the follow-up at two periods during the operating phase of the project.

### 6.6.3 OBSERVATIONS AND CONCLUSIONS

Although the proponent has concentrated its analysis of economic spinoffs on the Nord-du-Québec administrative region, COMEX would like to mention the importance such a project will undoubtedly have for the Québec economy overall, an argument emphasized by several participants in the public hearings.

**Participation of regional businesses**

The expertise acquired by the Cree and Jamesian businesses during implementation of the Eastmain-1 project should allow them to benefit from a variety of means implemented by the proponent to maximize the economic spinoffs in the region. Given that, during the Eastmain-1 project, Cree businesses exceeded the objectives set by Hydro-Québec in terms of contracts, this situation will probably recur with respect to the $240 million projected (M70). The creation of the Cree Development Corporation is foreseen in Chapter 8 of the *Paix des Braves*, concluded between...
the Crees and Québec. Nonetheless, this possibility has not yet been followed up. COMEX considers that given the purposes and powers foreseen, such a corporation could help Cree businesses attain the objective mentioned above if it were established and provided with the necessary capital.

For Jamesian businesses, the pursuit of the dialogue between development promotion organizations and the proponent should facilitate their participation in contracts and purchases reserved for the region. At the public hearings, changes to these regional participation measures were requested. For example, an increase from $1 million to $5 million in purchases and contracts reserved as a priority for the host region was proposed. COMEX does not have sufficient data to rule on this subject and therefore considers that this problem should be the subject of discussions between the responsible authorities.

At the public hearings, some contractors described their positive experiences cooperating with Cree businesses. COMEX encourages the proponent to promote this type of cooperation, which will invariably decrease the tensions between the two communities and foster a better understanding between two groups.

Facilitate integration at work
Problems related to employment and health, such as alcohol abuse and isolation, were covered in Section 6.1. Certain other problems experienced by Cree workers were brought to the attention of the review bodies. In general, these problems can be described as difficulties with “integration on the jobsite.” These difficulties, although common to all isolated workers, are more pronounced among the Crees. The use of French as the working language requires adaptation not only by the Cree workers, but also by the proponent’s teams, who must show considerable flexibility. The proponent must put forth possible solutions in cooperation with the Cree Human Resources Development Agency or another valid interlocutor. One solution might be a transition period, with a translator onsite to help both the French-speaking and Cree members of a work team.

The dispersion of the project over a vast territory (about eight camps are foreseen) may make it very difficult for the single employment counsellor foreseen by the proponent to work effectively. COMEX believes that more than one Cree employment counsellor should be hired, to ensure an adequate presence not only in the camps but also on all jobsites. This will in turn allow the best possible integration of Cree workers.

Problems related to the Commission de construction du Québec (CCQ), such as the absence of a specific pool of labour for the region and the difficulty in obtaining competence cards, particularly for Cree workers, were mentioned on several occasions. The proponent has pledged to take the necessary steps with the CCQ to find solutions to these problems. In the Paix des Braves, Québec also pledged to implement administrative measures intended to facilitate access to jobs for Cree workers. COMEX considers that the proponent must continue to focus attention on this problem, because progress in this area should allow it to avert the disadvantages reported at the public hearings. The proponent should also institute a subsidy program for the hiring of Cree workers by non-Native contractors.

Training
Training is undoubtedly the most important means of granting the Crees greater accessibility to employment. Nearly half of the Crees that worked at Eastmain-1 expressed the need for more
advanced training. COMEX noted that several agreements foresee funds for training, both for jobs during construction and for future operation of Hydro-Québec facilities. All of these programs are now administered by the Niskamoon Corporation, which should generate better synergy among the programs. As this entity has expressed the desire to play the same role during the implementation of the project (M70), COMEX believes that this coordination will invariably increase the efficiency of training programs.

Moreover, COMEX considers that the Cree School Board and the Cree Human Resources Development Agency should be called upon to play a larger role in training. Given the impact of the project on several areas of activity in Crees communities, COMEX believes that the fields in which training is offered to the Crees should be extended to include subjects such as tourism, the environment, biology and any other area of interest related to hydropower developments and their environmental and social repercussions. Crees that completed advanced studies in various fields can better communicate with Hydro-Québec, can understand the technical aspect of proposals or solutions envisioned and can subsequently explain them in terms understandable to unilingual Cree speakers. The level of misunderstanding that the review bodies noted during the public hearings can thus be partly reduced.

**La Sarcelle powerhouse**

The review bodies would like to point out that the business partnership mentioned above concerning this powerhouse represents an excellent opportunity to increase the economic spinoffs of the project for the Crees and to help them acquire knowledge in the field of hydropower management.

The review bodies noted that the Boumhounan Agreement and the agreement reached with the MBJ foresees funds for implementation of various projects in the territory. For instance, the two agreements contain provisions for the creation of a fund for remedial works. Even if some of these projects may be subject to the environmental assessment process specified in Chapter 22 of the JNBQA, unilateral contradictory actions may cause both environmental and social problems.

To ensure the harmonious development of the territory consistent with the aspirations of all stakeholders, COMEX considers it necessary to implement means of coordinating actions foreseen by each party. Accordingly, COMEX believes that Hydro-Québec, the parent corporation of the proponent and the signatory of the two agreements, must ensure that this consensus-building takes place.

In addition, COMEX hopes that such cooperation between the Cree and the Jamesians occurs for all of the major actions foreseen on the territory.

**Developing and maintaining expertise**

During the public hearings, the stakeholders, notably the Association de l’industrie électrique du Québec (AIEQ), stressed the importance of the project for the maintaining and development of Quebec expertise in the field of electricity. In 2005, the electrical industry in Québec comprised more than 1000 establishments and generated over 32,000 jobs, along with 20,000 jobs at Hydro-Québec.
The large hydropower development projects carried out in Québec since the early 1970s have spawned a very dynamic sector that has subsequently achieved international recognition.

The sector includes firms specializing in construction of large facilities, along with equipment producers and manufacturers of parts, apparati and tools required for production generating stations, and power transmission and distribution systems. The province also boasts engineering consulting firms and professional services linked directly to this type of investment. Indeed, Québec companies are present at all steps of the implementation of a hydropower project. The AIEQ added that 70% of businesses’ knowledge is tacit, in other words accumulated through experience and used regularly, which underscores the risk related to the loss of experienced workers. This risk is even greater in Québec because the high average age of specialists is creating an imminent turning point, a changing of the guard, so to speak. A break in activities in this area at this critical juncture would hinder the intergenerational transfer of knowledge and could lead to the loss of expertise that is essential for the survival of this Québec industry (M50, p. 12).
7 SAFETY OF FACILITIES

Legal aspects
In Québec, before undertaking a dam construction or modification project, the proponent must obtain authorization from the ministry, as stipulated in the Dam Safety Act (R.S.Q., c. S-3.1.01), following analysis of the facilities by the Centre d’expertise hydrique du Québec (CEHQ), a body of the ministère du Développement durable, de l’Environnement et des Parcs. The Dam Safety Regulation supplements this legislation by specifying the various studies to carry out and the standards to follow. The Act and the Regulation apply to all of Québec, including the territory covered by the JBNQA.

In force since April 11, 2002, this Act ensures dam safety and protection of people and property from all risks associated with dams. It applies to all structures over 1 m in height intended to divert or retain water from watercourses or a reservoir. It covers various aspects concerning dam design, construction, repairs, monitoring and operation.

Under the Act, to obtain authorization to carry out the project, the proponent must submit the plans and specifications of the water retaining structures to CEHQ, along with the technical reports from hydrological, hydraulics and stability studies, etc. supporting their design. During the project analysis, CEHQ verifies that the dam design complies with the safety standards prescribed by the Act and that the plans and specifications comply with good practices. The safety standards notably cover resistance to floods and earthquakes. Following authorization of the project by the Provincial Administrator, specified in Chapter 22 of the JBNQA, CEHQ carries out a detailed analysis of the project structures.

The proponent must prepare and implement a water impoundment management plan that includes measures taken to safely manage the water impounded during the operation of the dam. It must also put in place an emergency measures plan and a monitoring activity plan.

Sizing of facilities
The project includes implementation of four earth-fill structures (See section 2.2.1) namely:
- The Rupert River dam (C-1): located at KP 314 of the Rupert River, this dam is 474 m in length and 29 m in height. It is equipped with a spillway with a capacity of 3,470 m³/s, corresponding to the maximum probable flood flow defined as the hypothetical high flow, originating from the combination of the most severe events that could occur. This spillway will be used to evacuate ecological instream flows and discharge when the additional inflow is greater than the flow in the tunnel, namely 800 m³/s;
- The Lemare River dam (C-R-21A): located on the Lemare River, this dam is 579 m in length and 19 m in height. It includes a structure that restores the natural flows of the river, allowing a mean annual flow of 16.2 m³/s and has a maximum capacity of 88 m³/s;
- The Nemiscau River-1 dam (C-76): located on the northern arm of the Nemiscau River, this dam is 810 m in length and 12.9 m in height. It includes a structure that restores...
the natural flows of the river, allowing the passage of a mean annual flow of 11.6 m$^3$/s and has a maximum capacity of 74 m$^3$/s;

- The Nemiscau River-2 dam (C-108): located on the southern arm of the Nemiscau River, this dam is 230 m in length and 9.4 m in height. It includes a structure that restores the natural flows of the river, allowing the passage of a mean annual flow of 2.0 m$^3$/s and has a maximum capacity of 6 m$^3$/s.

Aside from the four new dams, the diverted waters of the Rupert River will pass through the facilities of La Sarcelle, and the La Grande-1 and La Grande-2 dams on the La Grande Rivière. The proponent considers that the increase in flows will not jeopardize the safety of the La Grande-1 and La Grande-2 dams, which are already built and that will not be modified, nor to the La Sarcelle facility, after modification.

**Safety of the facilities**

The assessment of dam safety foreseen in the Dam Safety Act is intended to verify the status, stability and functioning of the dam, compliance of its design and construction with good practices and safety standards, and to determine, if applicable, remedial measures to be applied to improve safety.

Some of the retaining structures of the La Grande complex, such as the La Grande-1 and La Grande-2 facilities, have already undergone a safety assessment conducted by Hydro-Québec and transmitted to CEHQ. These evaluations demonstrated, to CEHQ’s satisfaction, that the facilities comply with good practices and safety standards applicable to resistance to high flows and earthquakes. All of the proponent’s other dams have already been or will undergo a safety assessment.

In 2003, the global safety program for all the proponent’s hydropower facilities in Québec was approved by CEHQ. This approval is valid for five years, and must then be renewed. The monitoring activities proposed in the safety program exceed the standards foreseen by the Dam Safety Regulation.

**Monitoring of facilities**

The Dam Safety Regulation specifies that monitoring of all dams and dikes at a facility shall include:

- site inspections, carried out to detect more apparent deficiencies and determine the general condition of a dam following major events such as floods, earthquakes and windstorms;
- regular inspections, carried out to ensure continuous monitoring of the dam in order to detect or monitor any deficiency or deterioration;
- formal inspections, carried out to monitor the behaviour of the dam and to determine the condition of each of its components or parts.

In its impact assessment, the proponent undertakes to ensure that its operations will not create situations that could imperil the riparian population, its employees and the environment (RP19). To do so, it will take preventive measures such as having the facilities monitored by qualified employees, inspection of the dams using special instruments, verification of the dams according
to a preset frequency, verification of evacuation works by maintenance and gate lifting tests, along with maintenance works (RP19, p. 8).

For example, the proponent has close to 200 instruments permanently installed at the La Grande dam to monitor the structure (VPA38, p. 56). It also mentions that over 50 inspections of the facilities are carried out each year at the La Grande complex.

Emergency actions by the proponent
To protect the population, the environment and property, the proponent has established emergency response plans for all disaster situations that could occur at existing hydropower facilities. (RP19, p. 8). Equivalent emergency actions will also be put in place for the project facilities.

To prepare for any eventuality during construction of the facilities, an emergency measures plan in case of an incident or accident related to the safety of dams or temporary structures will be in effect (RP14, p. 4-82) as soon as the works begin at the jobsite (RP13, p. 139). The proponent noted that this emergency measures plan will cover situations such as serious accidents (at work, in the air, on roads, underground, etc.), interruptions of the power and drinking water supply, fires, epidemics, accidental spills of contaminants or toxic products, freezing rain, tornadoes, earthquakes, failure of the dam or bomb threat (RP13, p. 139).

Moreover, before the project operations begins, an emergency measures plan will be prepared by the proponent. This plan will meet the requirements linked to civil security, fire safety and dam safety. The emergency measures plan of Native communities and those of the civil security authorities will integrate the events that may be caused by the proximity of the hydropower facilities comprised in the project. In addition, several times a year, the proponent will carry out different types of emergency simulations. It can then adjust its emergency actions as needed.

Proponent’s assessment
A vital element in the planning of a dam project is design, whereby the proponent produces a structure that will be safe over the long-term, that can withstand the maximum level in the reservoir and that will not cause any accidents. According to the proponent, its “conservative” design criteria are constantly reviewed to take into account changes in expertise in this area (VAP38, p. 42). Spillways foreseen as part of the project, along with those of the La Grande complex, are sized to discharge the probable maximum flood, whose probability of occurrence is almost zero.

In planning the emergency actions to take during operation, in case of accident or breakage of the dam, the proponent must present, for each dam, a detailed assessment of the consequences of the hypothetical failure of the dam that includes specifying the area potentially affected. This dam failure scenario is required by the Dam Safety Regulation. It corresponds to the worst case scenario because the data used to calculate the high flow wave resulting from the failure are extreme data both with respect to the breach in the structure and the high flows that accompany the failure. This approach is very safe and conservative. Performing this assessment in no way implies that the events will occur, but rather it is used as the basis for an emergency actions plan.
The proponent has assessed the dam failure consequences for the four main facilities foreseen as part of the project, as well as for the OA-03 dike constructed during the development of the La Grande complex, adjacent to the site of the planned La Sarcelle hydropower generating station (RP19 and RP20). The proponent has presented the findings of its simulations and produced maps illustrating the maximum floods in case of failure of the facilities.

In case of failure of the Rupert dam, the simulations indicate that the failure wave front would reach the Route du Nord in 30 minutes. The maximum increase in water level to the right of the bridge would reach 17.51 m 26 hours after the rupture and would completely destroy the bridge. The failure wave front would reach the height of Old Nemaska 16.5 hours after the failure. The increase in maximum water level in Nemiscau Lake would reach 4.27 m almost 40 hours after the failure. Lastly, the failure wave front would reach the village of Waskaganish 47 hours after the dam fails. The increase in maximal water level of 1.61 m, would occur 66 hours, or slightly less than three days, after the dam fails, which is sufficient time for the necessary measures to be taken to ensure the safety of the residents.

The proponents considers that the safety of the La Grande-1 and La Grande-2 dams, located on the La Grande Rivière, is in no way compromised by the projected 14% increase in flows entering their reservoir. Given the impoundment capacity of the reservoirs and the fact that excess flows will serve to increase the output of generating stations, the current maximum level of operation defined in the JBNQA for reservoirs will not be changed. In addition, the spillways of these two dams have maximum spillage capacities that exceed the respective maximum probable floods.

Regarding earthquakes, the proposed and existing facilities of the La Grande Complex are situated in the zone of lowest seismic intensity in Québec (RP13, p. 145). The risk of an accident caused by an earthquake is therefore very limited.

Moreover, the new relationship agreement between Hydro-Québec/SEBJ and the Crees of Eeyou Istchee, signed in March 2004, notably by the Cree Nation de Chisasibi (R13), foresees obligations intended to ensure the safety of this community. These obligations include monitoring of hydropower facilities, communication to the Crees and the creation of a high ground park. Although monitoring of the facilities is required by the Dam Safety Regulation, the proponent has restated its commitment to the Crees by specifying in the agreement that it would apply monitoring programs at its facilities, dikes, generating stations and retaining structures of the La Grande complex to be able to evaluate their behaviour and stability at all times.

The proponent has also pledged to inform the Crees of the nature, span and extent of its monitoring programs for the La Grande Complex on a yearly basis. The Crees may comment on or question these programs. It will also help the community of Chisasibi to prepare and update its emergency measures plan. Moreover, in concert with Chisasibi, the proponent has agreed to create, at its own expense, a High Ground Park Development near the community to safely shelter the residents of this community in case of emergency. The proponent will grant $2 million as a contribution for the facilities and recreational and tourism equipment intended for this high ground park.
Concerns expressed by the population
At public hearings, dam safety was one of the important issues in the Cree communities situated near the bodies of water affected by the diversion of the waters of the Rupert River. At Nemaska, the subject was raised by Cree trappers whose traditional hunting grounds are situated near or downstream from the Rupert dam.

Dam safety was also one of the main concerns expressed by the Crees of Chisasibi. As this community is located downstream of the La Grande-1 and La Grande-2 hydropower facilities, the Crees are very worried about a catastrophe that could destroy the facilities. Given the implementation of the Eastmain-1-A project, the additional inflow of water in the Robert-Bourassa and La Grande-1 reservoirs would heighten their fears and stress level.

The sources of risks that could damage the facilities notably include terrorist acts and earthquakes, which are considered by the Crees as events that will occur sooner or later. Several said they had dreamed about the disappearance of their community following the destruction of the dams. Some Crees want the community to be moved to a safe location, while others fear that the community will have to be moved again.

Some Crees in the communities of Mistissini, Eastmain and Wemindji also raised the question of dam safety. The leader of the Eastmain community notably mentioned that he hoped the population would be kept constantly informed of the safety aspects and compliance assurance programs. Others consider that the implementation of dam failure scenarios by the proponent and the initiative of building a safe place for the Crees of Chisasibi, carried out in concert with the community, confirm the real possibility that these facilities will fail one day.

Conclusion
Given the legislation in force concerning dam safety and the fact that the proponent must obtain authorization from the CEHQ to carry out its project, COMEX considers that the facilities and the population will be safe during the construction and operation of the project. The proponent’s safety programs, along with monitoring programs, are well planned and rigorous, and allow quick detection of the slightest sign of deficiencies, which can thus avert accidents. COMEX considers that the proponent can resolve any problem related to weakness in a dike or dam before the structure begins to endanger public safety, hence the importance of Cree participation in the monitoring programs.

It would be preferable that the proponent's emergency measures plan concerning the construction period be available before work begins at the project jobsite. The emergency measures plan concerning the operation phase should be available to the responsible authorities prior to the operation phase of the project.

Moreover, COMEX noted during the public hearings, that the population considers dam safety very important, and that a lack of understanding and information is behind the various misperceptions and worries. Communication problems between the proponent and the population, and the
fact that the subject is complex and includes numerous elusive technical aspects seems to underlie these perceptions and concerns. The proponent should continue to provide information, transfer knowledge and promote popularization to demystify the issue of dam safety, particularly the real significance of hypothetical failure scenarios. The same applies to the impounded water management plan. The proponent should notably include the Crees in the inspection and monitoring of the facilities to restore confidence within the communities. The proponent should inform the leaders of the Cree communities and Cree organizations of its strategies in this area and invite them to participate in their formulation and application.

To avoid problems due to high flows, although this eventuality is improbable given the characteristics of the watershed and the presence of large lakes, in particular Mistassini Lake, the proponent should inform the population concerned of the warning system foreseen during the opening of the gates of the dams on the Rupert River, and make any necessary improvements.

COMEX considers the failure scenario a theoretical exercise, whose probability of occurrence is, for all intents and purposes, nonexistent. The purpose of the exercise is to prepare a safe emergency measures plan. Moreover, even if this scenario would materialize, damage to both Waskaganish and Nemaska would be minimal and the population would have ample time to secure any property situated near the waterways.

The fact that the proponent has agreed to put in place a high ground park, to dispel some of the Chisasibi Crees' fears of “an improbable or unforeseen catastrophic event” should not be considered proof of real anticipated risks of accidents associated with dam safety. The onus is on the proponent, in cooperation with the Chisasibi authorities, to ensure that the people concerned understand the situation well. COMEX thinks that the population should fully use the recreational and tourism facilities that the proponent has pledged to finance on this high ground park (R13).

Lastly, COMEX believes that the safety measures in place at the La Grande complex, specified in the Agreement Concerning a New Relationship between Hydro-Québec/SEBJ and the Crees of Eeyou Istchee (R13), should serve as a model to establish a similar agreement between the proponent and the Crees of Nemaska and Waskaganish for the monitoring of facilities foreseen in the project and the publicizing of the compliance assurance program and its findings.
8 CUMULATIVE EFFECTS

8.1 LEGISLATIVE FRAMEWORK

Schedule 3 of Chapter 22 of the JBNQA states that an impact assessment must if necessary take into consideration all direct, indirect and cumulative impacts, as well as short and long-term impacts and reversible or irreversible impacts. As regards the project being assessed, the directive for preparation of the impact assessment issued in July 2003 (P2) requested that the proponent identify and assess all of the project’s cumulative environmental and social impacts in combination with the effects of other works or activities over the past 30 years, and any effects that could be reasonably foreseen over the next decade. This directive asked the proponent to identify valued components subject to the assessment of cumulative effects, suggesting a list of 9 factors to consider:

- wildlife and plant species at risk;
- fish and their habitat, notably the lake sturgeon in the Eastmain and Rupert rivers, as well as the Smokey Hill lake cisco;
- the increase in bodies of water with high fish mercury levels;
- bird fauna and habitats, notably the harlequin duck and migrating birds;
- land animals and their habitats, notably woodland caribou;
- the Cree people’s health and quality of life;
- hunting grounds and their use by the Crees;
- the transfer and usefulness of traditional Cree knowledge as to the territory’s rivers subsequent to the diversion of numerous rivers over the past 30 years;
- recreational tourist activities, among them hunting, fishing and wild water boating.

Methodology used by the proponent

To assess cumulative effects, the proponent followed the user guide prepared for the Canadian Environmental Assessment Agency (R14), which emphasizes solely cumulative biophysical effects, seeing that most of the data available on assessment methods and examples of cumulative effects address these same elements. According to this guide, the authorities involved are responsible for determining whether the assessment of cumulative effects must consider factors such as sanity and socioeconomic conditions, physical and cultural heritage, and other environmental effects.

In order to determine the valued ecosystem components (VECs) to be assessed with regard to cumulative effects, the proponent examined the nine themes listed in the directive, based on the four selection criteria below:

- the component is considered of value by the communities concerned or by the scientific community;
- the possibility of assessing the cumulative effects on the component as a result of the addition or interaction, over time, of direct or indirect impacts through several interventions;
- the possibility of foreseeing or measuring cumulative impacts on a large territory or over a lengthy period of time;
- the existence of reliable data for the component dating back over the past 30 years.
8.2 CUMULATIVE EFFECTS SELECTED BY THE PROONENT

Given that the analysis of cumulative effects must use quantitative techniques based on the best available data, the proponent decided that only the following 3 topics, of the 9 suggested in the directive, could adequately meet the basic criteria for an analysis of cumulative effects:

- fish mercury levels and consumption recommendations;
- hunting, fishing and trapping by Crees;
- recreational boating (canoe and kayak).

A fourth topic was added to the list following a question asked the proponent during the compliance analysis of the impact assessment. It consists of the transmission and usefulness of traditional knowledge of the rivers diverted for hydropower generation (COE11).

The proponent did not retain the other topics included in the directive, notably on the following grounds: historical reference data are incomplete and sometimes missing; anticipated impacts may be considered minor based on impact assessment data; the recognized method did not allow for conducting a reliable assessment; or, the true project impacts may have been cloaked by factors outside of the assessment zone over which it had no control. The proponent notably did not choose the quality of life of Crees, considering that the cumulative effects related to its project were impossible to assess. Furthermore, the proponent estimated that the project’s residual effects on those elements selected within the framework of the impact assessment to determine quality of life and social cohesion would be positive or nil, as the case may be.

In analyzing cumulative effects, the proponent selected the primary drivers of change within the territory over the past 30 years, namely:

- changes in the river system;
- development of the road network;
- development of the power transmission system;
- forest fires;
- the JBNQA, the Paix des Braves and other agreements

The spatial boundary adopted by the proponent covers around 350,000 km² and includes the municipalities of James Bay, Chibougamau, Chapais, Lebel-sur-Quévillon and Matagami, as well as Category I lands south of the 55th parallel. This represents around 25% of the entire Québec territory. As regards the JBNQA, the Paix des Braves and other agreements, the reference zone selected by the proponent is the entire territory covered by these agreements.

The proponent set temporal limits for a period of around 40 years (30 years in the past and 10 years in the future). 1975 was selected as the baseline year for the past, as it corresponds to the start of construction of the La Grande Complex. For recreational boating, however, the proponent selected 1973 as the baseline year, seeing as this marked the publication of the Fédération québécoise de canot et de kayak’s (FQCK) first guide. For the future, the proponent set the cut-off date at 2015, except for the issue of fish mercury levels, where this date was set at 2030.
8.2.1 FISH MERCURY LEVELS AND CONSUMPTION RECOMMENDATIONS

Pursuant to its detailed analysis of mercury levels in section 16.3 of its impact assessment, the proponent assessed cumulative effects for the following elements:

- the number of environments where the project will entail an additional restriction on fish consumption, compared to the baseline;
- the duration of this additional restriction.

An increase in fish mercury levels is linked to flooding of land through the creation of reservoirs and diversion bays, as well as to the exporting of mercury to diversion channels. For the analysis of cumulative effects with regard to consumption restrictions, the baseline corresponds to the recommendations in force for adults in general and regarding fish from natural bodies of water in James Bay, based on average mercury concentrations among primary species. Specific recommendations for groups at risk (pregnant women, children, etc.) will notably be formulated with regard to the management of health risks. The proponent hence addressed cumulative effects within the perspective of prolonging consumption restrictions.

The project will generate increased mercury levels in fish in six environments:

- the Eastmain-1 Reservoir;
- the Rupert upstream diversion bay;
- the Rupert downstream diversion bay;
- the Rupert River, immediate downstream of the control structure;
- the Lemare river, immediately downstream of the flow release structure;
- the Nemiscau river, immediately downstream of the 2 flow release structures.

Based on data from various proponent assessments, recommendations regarding consumption prepared for adults in general and targeting fish from environments affected by the La Grande Complex will be the same as those in the region’s natural environments, and this as of the first summer following the onset of the project, namely in 2010. However, additional restrictions will continue to apply to the Eastmain-1 Reservoir, whose impoundment was recently completed.

As regards fish consumption recommendations, there will an additional consumption restriction for adults in general and according to the baseline for the 6 affected environments listed above, except for the Rupert River immediately upstream of the control structure. In the case of the Eastmain-1 Reservoir, fish consumption restrictions will be prolonged for one year.

The proponent estimates that a return to consumption recommendations equivalent to the baseline will occur between 2016 and 2021 for the lake whitefish, in 2024 or 2025 for the northern pike, in 2026 or 2028 for the walleye and in 2028 for the lake trout. According to the proponent, by 2028 consumption recommendations will be the same as the baseline for all species in the six environments affected by the project.
8.2.2 CREE HUNTING, FISHING AND TRAPPING

The zone selected by the proponent includes all of the traplines used by Crees south of a latitude of 55°30’N, which represents a territory of around 368,800 km². To assess cumulative effects, the proponent focused its analysis on the availability and accessibility of traplines and resources for Crees. The indicators selected are the following: size of available traplines; length of available rivers; harvesting rights with regard to wildlife resources; and, development of support programs for Cree trappers.

Crees access their traplines with transportation means appropriate for the distances to be travelled and limited by the financial resources at their disposal. Some still travel by canoe, while others prefer travelling by vehicle, snowmobile or airplane. There has been a drop in visits to traplines, given the high costs of travelling to remote corners of the territory and a certain degree of sedentation. Resources are increasingly harvested closer to villages, regardless of whether communities are in the south or north sections of the territory.

Between 1975 and 2004, the availability of traplines and resources throughout the territory changed as a result of hydropower projects, the development of the road network, growth in the power transmission system and disturbances in the forest cover (fires and woodcutting).

Changes in the river system due to the La Grande Complex had an impact on the Crees’ use of the environment and resources. For example, trapping and hunting are no longer possible in those areas flooded by reservoirs or diversion bays. Furthermore, while as many fish can be caught in reservoirs as in the natural environment, high fish mercury levels in the former have caused Crees to limit their fishing activities. Use of reservoirs is also limited by navigation-related problems, but mitigation and compensation measures for tallymen have gone a long way towards facilitating access to these new bodies of water. In 2001, mercury levels were comparable to those in the natural environment, except in the case of piscivorous species. Despite this decrease in mercury concentration, numerous Cree fishermen still have a negative perception of the quality of the fish to be caught in these reservoirs and restrict their fishing activities accordingly. The proponent has thus decided to consider the environments incorporating reservoirs as ‘lost’ for the purposes of analyzing cumulative impacts.

As regards rivers whose flow has been modified, the proponent feels that generally speaking, these reduced-flow rivers revert over time to productive environments for waterfowl and small and large wildlife. Use of reduced-flow rivers has decreased due to the increasingly limited accessibility of certain reaches not concerned by a control structure and by the decreasing interest in these sectors by Crees. The proponent has noticed that Crees practice little activities in increased-flow reaches, and has thus decided to consider the reaches of rivers whose flow has been modified for the purposes of analyzing cumulative impacts.

The proponent identified 39 rivers used by the Crees for hunting, fishing and trapping. These cover a total of 8,325.5 km. The La Grande Complex flooded 1,042.4 km (12.5%) of this total length and changes in flow further decreased the possibility of hunting, fishing and trapping over an additional 530 km (6.4%) of river. With the execution of the Eastmain-1-A and Rupert diversion project, the proponent estimates that there will be 1,167.5 km (14.0%) of flooded rivers and an additional 698 km (8.4%) where hunting, fishing or trapping is no longer possible due to modified flow. However, it considers that traditional activities can still be practiced in the 314-km reach of
the Rupert River downstream of the cutoff point, and this as a result of the ecological instream flows and planned mitigation measures. Once the project is completed, the proponent concludes that 6,627 km of river (19.6%) will still be available for practicing traditional activities, which means there will have been a cumulative effect on hunting, fishing and trapping activities on 1.5% of available rivers.

According to the proponent, roads enable Crees to reach their traplines more easily, with more flexibility and at a lower cost. The presence of numerous Cree camps along the sides of the roads attests to their frequent use. Generally speaking, tallymen whose traplines cross these roads confirm that lakes near roads are overfished. In addition, moose are rarer there. Lacking precise information, the proponent refrains from quantifying the use of roads by Crees or the repercussions of roads on hunting, fishing and trapping activities. The project framework includes, as per the Boumhouanan Agreement and at the Crees' request, construction of the Muskeg-Eastmain-1 road and the road connecting to circuits 7069-7070. Moreover, access roads to hydraulic structures will only be retained at the request of the tallymen concerned.

In the proponent’s opinion, seeing as hunting, fishing and trapping by Crees will not be compromised by any of the planned actions or events, this valued ecosystem component will not require any mitigation or follow-up measures other than those also provided for by the project.

### 8.2.3 RECREATIONAL BOATING (CANOE AND KAYAK)

Subsequent to its assessment of cumulative effects on recreational boating, the proponent has opted to use indicators based on critical evaluations already used by canoe specialists in Québec (notably, the FQCK). The higher degree of value corresponds to intact river canoe routes, followed by changed rivers that are still attractive for canoeing in light of an appropriate flow.

The proponent identified 32 rivers with canoe routes in the James Bay territory, to which it added 2 rivers further north which are impacted by the La Grande Complex (Caniapiscau and Koksoak). According to the proponent, the total length of these two rivers within the reference territory for the cumulative impact assessment is 8,380 km. The total length of the rivers and reaches intact for the purposes of recreational boating, after the development of hydropower projects, is around 6,470 km, or 77% of the total. According to the proponent, 27 of the 34 rivers in the assessment zone were not modified by the development of the La Grande complex.

Before 1974, rivers in the James Bay region, north of the Rupert River, could only be accessed by floatplane or waterway. Around the mid-80s, the territory was connected to the rest of Québec by a road, thereby offering boaters and kayakers access to certain rivers, among these the Rupert, the Opinaca, the Sakami and La Grande Rivière. According to the proponent, this region’s remoteness and distance from major urban centres, the difficulty accessing the bodies of water by road, the significant logistics required for long expeditions and the short summer season could all be factors explaining the low number of visitors.

Between 2004 and 2015, the total length of the 34 canoe routes identified by the FQCK that were modified by hydropower projects went from 1,909 km (23%) to 2,393 km (29%). Upon performance of the project, the developed portion of the 8 rivers impacted by hydropower projects will jump from 45.6% in 2004 to 57.2% in 2015. However, according to the proponent, all of the rivers would retain entirely navigable reaches.
Seeing as the 31-km reduced-flow reach of the Rupert River would remain navigable, the proponent considers that the cumulative impact of the Rupert diversion on the navigability of canoe routes in the James Bay region is "rather low". The proponent also concludes that the river’s ecological minimum flow regime and hydraulic structures will continue to represent conditions appropriate for navigation, and this on all previously navigable reaches of the river. The rapids modified by the construction of hydraulic structures were already all considered inappropriate for navigation by the FQCK in light of their being too powerful or having too great a slope. However, changes in the Rupert River could generate a decrease in interest by users who prefer to boat in intact natural environments.

8.2.4 THE TRANSFER AND USEFULNESS OF TRADITIONAL CREE KNOWLEDGE AS TO THE TERRITORY’S RIVERS SUBSEQUENT TO THE DIVERSION OF NUMEROUS RIVERS OVER THE PAST 30 YEARS

In terms of the transfer and usefulness of traditional Cree knowledge as to the territory’s rivers, subsequent to the diversion of numerous rivers over the past 30 years, review bodies asked the proponent, when doing the compliance analysis of the impact assessment, to examine the possibility of gathering data and information from middle-aged and elderly people, as well as from available anthropological publications (COE11).

According to the proponent, while there are certain publications on Cree fishing activities for the downstream increased-flow portion of La Grande Rivière which allude to certain knowledge of this river, there is no publication that specifically describes traditional Cree knowledge regarding reduced-flow rivers of the La Grande Complex. An assessment of the cumulative impacts should thus be impossible, given the lack of information for determining a baseline for the various traditional knowledge regarding these rivers prior to their diversion, as well as the lack of publications on the impacts of diversion of these rivers, the process of transmitting knowledge, putting it into practice and ensuring its mastery by future generations. However, the proponent has obtained certain information from interviews of Crees who use the Eastmain and Opinaca rivers, and this as part of the follow-up of social impacts for the west sector of the La Grande Complex, (RP13).

Crees generally transmit knowledge to members of their own family. As an indication of this sharing of knowledge, the proponent has retained family ties between current tallymen and those responsible for the traplines of reduced-flow rivers of the west sector of the La Grande Complex in 1977-78 (more specifically, the Sakami, Eastmain and Opinaca rivers, and Petite rivière Opinaca). Of eleven such tallymen, five held this position in 1977-78, five took over from their fathers, and 1 succeeded his uncle. Seeing as use of the traplines continued, the proponent assumes that transfer of knowledge within families likely occurred.

The assessment of social impacts indicates that Crees use the reaches of the Opinaca and Eastmain rivers that have been modified by a groundwater dam. The proponent hence assumes that the same will hold true for the Rupert River. Furthermore, the proponent considers that the maintenance of an ecological instream flow for the Rupert River would enable the transfer of knowledge, including that concerning reaches not impacted by a groundwater dam.
In the Rupert diversion bay sector, flooding of six traplines could compromise specific transfer of knowledge, given that the exact location and features of fishing grounds would be affected. However, knowledge regarding traditional techniques such as the setting of fishing lines can also be transferred and may ensure continuity in use of the overall environment.

### 8.3 CONCERNS RAISED DURING THE PUBLIC HEARINGS

During the public hearings held in the spring of 2006, numerous comments and questions from stakeholders alluded to the cumulative effects of development projects on the James Bay territory, over the past thirty years, which have had a marked effect on Cree society. The social and environmental impacts of the La Grande Complex and other projects were notably raised, as were the cumulative impacts of hydropower projects, combined with forestry and mining projects, on the physical, mental and spiritual health of Crees in the Nord-du-Québec region, the cumulative impacts of fish mercury levels, the effects on the James Bay and Hudson Bay eelgrass and marine environment, as well as on the availability of the Crees' traditional food. Despite the fact that stakeholders mentioned having observed these major changes over the past few years, notably with regard to their traditional lifestyle, culture and biophysical environment, they were numerous in admitting to a difficulty in measuring the actual scope of all of these changes, while nonetheless remaining afraid that the problems already experienced would only be exacerbated by the project being considered and other future projects.

These hearings also reminded the review bodies of the difficulties inherent in assessing cumulative effects on the Eeyou Istchee territory. These difficulties included: all of the gaps or failures with regard to the analysis of every project; restrictions due to the analysis’ spatial boundaries; the apparent absence of limits as regards hydropower development in the Nord-du-Québec region, compared to the modifications and limits considered acceptable by the Cree population; the necessity of having an independent analysis of these cumulative environmental and social effects conducted by an entity independent from the proponent; the importance of using traditional knowledge; and, the necessity of involving Crees in follow-up programs so as to obtain their input on the cumulative effects of development projects.
8.4 COMEX ANALYSIS

8.4.1 GENERAL CONSIDERATIONS

While not mandated to do so by a specific directive, the proponent followed the user guide prepared by the Canadian Environmental Assessment Agency. At present, this is the only official guide available. The approach recommended in this guide focuses on an assessment of biophysical rather than socioeconomic impacts, given that most of the information and examples of cumulative impact assessment methods involve biophysical impacts (R14). Its scope is thus limited, and the process is not easily applicable to the JBNQA’s environmental assessment process, which incorporates social impacts.

In assessing cumulative impacts related to the project, the directive stipulates that impacts from other works or activities currently existing or completed over the past 30 years should serve to establish the baseline time boundary for the assessment. This requirement aims to determine the situation prior to hydropower development, as a reflection of the baseline situation of Cree communities in the James Bay territory. Because it had not been deemed a current practice (and hence, judged not required) to perform environmental assessments at the time of initiating the La Grande Complex works, the proponent was unable to provide quantitative scientific and social data for this baseline.

While anthropological documents dating back to this period or earlier do provide, although not systematically, observations on the way of life of Cree populations, these cannot be easily adopted to serve as baseline conditions for biophysical and social elements. In this latter regard, the proponent could have referred to the available anthropological reference to improve its analysis.

COMEX considers that within this framework, the proponent’s decision to reject most of the biophysical elements, given a lack of quantified data, is reasonable. Certain documents produced by Hydro-Québec (notably, OED32) nonetheless illustrate that an assessment of cumulative impacts that included certain biophysical elements (among them caribou and waterfowl) could have been conducted had the timeframe not been established by the directive, despite doubts in this regard.

Data acquired through environmental follow-up subsequent to Phase 1 of the La Grande Complex, along with impact and follow-up assessments conducted during subsequent phases, could have been used in the quality of a baseline.

The proponent quickly rejected certain elements because residual project impacts on these were considered positive or nil (fish populations and Cree quality of life). The mere fact that an impact assessment for a project element is positive overall does not mean that the same conclusions will be reached in the case of an analysis based on cumulative effects for previous and future years. The purpose of conducting cumulative effects assessments is to determine whether past activities, activities related to the project under consideration and future activities have an effect on the element in question. In this regard, the proponent would have benefited from extending the scope of its assessment of cumulative impacts of the element concerning the overall quality of life of Crees.

Testimonials heard during the public hearings held in Cree communities illustrate that each of the communities is already affected to a certain degree by various projects (construction of the La Grande generating stations, creation of reservoirs, construction of roads and power transmission lines, etc.) or disturbances (relocation of the communities of Nemaska and Chisasibi) on their respective territories. For certain communities, more specifically Chisasibi, the physical effect on their hunting grounds and community areas, combined with the speed with which projects were executed,
have had an undeniable negative impact. An interpretation of the testimonials heard during the hearings leads us to believe that the unconscious assimilation of negative social impacts has led to an embellishment of the past, uncertainty with regard to the future and a poor vision of development potential. Past hydropower projects, associated to various social phenomena, appear to have changed Cree society as well as its self-perception, so much so that Cree communities have few projects in mind, given the scope of the hydropower giant’s initiatives.

Various factors such as the magnitude of the physical impacts on the community’s territory, the attitude of proponents with regard to Crees and the territory, the era during which projects or disturbances occurred, the dissemination of information and the involvement (or not) of Crees in the project’s development and implementation, the proximity of southern communities, the development of the road network, the presence of other types of development within the territory, and the Cree society’s demographic structure all probably had an effect on the distress of communities and their ability to forge ahead in spite of adversity and past challenges. Despite the cumulative nature of these impacts, they are hard to distinguish and therefore difficult to assess. The cumulative effects of the project being studied will complement an already large and complex ‘baggage’, and this in a territory that has experienced rapid and intense development over the past 30 years (see map 8.1).

In considering whether or not the cumulative effects of an additional hydropower project, albeit within the framework of a government agreement (the *Paix des Braves*), will have generally negative, positive or neutral repercussions on Cree communities, COMEX is of the opinion that the cumulative effects of this latest project can only be determined through a wide-scale and long-term follow-up of social impacts on Cree society. For future assessments, the permanent presence of COMEX, supported by the necessary resources, will ensure continuity as regards knowledge of the territory and its development, which will notably be taken into consideration during the analysis of all potential projects.
8.4.2 SPECIFIC THEMES SELECTED BY THE PROONENT

Fish mercury levels and consumption recommendations
Additional restrictions regarding fish consumption in terms of the current situation (presence of the Eastmain-1 Reservoir) must be applied to five of the six environments identified in section 8.2.1. Anticipated mercury levels in the Rupert River, even immediately downstream of the control structure, will not be high enough to warrant recommending additional consumption restrictions. The duration of these restrictions varies from one environment to the next and from one species of fish to the next, but can vary from 4 to 16 years. COMEX believes that according to the selection criteria and indicators, the analysis of cumulative effects with regard to mercury levels and consumption recommendations is satisfactory.

This being said, new increases in mercury concentrations could serve to exacerbate the fears expressed by many Crees of seeing their living environments even further contaminated. The proponent is highly cognizant of the scientific aspects of mercury contamination of environments and individuals. And while the proponent must contribute, at least financially, to providing information and increasing citizens’ awareness of the risks and benefits of eating fish, the COMEX believes that the main responsibility for developing communication mechanisms and ensuring that Crees have received the available information on consumption restrictions and appropriately adjusted their eating habits rests with the Cree Board of Health and Social Services of James Bay (CBHSSJB). COMEX also believes that effective communication strategies are the key to safe and healthy consumption. In addition, efficient communication mechanisms will indirectly encourage the maintenance of traditional activities.

COMEX is of the opinion that a program for properly documenting fish consumption by Crees, developed by the CBHSSJB with the proponent’s financial support, would facilitate a more effective long-term assessment of fish consumption restrictions. The latter’s role in this regard is first and foremost to follow-up the mercury contamination of fish and report all instances back to the competent authorities.

Cree hunting, fishing and trapping
Only a small part of the hunting grounds on the entire James Bay territory will be directly impacted by the creation of the Rupert diversion bays. These flooded territories will no longer be available for hunting and trapping, and high fish mercury levels will dissuade users from these sectors for a relatively long period of time. These flooded zones are concentrated in a few traplines that are sufficiently vast to ensure that users can exploit other areas within the same zone. As regards the Rupert River downstream of the control structure, while flow conditions will be modified, traditional activities will nonetheless be able to continue, given the presence of hydraulic structures erected to maintain water levels. Conditions in the increased-flow sector will be similar to those that prevail today. Section 6.4.1.1 of the report specifically addresses these issues as well as the planned mitigation and follow-up measures. COMEX recommendations targeting the participation of Cree users in follow-up programs aim to favour the Crees resuming ownership of the territory. This would ensure that Crees do not turn their backs on territories that have changed, for such a situation would engender the loss of the traditional knowledge and way of life of these environments.

From a purely spatial perspective, the project underway will have relatively limited cumulative impacts, particularly if we consider all of the mitigation and compensation measures planned by the proponent and accepted by the users. Despite this fact, past hydropower projects have had a real
impact on traditional activities. We need only recall the first communication strategies with regard to the mercury contamination of fish, which were so inappropriate that they had the effect of massively inciting the entire Cree population to abandon a healthy and abundant food resource. In some communities, severely impacted hunting grounds (major flooding, diversion of rivers, etc.) prevent tallymen and their families from living off of the resources they used to obtain through traditional activities. The absence of data enabling an accurate assessment of cumulative effects could in part be corrected by a global study on the harvesting of wildlife resources, conducted by the competent authorities. The proponent should be involved in any such initiative, as the case may be. While there is no denying that hydropower projects were in part responsible for the drop in traditional activities, the COMEX believes that other factors contributed to shaping the Cree society and its relationship with the 'Earth' and traditional activities.

Once again, COMEX recommends that a long-term, wide-scale follow-up of social impacts be conducted, notably to enable assessing the contribution of cumulative impacts from hydropower projects in the territory on the decrease in traditional activities.

**Recreational boating (canoe and kayak)**

As regards recreational boating, COMEX believes that while it will be affected by a cumulative project impact, this effect will be acceptable. Because the Rupert River will remain navigable in its entirety and since no other navigable river in the study zone will be significantly modified by the project, the cumulative impact on recreational boating appears minor.

The proponent has notably undertaken to perform certain mitigation and follow-up measures regarding tourism activities in conjunction with, among others, the Cree Outfitting and Tourism Association (COTA). COMEX is of the opinion that the proponent should develop, again in conjunction with this association, various promotional strategies with regard to tourists visiting its facilities. Furthermore, COMEX also feels that the proponent should partner with Tourisme Baie-James, as this entity wishes, to help it perform its mandates with regard to the development of a viable tourism industry within its territory.

It should be noted that no new hydropower development projects are planned for the James Bay territory, which means that no other territories or rivers should be impacted over the medium term.

**Traditional Cree knowledge as to reduced-flow rivers**

In light of the available information, COMEX considers that the proponent’s handling of the cumulative impact analysis on the transfer of traditional knowledge regarding reduced-flow rivers was satisfactory.

The very nature of the transfer of traditional knowledge renders this element extremely difficult to assess over time. In fact, given the oral aspect of transferring traditional Cree knowledge, there exist very few written documents in this regard. This makes it difficult to determine whether changes to the territory due to hydropower projects could have been responsible for an interruption of this transfer of knowledge. Elsewhere, anthropological publications dating as far back as the 1960s could have proven a valuable source of information on Cree traditional beliefs and myths. Other factors not related to development also had an effect on the transfer of knowledge. These notably include the separation of young Crees from their family environment in the 1950s and 1960s to go study in institutions far from the community.
The issue of maintaining knowledge of the territories modified by the project and the transfer of this knowledge are among the primary recommendations of this report. In fact, COMEX believes it is critical to urge users of the territory to continue their activities in the impacted environments, and this to ensure continuity as regards the transfer of traditional knowledge. The participation of Crees in teams responsible for planning and implementing environmental follow-up programs is a measure that could contribute to the transfer of traditional knowledge, seeing as it will be called upon to evolve with the creation of new environments.

8.4.3 OTHER THEMES

In addition to the themes selected by the proponent, COMEX also considered other environmental elements that it feels deserve consideration within the framework of assessing cumulative impacts.

As a permanent JBNQA committee, COMEX cannot ignore the significant transformation of the territory that has been caused, among others, by successive hydropower projects. We unfortunately conclude that analyses of cumulative biophysical impacts through VEC are difficult to do within the territory. However, the absence of data and the resulting uncertainty must not prevent COMEX from taking account of certain elements that have not been addressed by the proponent. These can nonetheless be assessed in a more global manner. Areas of specific interest include freshwater, terrestrial and marine ecosystems.

Freshwater ecosystems

While past hydropower projects have indeed caused habitats to be lost because of river diversions, the proponent always maintained a net positive balance with regard to fish production, and this because of the reservoirs, which constitute new and large aquatic habitats. Results of various follow-up initiatives indicate that fish populations generally adapt well to their new environment. Nonetheless, the transformation of lotic habitats into lentic habitats was done at the expense of fast-flowing water species. Moreover, certain species such as lake trout suffered from the negative and successive impacts of the destructive of their spawning zones by the significant drawdown of reservoirs, which was particularly insidious given that no mitigation measures implemented have to date been deemed effective. In the case of the lake trout, the low drawdown of diversion bays allowed the introduction of mitigation measures (the effectiveness of which remains to be seen).

The current project is part of the series of other projects involving the La Grande Complex. However, unlike these other projects, it respects the numerous requests made by government authorities to take mitigation measures into consideration as soon as possible after the project design phase and this, in collaboration with local populations. This resulted in saving over 90% of the aquatic environments, by means of eight hydraulic structures for the Rupert River decreased-flow sector, as agreed upon with the Cree population. To this, we add ecological instream flows subject to flexible management, the systematic renewal of lost spawning habitats, a respect for the passability of obstacles, etc.

COMEX is of the opinion that the proponent has taken the necessary steps to minimize additional impacts from its project on the environment and on the natural resources used for various purposes. COMEX deems that the cumulative project impacts will not cause irreparable harm to this type of regional ecosystem.
Terrestrial ecosystems

The evaluation of the cumulative impacts related to the unequivocal loss of terrestrial habitats to the benefit of aquatic habitats formed by the creation of reservoirs is complex. Verifying the assumption whereby the loss of animal production is proportional to the size of the land area lost is far from being all that easy, mainly due to the difficulty of establishing cause and effect. While the territory is characterized by an abundance of bodies of water, its land portion by far accounts for a much greater percentage of the total territory. The populations who inhabit it do not necessarily have the same restrictions as to space and movement as do those living in aquatic environments. Those species present in fewer numbers (lower density) have fewer problems relocating subsequent to a flooding of their habitat. This is notably the case for the moose, whose density in this zone is less than 0.3 individuals per 10 km². This zone, moreover, is near the northernmost boundary of its range. The migratory caribou is abundant, and moves over very large distances in sectors that vary from one year to the next, making the reduction of its terrestrial habitat difficult to determine. Furthermore, successive habitat losses have not prevented the migratory caribou population from increasing from several hundred thousand to around one million individuals over the past thirty years. Other species have a population dynamic that is more cyclical and increasingly dependent on factors other than habitat availability.

To all these factors that render the analysis of cumulative impacts complex, we must add habitat fragmentation as a result of opening of the territory in question to various projects (hydropower, forestry, etc.), which increases hunting and trapping pressure, with ensuing varied effects on the species involved.

COMEX nonetheless believes that the scientific and traditional knowledge available at the time of project analysis did not allow for identifying any specific problem with regard to the loss of terrestrial habitat primarily caused by flooding of the territory. Given our limited understanding of the various phenomena at work, there remains a degree of uncertainty in this regard. COMEX nonetheless wishes to emphasize that the minimum flooding of the territory was taken into consideration in its analysis of the variables presented by the proponent. Aside from losses regarding additional use of the territory and harvesting, which were addressed in section 6.4.1.1, COMEX does not feel that the current project will generate significant cumulative impacts on land animals in the region.

It nonetheless wishes to reiterate that as mentioned in section 5.1.1.2, the risks faced by the woodland caribou are exacerbated by its ‘at risk’ status, its sensitivity to habitat loss or fragmentation and its avoidance of human activities. COMEX believes that this species could possibly be affected by the cumulative impacts of various projects within the territory, and more particularly, hydropower projects. This amply justifies the need for telemetric surveys of the woodland caribou during the construction and operation phase and in the various project sectors.

Flooding during various phases of the La Grande Complex and the project being studied have caused and will cause irreparable losses in terms of microorganisms, some of which have a special status. In spite of their inevitability, these successive losses during the course of hydropower projects have never been assessed. COMEX feels that this problem is sufficiently important from the perspective of regional biodiversity to ask the proponent (section 5.1.1.2) to improve its follow-up program so as to have a better knowledge and understanding of the presence of these species on the territory. This measure can be considered a compensation mechanism with regard to cumulative impacts in this area.
Marine ecosystems

According to the proponent, the study zone comprising the eastern coast sector of James Bay was included in the La Grande Rivière freshwater plume delineated by 20% through isohaline. As mentioned in section 2.4.6.2, a model prepared by the proponent estimated that the maximum area of the winter plume of La Grande Rivière would be 3,430 km² for a flow of 5,000 m³/s and a complete coastal ice cover, following the Rupert diversion, i.e., 210 km² more than the maximum plume observed in 1993. Because this discrepancy is inferior to the natural variation in the plume's size measured in 1993, the proponent concludes that the increase in the size of the winter plume due to the Rupert diversion is contained within the current range of variations. As regards the summer plume, we were unable to establish a connection between La Grande Rivière flow and its minimum and maximum limits. The proponent believes that winds and variations in air pressure play a much greater role in the mixing of water masses than does the flow of La Grande Rivière. It consequently concludes that the increase in monthly average flow of 450 m³/s as a result of the diversion of the Rupert River will not cause a measurable change in the summer plume.

During the compliance analysis of the impact assessment and the public hearings, numerous presentations contested the proponent’s conclusions. These were notably led by Makivik Corporation (M41) and Nunavuvmmi Tasiujjuarmiugutiqit Katutjiaqitiit (NTK), (M40, M92,). To help them analyze this complex issue, the review bodies asked for advice from two oceanography experts (DOE3 and DOE6). NTK documents include notices of various scenarios, including one which predicts current and future salinity and ice concentration patterns subsequent to the Rupert River diversion. According to this notice, these scenarios, based on simulation models, cannot be retained because of the lack of oceanographic data regarding large bodies of water, such as James Bay, which are affected by freshwater inflow (DOE6).

COMEX considers these concerns to be legitimate. James Bay and Hudson Bay receive an average of 22,492 m³/s of freshwater annually, 41% of it from controlled rivers of projects in Québec, Manitoba and Ontario since the 1980s (RP10). As regards the 9,310 m³/s inflow from controlled rivers emptying into James Bay and Hudson Bay, 36.5% originates in Manitoba (Churchill and Nelson rivers), 26% in Ontario (Albany and Moose rivers) and 37.5% in Québec (La Grande Rivière). Modifications of the hydrological regime are mostly evidenced by an increase in winter flow to meet energy demand. COMEX is of the opinion that such changes to the hydrological regime have seemingly had cumulative impacts on the James Bay and Hudson Bay ecosystems.

It has been estimated that the anticipated increase in La Grande Rivière flow after the diversion will be around 200 m³/sec, in February and March, which represents 2.3% of the total freshwater inflow into Hudson Bay from James Bay, and 1.6% if we add flow from the Nelson and Churchill rivers (DOE6). This increase in flow is negligible when compared to the average annual freshwater inflow of 20,310 m³/s from the Hudson Bay rivers and inflow from melting ice in the springtime (around 250,000 m³/s). Water circulation and salinity near the Belcher Islands should not be affected by the project. It is also not likely that La Grande Rivière plume will reach Hudson Bay. Impacts, if there are any, should be observed between Rupert Bay and the mouth of La Grande Rivière. These impacts will not be noticeable, however, given the natural variations in the system (DOE3).

As regards the problem of the ice cover in James Bay and Hudson Bay raised by the NTK (C18), climate variations are likely the most significant parameter explaining its scope. Generally speaking, project impacts will be indistinguishable from other factors affecting the James Bay and Hudson Bay ecosystems.
The issue of cumulative impacts in Hudson Bay and James Bay is transboundary in nature and involves several jurisdictions, including the federal government, the provinces of Québec, Ontario and Manitoba, and the territory of Nunavut. COMEX thus feels that a single proponent should not be responsible for these cumulative impacts, and that their analysis should be the responsibility of all the jurisdictions involved.

COMEX’s position in this regard is shared by the DFO, which has observed that potential cumulative impacts of human activity in James Bay and Hudson Bay cannot be assessed within the framework of an environmental assessment for a specific project such as this one. In fact, assessing such a vast and complex ecosystem requires intimate knowledge and understanding of the determining factors and the various elements of the environment in question. This would call for a highly specialized expertise, a significant amount of information, and an in-depth analysis beyond the scope of what a single proponent can legitimately be expected to be responsible for (C27).

COMEX believes that any analysis of the cumulative impacts of James Bay and Hudson Bay will require setting up a research and monitoring program on a wide scale. This initiative should be spearheaded by a consortium consisting primarily of the government authorities concerned, as well as representatives from the academic community and those stakeholders responsible for the problem (including the proponent). Such a program will need to take into account traditional knowledge in determining its research approach. Communities could also take part, notably by contributing their valuable knowledge of these vast territories with which they are intimately familiar.

**Environmental follow-up and its lessons**

The assessment of repercussions - biophysical and social - related to project implementation will only be truly completed once the results of environmental follow-up measures are known. While we may be able to somewhat accurately predict the impact of certain actions on certain elements, a good number of conclusions will remain pending until environmental assessment results are in, given the degree of uncertainty regarding the effectiveness of mitigation measures. One of the rationales behind environmental follow-up involves the need to assess the actual impacts of projects and the effectiveness of implemented mitigation measures, if applicable. Based on results of this follow-up, the significance of the effects anticipated by the proponent in its impact assessment may need to be adjusted. In the event that results indicate a discrepancy, the proponent may need to modify the planned mitigation or compensation measures with regard to this specific impact. Results of environmental follow-up can also provide useful information for the development and evaluation of future projects.

Results of such environmental follow-up of past projects were in fact the source of some of the proponent’s conclusions regarding several issues germane to the project, including duration of mercury contamination and mercury exportation in bodies of water, plant colonization of the banks of changed bodies of water, impacts on large animals, etc.

Particular attention must be paid to follow-up regarding the Eastmain-1-A project and the project under consideration. These two projects are physically and ecologically connected, given that the Rupert diversion will have an impact on the water and fish in the Eastmain 1 Reservoir. Certain mitigation measures and measures for the development of fish production potential are planned to compensate for the projects’ combined effect downstream of the Eastmain-1-A and Eastmain 1 generating stations. Others, meanwhile, will apply to both the Rupert diversion bays and the
Eastmain 1 Reservoir, notably in an attempt to promote certain fish species. Ensuring consistency and integration of follow-up measures for both projects is hence critical.

The wide range of environmental follow-up measures recommended by COMEX within the framework of this project will enhance our knowledge of the biophysical and social environments specific to the James Bay territory, and notably enable us to better identify cumulative impacts of future projects. Also, in its capacity as a permanent organization, COMEX ensures continuity in the analysis of proposed projects as well as a more global view of development in the James Bay territory. This constitutes an efficient method of taking cumulative effects into consideration. Because the Crees are members of this committee, they also get to participate in territorial planning and development at an early stage, notably before the onset of a project’s operation phase.
PART IV

Conclusion
CONCLUSION

9.1 GENERAL CONCLUSION

The COMEX report is the product of a long and complex environmental and social assessment process that was carried out under the auspices of the Environment Quality Act, the James Bay and Northern Québec Agreement and the Canadian Environmental Assessment Act. The parties responsible for the application and sound operation of the various environmental assessment processes agreed to combine their efforts in a tripartite agreement signed in April 2003 by the Governments of Canada and Québec and CRA (P1). This agreement provided that the review bodies endeavour, to the greatest possible extent, to harmonize their assessment processes in order to avoid duplication, and work together to ensure efficient and appropriate assessments.

In each stage of the environmental assessment process for which it was responsible, COMEX’s ultimate objective was to submit the project to rigorous review so as to ensure that it be as respectful as possible of the biophysical and social environment.

The project analysis, which concludes with the release of COMEX’s recommendation to the Administrator as supported by the present report, was carried out in the same spirit. COMEX always kept in mind that this development project, which is on a spatial and temporal scale rarely equalled in Québec, has and will have significant and complex repercussions on neighbouring communities, as well as on economic development throughout the region and indeed throughout Québec. As well, the project represents a choice by society to develop an energy option that had undergone a certain slowdown in recent years, and the analysis was carried out against the background of the Paix des Braves (R5), signed in 2002 between the Cree Nation and Québec, and a series of sector-based agreements such as the Boumhounan Agreement (M70.5).

COMEX considers the project to be environmentally and socially acceptable under the authorization conditions that it has determined. This conclusion rests on the review of the project carried out in the various chapters of the report, but also, more globally, on the fact that the project meets sustainable development objectives in the following manner:
- by incorporating into the project a concern for maintaining the vitality and diversity of genes, species and all natural, terrestrial and aquatic ecosystems;
- by improving social equity through the satisfaction of the essential needs of human communities, present and future, and improving their quality of life;
- by improving economic efficiency in promoting the optimal management of human, natural and financial resources.

This conclusion also rests on the fact that the project respects the guiding principles laid out in Chapter 22 of the JBNQA and restated in Chapter 1 of the report. These principles on protecting the environment and the social milieu must be taken into account by the government. The incorporation of certain impact mitigation measures into the very design of the project, such as the ecological in stream flow regime or the control structures on the reduced-flow section of the Rupert River, are also elements that improve the project with respect to the biophysical and social environment.
COMEX also recognizes that this project will be a formative, practical application of the *Paix des Braves*, signed in 2002 between the Cree Nation and the province of Québec (R5). The project will provide the Crees with an opportunity to give direction to future development through the creation of jobs and businesses that will contribute to its long-term economic expansion. It is in this spirit that COMEX wrote this conclusion, emphasizing the importance of future relations between the proponent and Cree society and banking on the opportunities represented by the project without losing sight of the distinct features of Cree society, nor of the fact that it occupies a territory shared with the people of James Bay, who wish as much as they do that their presence there be permanent and harmonious.

However, a project of this scale, extending over a vast territory that has already been modified by other hydropower projects over the last thirty years, cannot be carried out without having both positive and negative environmental and social impacts. Whether real or imagined, the possible risks generate debate between supporters and opponents in communities affected by the project, and during public consultations held in the spring of 2006 the review bodies observed just how widely opinions can differ in a single community. Even though its recommendation is favourable, COMEX has seen fit to counterbalance that recommendation with conditions bearing on both biophysical and human aspects and aimed at improving the project and minimizing its impacts.

### 9.1.1 A JUSTIFIED PROJECT

This project falls within the scope of the guidelines contained in the Québec Energy Strategy, published by the Government of Québec in June 2006 (R20), which seeks among other things to encourage and increase Québec’s hydropower development in order that it become a source of collective wealth. In this respect the project is justified, for it will provide reliable energy at a competitive price in the fairly near future. It is also justified inasmuch as it will give us room for manoeuvre, and through the sale of electricity outside of Québec, will again contribute to our collective wealth.

### 9.1.2 PUBLIC CONSULTATION

In accordance with the rules and regulations governing the environmental assessment applicable to this project, public consultations were held during various stages of the environmental assessment process. The most complete and revealing consultation was held in the spring of 2006, in the form of public hearings on the acceptability of the project and its impacts. On this occasion, the six Cree communities affected by the project, along with the cities of Chibougamau and Montreal, were visited by the review bodies. Chapter 3 of the report provides a detailed account of the major points discussed during this consultation, but COMEX would like to reiterate a number of elements that are revealing of the consequences of such a project for the communities who will host or benefit from it.

In the Cree communities, COMEX noted that information and consultation efforts made over the years by the proponent, or more recently under the auspices of the Boumhounan Agreement, did not achieve all their intended objectives. Rather, there was confusion regarding the various hydropower projects in the James Bay region, anxiety about the future pursuit of traditional activities on territory affected by the project, and poor comprehension of the project itself.
Many participants in the hearings also harked back to what has gone on since the signing of JBNQA in 1975, expressing frustration with the various phases of hydropower development carried out to date and the resulting environmental and social consequences.

Overall, the hearings revealed that Cree society, whose population is increasing rapidly, is divided on the project. Indeed, it is apparent from the hearings that all Crees are attached to their culture and that they consider the practice of hunting, fishing and trapping to be a fundamental value of Cree society. On the other hand, a number of them would like to join the modern world, accepting the changes to traditional values that would result. COMEX wishes to emphasize that it is sometimes difficult to classify the causes of the profound social changes experienced by these communities, since hydropower development by the proponent coincided with the arrival of modernity.

In Chibougamau and Montreal, the focus was more on economic spinoffs in the form of contracts granted and jobs created, and on the opportunities for regional development and the development of expertise that would come as a result. COMEX understands that this project, requiring a total investment of over $4 billion, represents a major economic motor and in some cases will stimulate regions sorely tried by the slowdown of activities in other natural resource sectors. Let us remember that the prospect of jobs related to this project has also raised hopes among certain members of Cree communities, who see in it an opportunity for development and a solution to the chronic lack of employment for the young.

### 9.1.3 A PROJECT IN EVOLUTION

COMEX’s recommendation includes numerous conditions that require the proponent to return to the JBNQA Provincial Administrator for certain elements of the project that for the moment have yet to be defined. At first glance it may seem surprising that COMEX’s recommendation does not immediately map out the full array of activities connected to the project; however, it must be understood that the wisest course is to retain some flexibility, due to the duration of construction activities and the readjustments that will be made to optimize the project, or to future discussions with the users of the territory, certain decisions concerning for example mitigation measures or the fate of temporary roads required by the work cannot be taken immediately.

COMEX considers that allowing the proponent to better define certain activities before receiving authorization is preferable to attempting to define the entire array of activities from the outset. In certain cases, discussions are needed between the proponent and tallymen affected by the project before decisions can be made on the nature and scope of the work to be undertaken. This also allows the tallymen to learn the scale of changes that will take place in their respective trapping sectors before agreeing with the proponent on correctives to be made. This will be the case notably for temporary roads and for mitigation measures specific to certain trapping sectors.

Overall, COMEX recognizes that given the duration of construction and operation activities, it is impossible to predict everything and therefore preferable to retain flexibility in the
authorization of the project. This flexibility will also make it possible to truly take into account future discussions with the land users. In this way, the proponent will be able to make the right decisions at the right time, returning to the Administrator to receive the necessary authorizations.

9.1.4 BIOPHYSICAL IMPACTS AND MITIGATION MEASURES

A river with reduced flow
The project will entail a reduction in the flow of the Rupert River from KP 314 to the mouth in Rupert Bay. This reduction will vary from 71% at the diversion point to 51% at the mouth relative to the mean annual flow. Despite maintaining an instream flow regime, the restoration of a flow corresponding to the average natural hydrograph in the Lamarre and Nemiscau Rivers and the construction of nine control structures along the reduced flow stretch, it is undeniable that the nature of the river will change and that the modifications planned will raise questions and anxieties among the users. From the point of view of biophysical impacts, the proponent made a number of commitments ranging from environmental follow-ups to remedial measures (development of spawning grounds, seeding of river banks, fish passage systems, etc.) to better define or to correct the anticipated impacts. COMEX concludes that these efforts are sufficient and go in the right direction, that is, toward maintaining a “living” river that is attractive in terms of the survival of species currently present, along with the river’s various uses.

Though emphasized in section 5.2 of the report, COMEX wishes to reiterate the importance of the lake cisco spawning area at Smokey Hill, between KP 23 and 16.5 on the Rupert River, as an essential element in maintaining the species in Rupert Bay. The recommendations set out in Chapter 5 concerning the strictly biological aspects of this question are considered crucial by COMEX. For it is important to preserve the numbers of this species throughout Rupert Bay and its principal tributaries, along with the use of it by the Waskaganish Cree through dip-net fishing, whose success depends on both the numbers of fish and the configuration of the neighbouring rapids.

In the same vein, COMEX considers important the efforts to be made by the proponent for the maintenance and survival of the lake sturgeon. In this case, beyond natural variability, the success of the implemented measures will depend on the perseverance of some and the collaboration of others. In fact, COMEX believes that given the great longevity of this species and its sensitivity to overharvesting, these efforts will succeed if they are pursued in accordance with the species’ life cycle and if harvests are adjusted to the river’s yield in future years. Close collaboration between the proponent and the users of the land is of the utmost importance to attain convincing results.

Adaptative management
The proponent has agreed to respect the principles of adaptive management for the ecological instream flow regime planned downstream from the Rupert River diversion point. This mitigation measure, which is in fact part and parcel of the project design, provoked much interest during analysis of the project. COMEX recognizes that the work carried out by the proponent for the establishment of such a system was thorough indeed and goes well beyond the efforts usually deployed in hydropower projects involving reduced flow in a watercourse. On the other hand, the very nature of the project and the scale of the work demands considerable effort in this area,
as the flow reduction over 314 km of the Rupert River will have undeniable impact on a score of factors, including the fish, the landscape, navigation and the practice of traditional activities.

COMEX concludes that applying the principle of adaptive management of compensatory flows will allow for the regime to be revised, if need be, to correct any impacts subsequently detected in the multiple environmental follow-ups the proponent must perform or in observations made by the users of the land. COMEX understands that modifications to the instream flow regime resulting in flow values above those established during the analysis would represent an economic loss for the proponent in terms of power generation. However, it considers that the changes that will be undergone by ecosystems downstream from the diversion, and the uses for which the river serves throughout its course, are of sufficient importance to justify revision of the instream flow regime if it is demonstrated that the regime described, in the documents filed by the proponent to support his authorization request, is insufficient to ensure the survival of those ecosystems.

The environmental follow-up program
COMEX’s recommendations concerning biophysical impacts largely turn around submission for the Administrator’s approval of the various environmental follow-up programs and the results obtained. These authorization conditions will have the effect of ensuring that the assessment of real impacts and the success of mitigation measures are constantly monitored by the bodies responsible for the application of Chapter II of the Environment Quality Act and Chapter 22 of the JBNQA. However, some additions have been made with respect to monitoring indicators included by the proponent in his impact assessment with the aim of completing evaluation of the environment and impacts assessment after the facilities go into operation.

To correct some of the shortcomings in the circulation of information collected by the proponent regarding the evolution of ecosystems on the territory, it is also requested that the proponent involve the Crees not only into planning and performing the various follow-up campaigns, but in circulating their findings. This condition has two objectives: the circulation of information and the acquisition of knowledge about the new environments created by the project. It seeks to correct a situation brought to light in the public hearings, namely the very negative perceptions of the Crees regarding the practice of traditional activities in environments that had been altered by previous hydropower projects. This last point will be the subject of more detailed discussion further along in this text.

9.1.5 THE IMPACT ON THE HUMAN ENVIRONMENT AND MITIGATION MEASURES

The practice of traditional activities
The public hearings held in the spring of 2006 allowed us to observe that one of the most important issues for the Crees is that the project not risk altering their traditional way of life. They conveyed the fact that for them, the Earth represents a pantry from which they may take nourishing food. It also serves as a kind of savings bank, since they know that with good management they will always be able survive thanks to wildlife resources. For some Crees, the impacts of the project are acceptable on condition that they not appreciably harm the hunting, fishing and trapping possibilities. For others, the project is quite simply unacceptable, as it risks peril to certain spawning areas or important traditional hunting grounds. An analysis of land use is presented in section 6.4.1 and the essence of the analysis is repeated here.
In this context, COMEX considers that the real challenges with regard to the pursuit of traditional activities in the sections affected by the project have to do with the continuity of this practice and the comprehension of these altered environments in terms of their capacity to provide the users with wildlife resources. Previous experience in areas altered by hydropower development, notably reservoirs, and the use thereof by the Crees, leads more to a conclusion of failure than to an adaptation of hunting and fishing habits to new environments. It has to be said that on the one hand, altered environments are not always hospitable or easy to use, and on the other, that the disappearance of places that had always been used for traditional activities has marked their users psychologically, to the point of leading them to reject these environments. Past experience being what it is, COMEX insists that learning about and using these altered environments, with no interruption over time, is crucial to the maintenance of traditional activities, regardless of how Cree society might evolve in this respect.

COMEX points out that involving the Crees in planning and performing the field work required for the follow-up on the many environmental elements targeted by the proponent, and by COMEX’s recommendations, is a valuable way to maintain Cree interest in the altered environments, while indirectly ensuring the transmission of traditional knowledge to future generations. In the same spirit, the circulation of findings both on the success of mitigation measures and on the evolution of ecosystems will also feed this interest. COMEX also wishes to underscore the spirit of openness demonstrated by the tallymen in their collaboration with the proponent and in their vision of the future. However, as the project progresses, a side effect that must be avoided would be for them to displace their hunting and fishing practices entirely to the unaffected parts of their trapping territories.

On the subject of traditional activities, COMEX also considers that the proponent may benefit from the ideas and knowledge of the Crees in planning environmental follow-up programs and in performing mitigation measures. This could be an opportunity for the proponent to innovate in this area, notably for the mitigation and compensation measures prescribed for the benefit of hunting and fishing practices, by taking into account traditional know-how. Since the Crees who run trapping territories affected by the project will in a way be seeking new knowledge in the altered environments, it is essential that mitigation and compensation measures aimed at encouraging the use of this land, such as clearing certain areas to be flooded and cleaning up wood debris, be decided in collaboration with the tallymen and be in accordance with the new practices.

**Mercury and health**

Section 6.3.2 of the report placed considerable emphasis on the importance of effective communication of the health dangers related to mercury and, at the same time, the importance of continuing to eat fish as part of a balanced diet. COMEX has recognized that the new areas affected by increased mercury levels in fish are relatively modest compared to the consequences of hydropower development in the La Grande complex. However, it stresses that these changes, local though they are and of a duration that is now well documented, are part of a problem that is wider and more complex than simply setting guidelines for the consumption of fish. We are dealing at once with changes to a way of life and to the practice of subsistence fishing, the influence of the “south” and
its associated foodstuffs, the level of choice available to Crees who have become consumers in the same way as other Québécois, and Cree perceptions of the contamination of their traditional foods.

COMEX therefore reiterates its conviction that mercury contamination of fish and the danger it represents to health is a public health problem that must be tackled and solved by the CBHSSJB, whose mandate it is to deal with these problems. COMEX does not deny the proponent’s responsibility in this matter, but considers that its role should be limited to acquiring data on the evolution of fish contamination in areas affected by the project, and collaborating with the CBHSSJB in public health protection, without however taking on the leadership of this effort.

**Economic spinoffs**

The question of economic spinoffs discussed in section 6.6 is at the heart of the analysis and implementation of such a massive project. Their potential was brought up primarily at the public hearings held in Chibougamau and Montreal, and by certain Crees in the communities visited. The Crees and the people of James Bay have about the same view of such spinoffs: that they will be temporary and concentrated in the construction period, but that they may also permit the development of useful and durable expertise by the end of construction, i.e. in less than ten years. As the Crees see it, acquiring this expertise will depend primarily on training and access to qualified and diversified jobs. COMEX considers that the range of occupations where training is offered should be broadened to include subjects like tourism, the environment, wildlife resources management and any other field related to hydropower development and its biophysical and social repercussions. In this light, the proponent will play a supporting role toward organizations that have a mandate in human resources development, such as the Cree School Board or the Cree Human Resources Development agency (CHRD).

In a more general vein, COMEX observed that both the Cree and James Bay communities have significant challenges to face in maintaining and increasing the economic dynamics of their region, and it hopes that there will be collaboration between them in all of the major activities planned for the territory. COMEX emphasizes the fact that this development is necessarily regional and that it must be chosen by all the residents of the territory. For the Crees it is a way to control the future, while for the people of James Bay it is a way to find partners who are as interested as they in the viability of their society.

### 9.2 FOR GREATER ACCEPTANCE OF THE PROJECT BY THE COMMUNITY

#### 9.2.1 WASKAGANISH AND THE RUPERT RIVER

The flow of the Rupert River will be reduced by half, on average, in the area of the community of Waskaganish. While the proponent has planned a certain number of mitigation measures to lessen the inconveniences caused by this reduction, some will persist. COMEX does not have any data that would enable it to suggest how to moderate these residual inconveniences, however it does consider that discussions should take place between the proponent and the community of Waskaganish. The building of an access road to the Broadback River, which lies about 10 km south of the village,
was brought up along with other ideas as a way to facilitate use of another river that is important to the community.

9.2.2 CUMULATIVE IMPACTS

Territorial development
Chapter 8 of the report demonstrates that it is undeniable that past hydropower developments on the territory allowed it to be opened up, thus bringing about accelerated changes to Cree society and increasing the attraction for investors, notably in the areas of energy and natural resources development. In this sense, hydropower contributed, and with the EM-1A project and the Rupert River diversion will contribute once more, to reshaping the Cree way of life, as did the modernity brought by new ways of communication and transportation, exchanges with the rest of society, salaried labour, level of education, etc. It can thus be expected that in the coming years the territory will witness further developments. It could well be that in the near future, wind-power generation will occur near existing facilities, and that thanks to the expanded road network and the proximity of energy sources, mining projects will emerge. As a body whose mandate is to assess the impacts of such projects and to recommend authorization or refusal to the Administrator of Chapter 22 of the JBNQA, COMEX cannot but feel concern regarding their cumulative effects.

As a permanent committee, COMEX wishes to reiterate its obligation under the JBNQA to take these cumulative effects into account. Moreover, since it examines all such projects it is in a position to have a global view of territorial development and to take past development into account when it has a project under study. In addition, the Crees are members of COMEX and can thus participate in the analysis of projects based on their knowledge of the territory and of Cree society. In this respect it is certain that the cumulative impacts of territorial development can be taken into account. However, the appreciation of such impacts remains problematic due to the limitations of the method currently available and the remaining uncertainties in their assessment, particularly when it comes to social aspects. COMEX, which performs its analysis as much from the social as the environmental point of view and which also ensures continuity of expertise, is composed of members who are well informed about the evolution of all parts of the society residing on the territory, and while not a panacea, is a security net for taking into account the cumulative effects.

The Chisasibi community
Chisasibi is undoubtedly one of the Cree communities where the cumulative impacts of various hydropower projects built by the proponent since 1975 have deeply scarred the population and are the cause, at least in part, of great distress. This situation was especially revealed to the review bodies during public hearings held in the village over a period of one week. Their distress, very real, is exacerbated by the fear of an eventual break in the dams constructed, upstream of their community, on the La Grande Rivière. After analysis of the security of these facilities, in Chapter 7 of the report, the possibility of a break of these structures seems highly improbable.

Though it may appear evident that the current project will have little impact on the biophysical environment, this is not the case for its social repercussions, which will be added to those of previous projects. In addition, it is difficult for COMEX to discriminate between impacts of the project and other possible causes of distress. At the public hearings, various solutions were proposed by the
population to reduce the present-day stress in the community, such as returning the village to Gouverneur Island, relocating the village to an area that would be sheltered from flooding due to a dam break, or construction of a bridge connecting Gouverneur Island to the mainland. The recent agreement concerning a new relationship between Hydro-Québec/SEBJ and the Eeyou Istchee Crees signed in 2004 (R13), which offers certain solutions to the Chisasibi problem, did not seem to bring an end to the population’s feelings of distress.

COMEX does not have sufficient information to allow it to decide which solution should be chosen, still less whether the agreement could solve this community’s problems. Furthermore, the solution to this type of problem clearly goes beyond the analysis framework of the present project and choice made must must originate within the community. However, COMEX believes that this problem should be carefully examined by all parties concerned, including the GCCQ, the CRA, the various levels of government and Hydro-Québec, in order that potential solutions be found.

The Nemaska community
Various changes, more or less directly related to hydropower development, have marked the lives of this community. One of the most important was the abandonment of the Old Nemaska site in favour of a new location. The former site, on the banks of Nemaska Lake, has since become a resource center for the entire population and is well frequented, particularly in summer. As mentioned in section 6.3.3, the waters of this lake may undergo changes due to turbidity.

When they sojourn in Old Nemaska, the Crees draw their water directly from the lake. Since its quality may change, making it less desirable for the users, COMEX considers that this potential problem should be discussed between the Nemaska community and the proponent, so that should the need arise a solution may be found, in the form of a community well for example.

9.2.3 COMMUNICATIONS BETWEEN THE PROPONENT AND THE CREESES

It has been mentioned repeatedly in various sections of the report that COMEX was forced to conclude that the proponent’s efforts regarding communication with specific parts of Cree society, or with the latter as a whole, did not achieve the desired results. COMEX considers that the implementation of the project offers a good opportunity to correct this situation. This initiative is all the more important in view of a study produced by the INRS in 2006, showing that communication mechanisms set up with the signing of the Boumhounan Agreement were equally deficient, despite the fact that the mandate of the Boumhounan Committee is to foster communications and discussions relating to the project in each of the communities concerned with the support of designated Cree members from each Cree community (OED 23).

According to this study, improving communications between the proponent and the Crees will depend on finding solutions to the problem of language, since English is at best the Crees’ second language, and that the older people like the tallymen are unilingual Cree. The quality of translation was brought into question, notably for abstract and scientific concepts that have no Cree equivalent.
It is also recommended that the number of subjects be reduced, while increasing the number of meetings and thereby a more regular presence of the proponent in the communities. The information given would benefit from being delivered using visual aids to enhance comprehension.

It is essential that information be presented from a Cree perspective, by retaining what is specific to the Crees, notably the language, toponymy and life on the territory. For example, materials on paper should give more attention to what is happening in the communities, to impacts that will affect the people, changes that will occur on the land and the concerns of the population about the project and the future of their communities.

While the tallymen serve as conveyors of information, a recognized role that is important to their close relations and the community at large, there are other groups to be approached using an information strategy adapted according to age group. For example, since young Crees under 30 make up some 50% of the population and occupy a strategic position in the communities, the information delivered to them must be tailored to their ability to comprehend and use it.

Recommendations to improve the situation have already been made in other sections of this report. The foregoing suggests solutions to the proponent. However, COMEX wishes to expand on the latter by recommending that the proponent participate in setting up a post-implementation consultation process with the Cree population. COMEX is of the opinion that this consultation with the Crees should take place after the construction and prior to the start of operations, so as to learn their views on the execution of the project as a whole, its impacts and the effectiveness of the mitigation measures that were implemented. COMEX prefers public hearings as a consultation measure, since they reach a broad public and can cover all of the subjects. These public hearings would be held by COMEX and the proponent would be required to collaborate. They would take place after construction of the project, but before it goes into operation, around 2011. The report produced by COMEX on the lessons to be drawn from these consultations will serve, among other things, to define correctives to minimize all residual impacts.

9.2.4 RECOGNITION OF THE CREE NATION’S CONTRIBUTION TO ECONOMIC DEVELOPMENT

The James Bay region is often perceived as a portion of Québec’s territory relegated to the margins of history. Yet, the Rupert River was at the centre of communications and economic exchanges prior to the arrival of Europeans in North America and continued in that role when they discovered its potential for the fur trade. Thus the Crees maintained sustained contacts with non-Natives, exchanges that took place in certain locations still frequented by the Crees. It would be interesting for the Crees and the people of James Bay to celebrate these events by identifying these areas in a commemorative way. The choice of these sites and the manner in which they are commemorated would be done in partnership, thus serving as an opportunity to establish collaboration between the Crees and the people of James Bay as discussed above, while also revealing to visitors to the territory a little known aspect of it.
In the past, the proponent invited the Cree communities to inaugurations of hydropower facilities or to monuments like the one honouring burial places submerged under the waters of the Robert-Bourassa Reservoir. Such commemorative acts gave recognition to the contribution of the Cree Nation to hydropower development. COMEX considers that the project will have varying impacts on different sections of the territory and that certain tallymen and their families will be particularly penalized. This is the case with the Neeposh family from the Mistissini community, who will experience the greatest loss of territory. They have publicly expressed their sorrow at seeing land that has nourished them for centuries disappear under the waters, yet have accepted the situation for the betterment of all. In the view of COMEX, this gesture deserves official recognition in the near future, prior to the beginning of project operations, in the name of Québec society. COMEX encourages the Government to recognize, in a manner of its own choosing, this important contribution to development and the welfare of its citizens.

The construction and execution of work planned in the project will certainly be recognized in some fashion by the proponent or the Government. COMEX suggests that the organizers of such ceremonies systematically invite the Crees to participate in the planning and holding of them, while keeping in mind that for some, the implementation of the project is accompanied by a sense of loss and sadness that cannot be underestimated.

Hydropower development has strongly marked Cree society over the last 30 years. It is at the origin of the signature of the JBNQA and the entry of Cree society into modernity. The *Paix des Braves*, signed in 2002, also has at its foundation territorial development through hydropower. COMEX, as a JBNQA committee, has been a privileged witness to the debates and tremors that have shaken Cree society and the adjustment challenges that it is currently experiencing. With the Eastman-1-A project and the Rupert River diversion, it hopes that this society will enter into a new era characterized by the will of the Crees to take their affairs in hand. To accomplish this, they must preserve their attachment to their society’s fundamental values, which have allowed them to survive and grow as a nation, while taking advantage of the opportunities that will emerge to improve their individual and collective welfare. This equilibrium can only be achieved by maintaining a window on the outside world and positive relations with all of Québec society.

### 9.2.5 THE FUTURE OF CREE SOCIETY AND THE PROJECT

This section was written by the Cree members of COMEX with the consent and support of members named by the Government of Québec. Since the subjects covered originated in the concerns expressed at the public hearings in Cree communities, it seemed appropriate that Cree members take the initiative to respond.

**On the benefits of the project and the continuation of Cree Society**

*This statement is made with the consent and support of all of the Members of the Review Committee. As it concerns matters that are most appropriately expressed by the Crees appointed members to the Cree People, it is made as a personal communication from them.*

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*La traduction française de cette section se trouve à l’annexe 4 du rapport.*
During the public hearings the review bodies heard testimony from a variety of Crees and Québécois witnesses and a number of points of view on the project have been expressed, which are here summarized as follows:

"The project should not be built so as to protect the natural ecology of the area or to preserve God’s creation, as it is perfect in itself";

"Times have changed and the Cree way of life that was once solely provided for by the food harvested from Eeyou Istchee and by the goods and cash provided through the trade of furs is in fact now far more dependent on store-bought foods and on the economic input from the larger economy and on the employment and economic opportunity that this provides;"

"Whatever natural or spiritual forces determined the geographical nature of the area, it was predisposed by its design to hydropower development;"

"The project will provide a significant contribution to helping to slow the use of hydrocarbons that contribute to the phenomenon of global warming that is presently causing local and global changes in climate;"

"The project will provide cost effective and environmentally advantageous light and heat for hundreds of thousands of people and energy for economic development that will benefit Québec society, including the Cree Nation, and the larger economy;"

"The the project should not be built because these lands are Cree lands and the Crees do not want the project to be built;"

"The the project should not be built because it could bring an incremental negative impact to the rapid culture change that the Crees are experiencing and have been for the last 50 years. This has brought negative health (obesity, diabetes, etc.) and social impacts (increased family violence, changes in values, drug and alcohol abuse, etc.) and the project will not help resolve these problems;"

"The project is accepted because it was part of a larger agreement and because of the financial benefits and those to come from employment and contracts, including those on remedial works stemming from the review process and also stemming form the Boumhounan Committee."

The New Relationship Agreement tells us that the project was consented to by the Crees as a condition of the out-of-court settlement on how Québec’s obligations to the Crees under the 1975 James Bay and Northern Québec Agreement would be fulfilled for 50 years and that if it is approved by the social and environmental impact review process, the decision will be accepted by the Crees.

We have been involved in the review of this project for over three years and given its design, we believe that the impacts are significant but manageable. There will not be any species lost as a result, although there will be habitat lost to flooding and consequent decrease of certain animal populations. The trappers will have to adapt to new circumstances including some habitat loss, which in the case of fish will require remedial measures. The social and cultural impacts of this project can be dealt with in a positive way, if the Crees are willing to do so. Moreover, in our view the lines of causal connection that might link project to social and health impacts are not lines of primary cause and
in all cases can be avoided or managed. The statement of the Cree Health Board to this effect confirms our views in this matter.

The choice to proceed with the construction of this project has a fundamental spiritual aspect that addresses all of these issues. Strict economic determinism, if applied to this project, as it was apparently applied to the decision of divert 100% of the Eastmain River in the 1970’s, would see 100% of the Rupert River diverted at a chosen diversion point. This would increase the production of the La Grande Project not by 14% but by 20%, which would doubtlessly increase the positive economic value of the project derived from its production of electricity. It would make this project worth billions of dollars more to the economy.

This was not however the decision made by the promoter in conjunction with representatives of the Cree Nation. Moreover, since the Eastmain diversion, governments have regulated river diversions so that there would have to be measures to protect fish habitat, migratory bird habitat and that of other fauna, if the project would be accepted. They therefore decided to design a project that would be of significant economic benefit and also would preserve the greatest majority of the ecological productivity and diversity of the area and the related cultural activities. It is our belief that this choice is a commitment made by the larger society in the protection of an area of significant ecological importance and also shows respect for the Cree wish not only to participate in development of the region, but to continue to pursue and adapt their hunting, fishing and trapping way of life to the new economic realities of the territory. The fur trade is no longer the mainstay of the Cree economy, as that it once was.

While immediately after construction the damages to the ecology of the river and diversion areas will be substantial, over time this will lessen as the aquatic and terrestrial fauna and vegetation re-colonize the exposed areas and adapt to these changes. We expect that all of the fish species will survive and thrive in the new water bodies. We expect the land animals and avian fauna to continue to use the area in numbers similar to those found today, while losing a portion of their habitat to flooding in the diversion area. The Review Committee has required the promoter work with the Crees who occupy this area through long-term (20 to 30 years) joint efforts to promote the recovery of the natural ecosystem, to learn from this process and to allow the traditional Cree users of these areas and their resources to re-appropriate their traditional knowledge of the land and its resources and to re-establish their spiritual relationships with it.

The Cree decision to sign the New Relationship Agreement was a decision to accept the possibility that this project, with certain pre-review conditions set out in the Boumhounan Agreement, might be approved by the review process. It was in other words, a decision that reflected the Cree understanding that certain defined hydropower development might continue. It was in fact a brave decision and reflected an age-old Cree capacity to take risks for the benefit of their society. In this case, the risk taken was that the benefits of the New Relationship and Boumhounan Agreements would out-weigh the damages to be caused by the project, if approved. There is not a Cree hunter who does not understand the risks to life involved in hunting or that there are potentials in the territory that are yet to be discovered.

Moreover, the decision to sign the New Relationship Agreement was a decision subscribed to by almost 70% of the Cree electors in a secret ballot managed by the Cree communities themselves, at their request.
Development is a fact of modern life that will not go away as it is driven by population growth, economic growth and by technological advancement. Modernity, the changes brought to societies by new proposals and new technologies is something to which all people and all Peoples must adapt. Some will adapt to it by turning their backs to it, but it will transform the world around them anyway.

The choices that people make in their day to day lives in allocating their resources and time and in expressing their preferences are crucial to the type of impact that these changes will bring to their health and well-being. In the Cree world the sources of change are many, from population increase, to changes in the Cree economy, changes of access to and from the territory, increased availability of new varieties of food and consumer products, increased exposure to other languages and to other values and new information through mass media, changes brought to the territory by education, by hydropower, forestry and by mining development, to name a few.

Decisions made in respect to all of these by Canada, Québec, and the Cree Nation and by the individuals touched by these changes play a large role in determining whether the impacts of each of these sources of change are positive or negative. Governments and their institutions have a responsibility to protect their citizens and citizens have the responsibility to protect themselves, their families and their communities.

To point to any one of these sources of change as the primary or only cause of negative impacts is to deny the complexity of how such factors work together and over time. What is important to the Crees is that they face the future and all of these realities and that they continue to bend and shape forces of change to their advantage. The Crees must continue to be guided by their spirit, traditions and values while seeking all opportunities to maintain and advance their own well-being in all senses of this term: physical, social and spiritual. They must also continue their tradition of maintaining positive relations with the larger society.
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APPENDIX 1

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DOCUMENTATION

Documentation used by the review bodies during the environmental and social review of Eastmain-1-A and Rupert Diversion Project

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E11.3 - Volume 3 - Chapter 13 to 15.
E11.4 - Volume 4 - Chapter 16 to 25.
E11.5 - Volume 5 - Appendices.
E11.6 - Volume 6 - Methods.
E11.7 - Volume 7 - Maps – Biophysical Environment.
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Administration régionale crie


MC2.1 - Table. 15 p.

MC3 Environmental Review of the Eastmain 1A-Rupert Diversion hydroelectric project - Conformity Analysis of Chapter 20 of the EIS. March 31, 2005. 2 p.

MC3.1 - Table. 7 p.

MC4 Environmental Review of the Eastmain 1A-Rupert Diversion hydroelectric project - Conformity Analysis of Chapter 22 of the EIS. March 31, 2005. 2 p.

MC4.1 - Table. 20 p.

MC5 Environmental Review of the Eastmain 1A-Rupert Diversion hydroelectric project Conformity Analysis of Chapter 23 of the EIS. March 31, 2005. 2 p.

MC5.1 - Table. 16 p.

MC7  Environmental Review of the Eastmain 1A-Rupert Diversion hydroelectric project - Conformity Analysis of chapters 7, 16, 18, 21 and 22 regarding Issues, VEC (Valued Ecosystem Components) and Cumulative Effects. April 7, 2005. 3 p. Appendix: 9 p.


MC11.1 - Table. 5 p.


Autres organisations cies


MC19 CREE OUTFITTING AND TOURISM ASSOCIATION (COTA) - CREE NATIVE ARTS
AND CRAFTS ASSOCIATION (CNACA). Joint review of the conformity of the
Environmental impact Statement (EIS) of the Eastmain-1-A and Rupert Diversion Project
by COTA and CNACA. April 29, 2005. 16 p.

MC20 CREE NATION OF MISTISSINI. Conformity Analysis Eastmain-1-A Powerhouse and

Inuits (Nunavut)

MC21 NUNAVUT HUDSON BAY INTER-AGENCY WORKING GROUP (NTK). An assessment
of the extent to which the Environmental Impact Statement for the Eastmain-1-A
Powerhouseand Rupert Diversion meets the requirements outlined in the Directives for the
Appendix 1: 30 p. Appendix 2: 40 p.

MC22 NUNAVUT HUDSON BAY INTER-AGENCY WORKING GROUP (NTK). Comments on
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MC23 UNION QUÉBÉCOISE POUR LA CONSERVATION DE LA NATURE. Commentaires
sur l’étude d’impact sur l’environnement dans le cadre des consultations publiques sur la
conformité de l’étude d’impact. 28 avril 2005. 8 p.

MC24 REGROUPEMENT NATIONAL DES CONSEILS RÉGIONAUX DE L’ENVIRONNEMENT
DU QUÉBEC (RNCREQ). Avis présenté au Comité d’examen (COMEX) et à la Commission
fédérale d’examen par le Regroupement national des conseils régionaux de l’environnement du
Québec, Dans le cadre de la consultation publique sur la conformité de l’étude d’impact du

MC25 RÉVÉRENCE RUPERT. Examen de l’Étude d’impact sur l’environnement du projet

MC26 SIERRA CLUB OF CANADA. Draft comments on the conformity of Hydro-Québec’s
Environmental Impact Statement on the proposed Eastmain-1-A Generating Station and

MC27 FONDATION RIVIÈRES. Commentaires relatifs à l’étude d’impacts concernant sa conformité

Autres

MC28 GUY LANGEZIER. Commentaires sur les impacts environnementaux de la dérivation rivière

MC29 GUY LANGEZIER. Addenda: Commentaires sur les impacts environnementaux de la
dérivation de la rivière Rupert. 29 avril 2005. 2 p.

MC30 GAIL WHITEMAN - ROTTERDAM SCHOOL OF MANAGEMENT - ERASMUS
UNIVERSITY. Comments on the Environmental Impact Assessment for the Eastmain 1-A
3.2 NOTICES FROM THE DEPARTMENTS AND GOVERNMENTAL BODIES

Gouvernement du Québec

AV1 CENTRE D’EXPERTISE HYDRIQUE DU QUÉBEC. *Avis technique.* 3 février 2005. 2 p.


AV16 SECRÉTARIAT AUX AFFAIRES AUTOCHTONES. *Avis technique - Renseignements complémentaires.* 13 janvier 2006. 2 p.

AV17 MINISTÈRE DES SERVICES SOCIAUX ET DE LA SANTÉ. *Avis technique.* 15 janvier 2006. 2 p.
AV18 CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. Avis technique. 16 janvier 2006. 2 p.
AV19 MINISTÈRE DE LA SÉCURITÉ PUBLIQUE. Avis technique. 16 janvier 2006. 1 p.
AV26 CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. Recevabilité de l'étude d'impact. 4 avril 2006. 1 p.
AV28 SECRÉTARIAT AUX AFFAIRES AUTOCHTONES. Avis technique. 21 avril 2006. 4 p.

Gouvernement fédéral

3.3 PROponent’S ANSWERS


RP4 Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc C3 - Milieu terrestre. 27 septembre 2005. 91 p.

RP5 Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc C1A - Mercure dans le poisson et santé publique - Bloc C1B - Océanographie. 19 octobre 2005. 109 p.


3.4 DOCUMENTS TABLED BY THE REVIEW BODIES


COE7 Lettre à P. Mora - SEBJ - Préavis relatif à la conformité de l’étude d’impact du projet. 5 mai 2005. 5 p.


COE15 Liste des errata identifiés par les organismes d’examen dans le complément de l’étude d’impact déposé par le promoteur. 28 février 2006. 2 p.
4 - TECHNICAL MEETINGS

4.1 DOCUMENTS TABLED BY THE PROPONENT

Rencontres des 20 et 21 avril 2005

RTP3  Photo - Bateaux. 21 avril 2005. 5 p.

Rencontre du 24 janvier 2006

RTP4  Carte 220 -1- Digue C-R-1-2-3 - Réseau hydrographique. 24 janvier 2006. 5 p.
RTP6  Graphique - Figure 7-3-7-A - Station RN2805 (PK209,0) - Niveau d’eau vs débits. 24 janvier 2006. 1 p.
RTP8  Opinion Survey Table. 24 janvier 2006. 2 p.
RTP9  GÉNIVAR. Présentation - Réponse 204 - Position des stations d’échantillonnage pour le cisco de lac en aval de Smokey Hill. 24 janvier 2006. 7 p
RTP9.2 - Tableau - Données relatives à l’échantillonnage par placettes à l’automne 2002 dans la Rupert, à l’aval de Smokey Hill. 2 p.
RTP10  Tableau 81-1 - Émissions de gaz à effet de serre des milieux naturels actuels des biefs Rupert et des réservoirs du Québec et émissions brutes futures des biefs Rupert. 1 p.

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RTP14  Note d’étude technique - Évaluation sommaire de la possibilité de stratification thermique dans le lac Nemiscau. 8 février 2006. 9 p.
Étude sur la perception des communautés cries. 15 février 2006. 41 p.


4.2 DOCUMENTS TABLED BY THE REVIEW BODIES

RTOE1 Compte rendu - Rencontre d’introduction entre les organismes d’examen et le promoteur. 10 février 2005. 3 p.


RTOE2.1 Présentation - Milieu aquatique. 20 avril 2006. 15 p.

RTOE2.2 Présentation - Archéologie. 21 avril 2006. 6 p.

RTOE2.3 Présentation - Environnement social et santé. 21 avril 2006. 8 p.

RTOE2.4 Présentation - Justification. 21 avril 2006. 9 p.


RTOE4 Questions d’éclaircissement demandées par les organismes d’examen pour la rencontre technique prévue pour le 24 janvier 2006. 17 janvier 2006. 3 p.

RTOE5 Rencontre technique avec Hydro-Québec le 8 février 2006 - Questions d’éclaircissement des organismes d’examen dans le cadre de la préparation pour les audiences publiques. 1er février 2006. 5 p.

4.3 TRANSCRIPTS (VERBATIM) OF THE TECHNICAL MEETINGS

VRT1 Rencontre d’information technique - Volume 1 - Milieu Aquatique. 20 avril 2005. 100 p.


VRT4 Rencontre d’information technique. 8 juin 2005. 83 p.

VRT5 Rencontre d’information technique. 12 juillet 2005. 87 p.


VRT9 Rencontre d’information technique. 8 février 2006. 91 p.
5 - PUBLIC HEARINGS

5.1 BRIEFS AND DOCUMENTS TABLED BY THE PARTICIPANTS

Inclut les documents que les participants ont déposés dans le cadre de leur présentation, tenant lieu de mémoire, ou en soutien à leur mémoire. Dans la mesure du possible, les documents sont présentés en ordre de présentation dans les transcriptions des audiences publiques (section 5.7).

Mistissini


Note : Un mémoire a été déposé par le CCSSSBJ au cours de cette première séance. Des copies de ce mémoire étaient disponibles aux participants des autres séances alors que des présentations verbales différentes ont été faites par des représentants de cet organisme à tous les endroits où ont eu lieu des audiences.

Nemaska


Eastmain


Wemindji


M8 EMILY GEORGEKISH. Poem - No heart too small, No world to wide… April 2006. 1 p. (Référence à la séance 11, page 103).
(Référence à la séance 13, page 33).

M10 JENNIFER (MAYAPPO) STEWART. Submission for public hearings. April 2006. 1 p.  
(Référence à la séance 13, page 54).

M11 CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB) - 
ELLEN BOBET. What People in Eeyou Istchee say about their Health -Results from the 2003 
Canadian Community Health Survey. April 11, 2006. 8 p.

M12 CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). 
Canadian Community Health Survey - Cycle 2.1 - James Bay Cree Territory - Highlights. 
February 2006. 49 p.

Chibougamau

M13 VILLE DE CHIBOUGAMAU. Mémoire déposé dans le cadre des audiences publiques. 
15 avril 2006. 9 p. (Référence à la séance 14, page 58).

M14 ROCHE LTÉE, GROUPE-CONSEIL. Mémoire déposé dans le cadre des audiences publiques. 
Avril 2006. 8 p. (Référence à la séance 14, page 69).

Avril 2006. 8 p. (Référence à la séance 14, page 79).

M16 COMITÉ DE MAXIMISATION DES RETOMBÉES ÉCONOMIQUES DU NORD-
DU-QUÉBEC (COMAX-NORD). Mémoire déposé dans le cadre des audiences publiques. 
Avril 2006. 10 p. (Référence à la séance 14, page 90).

M17 VILLE DE LEBEL-SUR-QUEVILLON. Mémoire déposé dans le cadre des audiences publiques. 

M18 COMMISSION ÉCONOMIQUE ET TOURISTIQUE DE CHIBOUGAMAU (CETC). 
(Référence à la séance 15, page 64).

M19 CHAMBRE DE COMMERCE DE CHIBOUGAMAU. Mémoire déposé dans le cadre des audiences publiques. 
Avril 2006. 10 p. (Référence à la séance 15, page 114).

M20 COMITÉ DE MAXIMISATION DES RETOMBÉES ÉCONOMIQUES EN ABITIBI-
TEMISCAMINGUE (COMAX-AT). Mémoire déposé dans le cadre des audiences publiques. 

M21 LA CONFÉRENCE RÉGIONALE DES ÉLUS DE L’ABITIBI-TÉMISCA-MINQUE (CRÉAT). 

M22 ASSOCIATION DE LA CONSTRUCTION DU QUÉBEC (ACQ) - RÉGION SAGUENAY 
LAC-JEAN. Mémoire déposé dans le cadre des audiences publiques. 27 avril 2006. 11 p.  
(Référence à la séance 16, page 7).

M23 AUTOMATISATION GRIMARD. Mémoire déposé dans le cadre des audiences publiques. 
12 avril 2006. 5 p. (Référence à la séance 16, page 18).


Montréal

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M40.5 - Appendix B - Salinity and Ice Concentration Analysis to Assess the Cumulative Affects of the La Grande River Complex on Hudson Bay and the Belcher Islands. April 2006. 22 p. 21 maps.

M40.6 - Appendix C - Traditional Ecological Knowledge (TEK) Linkages to Ice Concentration and Salinity Studies. April 2006. 22 p.


M41.1 - GEOARTIC. Assessment of the Potential Environmental Impact of the La Grande River Complex on Hudson Bay and the Inuit Coastal Communities in Northern Quebec. April 21, 2006. 16 p. 6 maps and figures.

M41.2 - GEOARTIC. Attachment 1 - An overview outlining the major features of the freshwater budget and the changes in the river discharges associated with hydroelectricity developments in the Hudson Bay Watershed. April 2006. 20 p.

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M56.1 - CAMILLE BÉLANGER, JEAN-FRANÇOIS LEFEBVRE, YVES GUÉRARD. Windpower and its Dependence on Hydro Reservoirs - Results from Wind Farms Simulations for Quebec. 15 mai 1998. 15 p.


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M59.2 - Tableau - Approvisionnements. 1 p.

M59.3 - Tableau - Bilan en énergie - Hydro-Québec Production. 2 p.

M59.4 - Tableau - Hydrogrammes PK 314. 1 p.

M59.5 - Tableau - Moyenne mensuelle des surpluss - déficits énergétiques. 1 p.

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M60.1 - Présentation- Analyse technique. 5 mai 2006. 12 p.

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M63 CHAMBRE DE COMMERCE D’AMOS-RÉGION. Mémoire déposé dans le cadre des audiences publiques. 28 avril 2006. 13 p. (Référence à la séance 27, page 8).

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M64.1 - Commentaires additionnels. 18 mai 2006. 2 p.
M65 - EEYOU COMMUNICATIONS NETWORK. *Submission for the public hearings.*
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M66 - TOURISME BAIE JAMES. *Mémoire déposé dans le cadre des audiences publiques.*
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M66.1 - TOURISME BAIE JAMES. *Plan directeur marketing et de développement touristique.*

M67 - FÉDÉRATION DES CHAMBRES DE COMMERCE DU QUÉBEC (FCCQ).
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M68 - CHAMBRE DE COMMERCE ET D’INDUSTRIE DE ROUYN-NORANDA.
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M69 - ASSOCIATION DES CONSTRUCTEURS DE ROUTES ET GRANDS TRAVAUX
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M70 - NISKAMOON CORPORATION - DR. BILLY DIAMOND. *Presentation.*


M70.5 - HYDRO-QUÉBEC/SEBJ ET CRIS DE EEYOU ISTCHEE. *Convention Bouthounan.*

M70.6 - HYDRO-QUÉBEC/SEBJ ET CRIS DE EEYOU ISTCHEE. *Convention Niskamoon.*


M73 - ASSOCIATION DE L’ALUMINIUM DU CANADA. *Mémoire déposé dans le cadre des audiences publiques.* 5 mai 2006. 15 p.


M74.2 - *Commentaires sur la présentation d’Hydro-Québec par le Dr Michel Plante le 4 mai 2006.* 9 mai 2006. 1 p.

M74.3 - *Commentaires sur mémoire de Santé Canada.* 9 mai 2006. 3 p.

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CREE TRAPPERS’ ASSOCIATION (CTA) OF WASKAGANISH. Submission for the public hearings. June 1, 2006. 5 p. (Référence à la séance 33, page 59).

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M87.4 - Submission for the public hearings. May 2006. 32 p.


M91.3 - Picture of fish # 2. June, 2006.

M91.4 - Picture of fish # 3. June, 2006.

M91.5 - Picture of fish # 4. June, 2006.

M91.6 - Picture of fish # 5. June, 2006.


M92 CHIEF ABRAHAM RUPERT. Eelgrass in the James Bay and Hudson Bay Ecosystem. 2006. 6 p. (Référence à la séance 43, page 106).


M93 IRENE BEARSKIN HOUSE. Eenou/Eeyou Pimaatsiiun & Healing practises Interview Presentation, November 16, 2005. 9 p.


5.2 DOCUMENTS TABLED BY THE PARTICIPANTS WITHOUT AN ORAL PRESENTATION


DAP2 VILLE DE ROUYN-NORANDA. Résolution du conseil. 10 avril 2006. 2 p.

DAP3 CREE TRAPPERS ASSOCIATION. Submission for the public hearings. April 21, 2006. 8 p.
DAP4  MUNICIPALITÉ RÉGIONALE DE COMITÉ DU DOMAINE-DU-ROY. Mémoire déposé dans le cadre des audiences publiques. 28 avril 2006. 17 p.
DAP5  VILLE D’AMOS. Extrait du procès-verbal du 1er mai 2006. 1 p.
DAP6  CREE REGIONAL AUTHORITY. Lessons learned from the EM1 Project and the inception of follow-up requirements for the EM1A-Rupert Diversion project - Follow-up of economic and social impacts: the case of Cree employment. May 1, 2006. 6 p.
DAP7  CHAMBRE DE COMMERCE DE VAL D’OR. Mémoire déposé dans le cadre des audiences publiques. 2 mai 2006. 11 p.
DAP9  GROUPE RIVERIN. Mémoire déposé dans le cadre des audiences publiques. 9 mai 2006. 3 p.
DAP10  GROUPE GÉNETIQUE. Mémoire déposé dans le cadre des audiences publiques. 15 mai 2006. 5 p.
  DAP12.1 - Referendum Results numbers as supplied by James Diamond to the movie. 1 p.
  DAP12.2 - Community referendum results. 1 p.
  DAP12.3 - Referendum results of affected communities 1 p.
DAP13  MOUVEMENT AU COURANT. Letter to the Gazette. 26 mai 2006. 4 p.
DAP22  FONDATION RIVIÈRES. Mémoire déposé dans le cadre des audiences publiques. 9 juin 2006. 60 p.
  DAP22.1 - Tableau des puissances installées. 2 p.
  DAP22.2 - Annexe C - Coûts de construction. 4 p.
5.3 DOCUMENTS TABLED BY THE PARTICIPANTS DURING AN ORAL PRESENTATION (NO BRIEF TABLED)

Eastmain

DPO1 JAMIE MOSES. (Référence à la séance 9, page 40).
  DPO1.1 - Picture of boy holding fish.
  DPO1.2 - Photo of boy by body of water.

Wemindji

DPO2 Wemindji aerial photo.

Waskaganish

DPO3 I. DIAMOND.

DPO4 DORIS SMALL.

Chisasibi

DPO5 R. PECHABANO.
  DPO5.1 - Picture of Capsaoui. (Référence à la séance 37, page 81).
  DPO5.2 - Draft Report : Eelgrass in James Bay and Hudson Bay Ecosystem. 6 p. (Référence à la séance 37, page 81).
  DPO5.5 - HYDRO-QUÉBEC-SEBJ AND EEYOU ISTCHEE CREES. 1986 La Grande Agreement. 1986.
  DPO5.6 - HYDRO-QUÉBEC. Environmental Performance Report. 2000.
  DPO5.7 - WASKAGANISH CREE NATION. Poster of Eastern James Bay Eeyouch Interets in the Offshore Region of James Bay and Hudson Bays. 1 p.

DPO6 KEVIN HOUSE, YOUTH CHIEF OF CHISASIBI.

DPO7 JOHNNY SAGANASH.
  DPO7.1 - HYDRO-QUÉBEC. Carte - Réseau de transport.

DPO8 REGGIE TOMATUK.
DPO8.1 - Picture of fish # 1. 2006.
DPO8.2 - Picture of fish # 2. 2006.
DPO8.3 - Picture of fish # 3. 2006.

5.4 DOCUMENTS TABLED BY THE PROPONENT DURING THE SESSIONS

Mistissini

PAP1
(Référence à la séance 1, page 19).

PAP1.1 - Allocution. 27 p.

PAP2
Table - MeHg exposure levels in Quebec, March 16, 2006. 1 p.
(Référence à la séance 2, page 97).

PAP3

Nemaska

PAP4
(Référence à la séance 4, page 23).

PAP4.1 - Allocution. 27 p.

PAP5
Table - Rupert-Instream Flow at Diversion Point. March 21, 2006.
(Référence à la séance 4, page 49).

PAP6
Graphique - Régime de débits réservés écologiques au point de coupure. 21 mars 2006.
(Référence à la séance 4, page 49).

PAP7
Graphique - Débits annuels. 21 mars 2006.

PAP8

PAP9
Figure 4-11. Present and future hydrographs at Nemiscau closure points.
(Référence à la séance 4, page 70).

PAP10

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PAP12
Plate 4-4: Transfer Tunnel and Forebay Weir, Plan Views, Sections and Profile.

PAP13
Figure - Social changes. March 22, 2006. 3 p.

PAP14

PAP15A
Drawing of Evolution of instream flow along the Rupert. April 2006.
(Référence à la séance 6, page 9).

PAP15B
Table 15-1: Breakdown of costs according to main project components.

PAP16
**Eastmain**

**PAP17** Presentation - *A project for present and future generations*. April 4, 2006. 54 p. 
(Référence à la séance 8, page 22).

**PAP17.1**  Allocution. 25 p.


**PAP20** Typical cross-section of a dam. (Référence à la séance 9, page 38).

**PAP21** Figure - *Monitoring Program*. April 5, 2006. 2 p. (Référence à la séance 9, page 38).


**PAP24**  Figure - *Evolution of Instream Flow and the Rupert*. April 5, 2006. (Référence à la séance 9, page 69).

**PAP25** FRANK C. BELLROSE. *Ducks, Geese and Swans of North America*. 
(Référence à la séance 9, page 70).


**PAP27** Large and medium races of the Canada Goose - Migration corridor. 
(Référence à la séance 9, page 71).

**PAP28** Canada goose - *Range of specific population*. (Référence à la séance 9, page 73).

**Wemindji**

**PAP29** Presentation - *A project for present and future generations*. April 11, 2006. 54 p. 
(Référence à la séance 11, page 19).

**PAP29.1**  Allocution. 26 p

**PAP30** Graph - *Level and Flow (JBNQA maximum level)*. April 11.


**PAP36** Plate 4-11-1 - *Hydraulic Structure at Sakami Lake Outlet Plan View and Section*, December 2005. (Référence à la séance 11, page 52).

**PAP35** Figure 13-15 - Rating curves at Sakami Lake outlet. November 2004. (Référence à la séance 11, page 52).


**Chibougamau**

**PAP39** Présentation - *Un projet conçu pour les générations actuelles et futures*. 
25 avril 2006. 54 p. (Référence à la séance 14, page 14).


PAP42 Tableau - Exemple de clause de sous-traitance. 26 avril 2006. (Référence à la séance 16, page 136).


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PAP49 Présentation - Un projet conçu pour les générations actuelles et futures. 1er mai 2006. 59 p. (Référence à la séance 17, page 19).

PAP49.1 - Allocution. 29 p.

PAP50 Acétate - Omble de fontaine (souche Rupert). 1er mai 2006.

PAP51 Présentation – PGEÉ : un plan évolutif. 1er mai 2006. 3 p. (Référence à la séance 17, page 57).


PAP56A Carte 1 - Sites d’aménagement proposés, 13 mars 2006. (Référence à la séance 19, page 7).


PAP56C Présentation - Impacts potentiels du projet sur les baies James et d’Hudson. 3 mai 2006. 31 p. (Référence à la séance 21, page 10).


PAP56E Présentation - Développement de l’éolien en complémentarité avec l’hydroélectricité. 3 mai 2006. 6 p. (Référence à la séance 22, page 28).

PAP57 Comparaison des options de production d’électricité. 3 mai 2006. 4 p. (Référence à la séance 22, page 50).

PAP58 Fonds versés par HQ/SEBJ à des entités cris. 3 mai 2006. 1 p. (Référence à la séance 22, page 50).
PAP59 Picture - Transport routier d’une éolienne. 3 mai 2006. (Référence à la séance 22, page 55).

PAP60 SPRINGER. Mercury in the Biogeochemical Cycle - Natural Environment and Hydroelectric Reservoirs of Northern Québec. (Référence à la séance 23, page 10).


PAP63 Présentation - Changements sociaux chez les Cris - 30 ans. 4 mai 2006. 11 p. (Référence à la séance 23, page 44).

PAP64 Réponse aux commentaires de Santé Canada sur la conformité de l’étude d’impact - volet mercure et santé humaine. 4 mai 2006. 5 p. (Référence à la séance 24, page 107).


PAP64.2 MEYERS, J. GARY ET AL. Prenatal methylmercury exposure from ocean fish consumption in the Seychelles child development study. 2003. 8 p. (Référence à la séance 23, page 10).

PAP64.3 DAVIDSON, W. PHILIP. Effects of prenatal and postnatal methylmercury exposure from fish consumption on neurodevelopment. 1998. 8 p. (Référence à la séance 23, page 10).

PAP64.4 DAVIDSON, W. PHILIP, AND AL. Longitudinal neurodevelopmental study of Seychellois children following in vitro exposure to methylmercury from maternal fish ingestion: outcomes at 19 and 29 months. 1995. 12 p. (Référence à la séance 23, page 10).


PAP65A Présentation - Processus de consultation. 5 mai 2006. 6 p. (Référence à la séance 25, page 97).

PAP65B Présentation - Rectificatif au mémoire de RNCan - Mercure, matières organiques et mesures d’atténuation. 5 mai 2006. 2 p.

PAP65C Présentation - Simulations visuelles. 5 mai 2006. 18 p.

PAP66 Réponse à une question posée lors de la séance du 1er mai 2006 à Montréal - Achat de production privée par HQP. 16 mai 2006. 3 p. (Référence à la séance 27, page 72).


PAP68 Réponse à une question posée lors de la séance du 27 avril 2006 à Chibougamau - Véhicule électrique et consommation d’électricité. 16 mai 2006. 1 p. (Référence à la séance 27, page 74).


PAP74 Graphique - Figure 13-7 - Lac Sakami. 16 mai 2006. (Référence à la séance 28, page 80).

PAP75 Graphique - Figure 13-6 - Lac Boyd. 16 mai 2006. (Référence à la séance 28, page 80).

PAP76 Graphique - Figure 13-5 - Parcours Boyd-Sakami. 16 mai 2006. (Référence à la séance 28, page 80).

PAP77 Graphique - Figure 13-4 - Parcours Boyd-Sakami. 16 mai 2006. (Référence à la séance 28, page 80).


PAP81.1 - Volume 2. Fiches d’information techniques et figures des secteurs archéologiques 1.01 à 4.08.


PAP84 Présentation - Moyens identifiés. 17 mai 2006. 1 p. (Référence à la séance 29, page 112).


PAP87 Photo d’une séance annuelle d’information à Mistissini sur le suivi environnemental. 2006. (Référence à la séance 29, page 124).


PAP89 Hydro-Québec et le climat. 17 mai 2006. 14 p. (Référence à la séance 29, page 143).

PAP90 Dessin technique - Engagements en turbines. 17 mai 2006.

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PAP91.1 - Allocution. 27 p.


PAP95 Figure - Longitudinal profile of transfer tunnel. May 30, 2006.

PAP96 Figure - Rupert Estuary - Navigable Channel - After Diversion - Depth at Low Tide. May 31, 2006.


PAP99 Figure 311-1 - Rupert Estuary - Present and future conditions. June 1, 2006.

PAP100 Présentation - Simulations visuelles. 1er juin 2006. 27 p.


PAP102 Photo - Seuil 207. 2 juin 2006. (Référence à la séance 36, page 72).


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PAP104.1 - Allocution. 25 p.


PAP107 Presentation - Structural monitoring program relating to dam safety at Hydro-Québec, La Rande Rivière. June 2006. 21 p. (Référence à la séance 38, page 49).

PAP108 Affiche - Relations avec les communautés autochtones. 2 p. (Référence à la séance 38, page 54).

PAP109 Diagramme - Programme de mesures d’urgence - Identification de ressources du milieu - Cree Nation of Chisasibi. 1 p. (Référence à la séance 38, page 78).

PAP110 Graph - Forecasted water levels. June 7 2006. 1 p. (Référence à la séance 38, page 79).


PAP113 Graph - Figure 14-3: Duration curve for the daily variation in La Grande-1 turbine flow - Present (200-2002) - and future conditions. June 7, 2006. 1 p. (Référence à la séance 39, page 18).

PAP114 Graph - Figure 14-5: Grande Rivière Estuary - Stage - duration curves at Chisasibi - Present (2000-2002) and future conditions. June 7, 2006. 1 p. (Référence à la séance 39, page 18).


PAP118 Picture - Land slide along La Grande. (Référence à la séance 39, page 33).


PAP120 Presentation - Eelgrass on the Northeast Coast of James Bay. June 8, 2006. 8 p. (Référence à la séance 40, page 84).

PAP121 Figure - Distribution of Sedimentary Facies. June 8, 2006. 1 p. (Référence à la séance 40, page 93).


5.5 SUPPLEMENTARY DOCUMENTS TABLED BY THE PROONENT


DCAP1.1 - Carte – Vue d’ensemble du projet.


DCAP2.1 - Carte - Sites d’aménagements proposés.


DCAP8  *Comparaison des options de production d'électricité - Biodiversité*. Juin 2000. 4 p.

DCAP9  *Comparaison des options de production d'électricité - Le territoire utilisé*. Avril 2000. 4 p.

DCAP10  *Comparaison des options de production d'électricité - Rendement de l’investissement énergétique*. Avril 2000. 4 p.


DCAP16  Dr. Michel Plante -Direction Santé et Sécurité - *Commentaires relatifs aux précisions apportées par Santé Canada en regard du mémoire déposé à la commission fédérale d’examen*. 8 Juin 2006. 4 p.

DCAP17  *Answers to Questions and Notes by Jocelyne Beaudet (Waskaganish Hearings)*. June 8, 2006. 5 p.

DCAP18  *Answers to Questions and Notes by Jocelyne Beaudet (Waskaganish Hearings) - Final version*. June 9, 2006. 6 p.


DCAP20  *Carte - Planche 2-1 : Conditions de navigation dans la rivière Rupert en conditions futures*. 9 Juin 2006.


DCAP23  *Response to the document by the Cree Regional Authority dated May 1, 2006, concerning the lessons learned from the Eastmain-1 project and the follow-up requirements for the Eastmain-1-A/Rupert project in terms of Cree employment*. June 9, 2006. 7 p.


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DOE1 Requêtes de dépôt de documents avant les audiences publiques. 16 février 2006. 1 p.
DOE2 Compte rendu - Rencontre technique avec le professeur Grant Ingram (University of British Columbia). 19 avril 2006. 3 p.
DOE4 Lettre à Santé Canada. 15 mai 2006. 1 p.
DOE5 Notes et questions de Jocelyne Beaudet à Hydro-Québec (Waskaganish). 2 juin 2006. 2 p.

5.7 TRANSCRIPTS (VERBATIM) OF THE SESSIONS

6 - DOCUMENTS TABLED FOLLOWING THE PUBLIC HEARINGS

6.1 PARTICIPANTS

D1 GÉRALD CÔTÉ. Libre échange intercultural - En marge de la consultation publique de Chisasibi sur la dérivation de la Rupert. 11 juin 2006. 2 p.


D7  GRAND CONSEIL DES CRIS - ADMINISTRATION RÉGIONALE CRIE - HYDRO-QUÉBEC - SOCIÉTÉ D’ÉNERGIE DE LA BAIE JAMES. Entente relative à la gestion de l’eau de la rivière Rupert intervenue entre les parties à Montréal. 13 juin 2006. 7 p.

D8  RESSOURCES NATURELLES CANADA. Supplément d’information ci-joint portant sur la question du mercure. 18 juillet 2006. 2 p.


6.2 PROponent

PD1  HYDRO-QUÉBEC - ENVIRONNEMENT CANADA. Faits saillants - Rencontre. 13 juin 2006. 5 p.


PD5 HYDRO-QUÉBEC ÉQUIPEMENT. Lettre à Pêches et Océans Canada - Engagements d’Hydro-Québec et information complémentaire. 7 août. 2 p.


PD5.2 - Étude complémentaire - Alimentation de l’esturgeon jaune dans le secteur des futurs biefs - Sonnaire du protocole d’étude. 2 p.


PD5.4 - Détermination des limites d’inondation et d’exondation en été dans le bief amont du seuil au PK 233. 9 p.

PD5.5 - Seuil au PK 233 - Conception optimisée - Note d’information. 1 p.

PD6 SOCIÉTÉ D’ÉNERGIE DE LA BAIE JAMES. Lettre à Bernard Forestell, commission fédérale d’examen et Clément Tremblay, COMEX - Exploitation de la rivière Rupert. 15 août 2006. 2 p.


PD7.1 - Tableau - Rapport sur la densité.

PD7.2 - Tableau - Calcul des gains-pertes en equivalents couples.

PD7.3 - Tableau - Bilan des pertes et des gains de couples nicheurs.


PD9.1 - Tableau 2 - Programme de suivi environnemental pour les poissons.

PD9.2 - Carte - Bief Rupert amont – Aménagement potentiel de frayère à touladi au lac Cabot.

PD9.3 - Carte - Bief Rupert amont – Aménagement potentiel de frayère à touladi au lac RP030.


### 6.3 REVIEW BODIES


**OED5** MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L’ENVIRONNEMENT ET DES PARCS. *Stratégie québécoise sur les aires protégées - Réserve de biodiversité projetée de Waskaganish (nom provisoire) - Plan de conservation*. Septembre 2004. 5 p.


**OED8** TABLE RONDE NATIONALE SUR L’ENVIRONNEMENT ET L’ÉCONOMIE. *Conseils sur une stratégie à long terme sur l’énergie et les changements climatiques*. Juin 2006. 39 p.


**OED13** JAMES, A.R.C. ET A.K. STUART-SMITH. *Distribution of caribou and wolf in relation to linear corridors. J. Wildl. Manage. 64 (1)*. 2000. 154-159.

**OED14** MAHER, P. *Expert Advice on the potential for tourism in the northern area of James Bay (Rupert River) - A report for the Joint Review Panel for the Eastmain-1A and Rupert - Diversion Project*. October 2006. 10 p.


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SOGEAM. Rivière Eastmain et Opinaca - Programme de suivi environnemental. 1998.

7 - MISCELLANEOUS CORRESPONDANCE


C20  PÊCHES ET OCEANS CANADA (MARYSE LEMIRE). Lettre à Louis Breton, Environnement Canada - Notification en vertu du paragraphe 79(1) de la Loi sur les espèces en péril. 11 janvier 2006. 2 p.


C26  TRANSPORTS CANADA (MICHEL DEMERS). Lettre à Nathalie Nicole, Hydro-Québec - Demande de Hydro-Québec pour l’aménagement hydroélectrique de la centrale de l’Eastmain-1-A et dérivation de la rivière Rupert. 22 août 2006. 2 p.

8- OTHER REFERENCE DOCUMENTS

R1 GOUVERNEMENT DU QUÉBEC. Loi sur la qualité de l'environnement du Québec (L.R.Q., Q-2) - Chapitre II et annexes A et B. 1981.


APPENDIX 3

LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>ACRGTQ</th>
<th>Association de constructeurs de routes et grands travaux du Québec</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIEQ</td>
<td>Association de l’industrie électrique du Québec</td>
</tr>
<tr>
<td>ATV</td>
<td>All terrain vehicle</td>
</tr>
<tr>
<td>CBHSSJB</td>
<td>Cree Board of Health and Social Services of James Bay</td>
</tr>
<tr>
<td>CCBD</td>
<td>Convention on the Conservation of Biological Diversity</td>
</tr>
<tr>
<td>CCQ</td>
<td>Commission de la construction du Québec</td>
</tr>
<tr>
<td>CEAA</td>
<td>Canadian environmental Assessment Act</td>
</tr>
<tr>
<td>CEAA</td>
<td>Canadian environmental Assessment agency</td>
</tr>
<tr>
<td>CEAT</td>
<td>Conseil des élus d’Abitibi-Témiscamingue</td>
</tr>
<tr>
<td>CEHQ</td>
<td>Centre d’expertise hydrique du Québec</td>
</tr>
<tr>
<td>CETC</td>
<td>Chibougamau Economic and Tourism Commission</td>
</tr>
<tr>
<td>CHRD</td>
<td>Cree Human Resources Development agency</td>
</tr>
<tr>
<td>CNACA</td>
<td>Cree Native and Crafts Association</td>
</tr>
<tr>
<td>COMEV</td>
<td>Evaluating Committee</td>
</tr>
<tr>
<td>COMEX</td>
<td>Environmental and Social Impact Review Committee</td>
</tr>
<tr>
<td>COTA</td>
<td>Cree Outfitting and Tourism Association</td>
</tr>
<tr>
<td>CPDNQ</td>
<td>Centre de données sur le patrimoine naturel du Québec</td>
</tr>
<tr>
<td>CRA</td>
<td>Cree Regional Authority</td>
</tr>
<tr>
<td>CREBJ</td>
<td>Centre régional des élus de la Baie-James</td>
</tr>
<tr>
<td>DFO</td>
<td>Department of Fisheries and Oceans</td>
</tr>
<tr>
<td>EMN</td>
<td>Environmental Monitoring Network</td>
</tr>
<tr>
<td>EOL</td>
<td>Eastmain, Opinaca, La Grande</td>
</tr>
<tr>
<td>EQA</td>
<td>Environment Quality Act</td>
</tr>
<tr>
<td>FTQ</td>
<td>Fédération des travailleurs du Québec</td>
</tr>
<tr>
<td>GCCQ</td>
<td>Grand Council of the Crees of Québec</td>
</tr>
<tr>
<td>GRAME</td>
<td>Groupe de recherche appliquée en macroécologie</td>
</tr>
<tr>
<td>HBC</td>
<td>Hudson Bay Company</td>
</tr>
<tr>
<td>HFTCC</td>
<td>Hunting, Fishing and Trapping Coordinating Committee</td>
</tr>
<tr>
<td>HPI</td>
<td>Habitat probabilistic index</td>
</tr>
<tr>
<td>HQ</td>
<td>Hydro-Québec</td>
</tr>
<tr>
<td>HQD</td>
<td>Hydro-Québec Distribution</td>
</tr>
<tr>
<td>HQP</td>
<td>Hydro-Québec Production</td>
</tr>
<tr>
<td>HQT</td>
<td>Hydro-Québec Transénergie</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>ISP</td>
<td>Income Security Program</td>
</tr>
<tr>
<td>JBNQA</td>
<td>James Bay and Northern Québec Agreement</td>
</tr>
<tr>
<td>MBJ</td>
<td>Municipality of Baie-James</td>
</tr>
<tr>
<td>MDDEP</td>
<td>Ministère du Développement durable, de l’Environnement et des Parcs</td>
</tr>
<tr>
<td>MRNF</td>
<td>Ministère des Ressources naturelles et de la Faune</td>
</tr>
<tr>
<td>MSY</td>
<td>Maximum sustainable yield</td>
</tr>
<tr>
<td>NBR</td>
<td>Nottaway-Broadback-Rupert</td>
</tr>
<tr>
<td>PK</td>
<td>Kilometer point</td>
</tr>
<tr>
<td>QCKF</td>
<td>Québec Canoeing and Kayaking Federation</td>
</tr>
<tr>
<td>QME</td>
<td>Québec Manufacturers and Exporters</td>
</tr>
<tr>
<td>RCC</td>
<td>Regional Control Centre</td>
</tr>
<tr>
<td>RNI</td>
<td>Regulation Respecting Standards of Forest Management for Forests in the domain of the State</td>
</tr>
<tr>
<td>SCC</td>
<td>System control centre</td>
</tr>
<tr>
<td>SEBJ</td>
<td>Société d’énergie de la Baie James</td>
</tr>
<tr>
<td>Sépaq</td>
<td>Société des établissements de plein air du Québec</td>
</tr>
<tr>
<td>UQCN- Nature-Québec</td>
<td>Union Québécoise de la Conservation de la Nature-Nature Québec</td>
</tr>
<tr>
<td>UTN</td>
<td>Unité de turbidité néphélémétrique</td>
</tr>
<tr>
<td>VEC</td>
<td>Valued Ecosystem Componant</td>
</tr>
<tr>
<td>WUA</td>
<td>Weighted usable area</td>
</tr>
</tbody>
</table>
SUMMARY TABLES OF THE IMPACTS, MITIGATION MEASURES AND FOLLOW-UPS SPECIFIC TO EACH HUNTING GROUND

IMPACTS ON HUNTING GROUNDS — MISTISSINI

<table>
<thead>
<tr>
<th>HUNTING GROUND M18 (NORTH OF THE TAILBAY)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXISTING INFRASTRUCTURE</strong></td>
</tr>
<tr>
<td><strong>INFRASTRUCTURE AND SANDPITS</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>IMPACTS ON THE BIOPHYSICAL MILIEU</strong></td>
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<tr>
<td><strong>IMPACTS ON THE HUMAN MILIEU</strong></td>
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<td></td>
</tr>
</tbody>
</table>
### HUNTING GROUND M18 (NORTH OF THE TAILBAY)

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of multi-species spawning grounds below the Nemiscau-1 and 2 tailbay works;</td>
<td></td>
</tr>
<tr>
<td>Relocation of a permanent camp to the shore of Kattishabocau Lake;</td>
<td></td>
</tr>
<tr>
<td>Relocation of a spring goose-hunt camp to the shore of Cramoisy Lake;</td>
<td></td>
</tr>
<tr>
<td>Building an access road to reach these camps (lakes Kattishabocau and Cramoisy) (HQ will study the feasibility of this);</td>
<td></td>
</tr>
<tr>
<td>Program to trap or relocate beaver and bears;</td>
<td></td>
</tr>
<tr>
<td>HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone;</td>
<td></td>
</tr>
<tr>
<td>Build a portage to safely pass the dams (Nemiscau-1 and 2).</td>
<td></td>
</tr>
</tbody>
</table>

### HUNTING GROUND M25 (FOREBAY AND SOUTH OF THE TAILBAY)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 30 km of the 735 kV maintenance road (7069-7070), ~30 km of the 735 kV line (7069-7070).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFRASTRUCTURE AND SANDPITS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rupert camp;</td>
<td></td>
</tr>
<tr>
<td>Dams and minimum flow works on Nemiscau-2 (on the boundary of hunting ground M18), Arques Brook and Lemare River;</td>
<td></td>
</tr>
<tr>
<td>Minimum flow works on Kayechischekaw Brook;</td>
<td></td>
</tr>
<tr>
<td>44 dikes (17 in the tailbay, 27 in the forebay);</td>
<td></td>
</tr>
<tr>
<td>1 transfer tunnel + 9 canals (4 in the forebay, 5 in the tailbay);</td>
<td></td>
</tr>
<tr>
<td>Large amount of material left over from digging the transfer tunnel and canals. Must be disposed of on the hunting ground;</td>
<td></td>
</tr>
<tr>
<td>6 possible quarries + 103 possible sandpits;</td>
<td></td>
</tr>
<tr>
<td>Permanent highways (access road to the tailbay (17.5 km) and forebay (31.8 km), 13.8 km access road to Rupert camp, 13.6 km access road to the transfer tunnel and Lake Cabot);</td>
<td></td>
</tr>
<tr>
<td>~32 km of temporary access roads to the canals and dikes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACTS ON THE BIOPHYSICAL MILIEU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding of 214.9 km² by the Rupert forebay and tailbay, covering 15.46% of the hunting ground;</td>
<td></td>
</tr>
<tr>
<td>Raised water levels on part of the Nemiscau River, presence of the Nemiscau-2 dam and restoration of flow regulated to the average natural hydrograph of the river (2.0 m/s);</td>
<td></td>
</tr>
<tr>
<td>Raised water levels on part of Arques Brook, presence of the Arques Brook dike and annual average return flow of 2.3;</td>
<td></td>
</tr>
<tr>
<td>Raised water levels on part of Kayechischekaw Brook, presence of a dike and annual average return flow of 0.4 m³/s;</td>
<td></td>
</tr>
<tr>
<td>Raised water levels on part of the Lemare River, presence of a dam and annual average return flow of 16.2 m³/s;</td>
<td></td>
</tr>
<tr>
<td>Raised water levels on part of the Mistikawissich River;</td>
<td></td>
</tr>
</tbody>
</table>
**Hunting Ground M25 (Forebay and South of the Tailbay)**

<table>
<thead>
<tr>
<th><strong>Impacts on the Biophysical Milieu</strong></th>
<th>Average June to September fluctuation should vary between 0.5 and 0.8 m in the tailbay;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average June to September fluctuation is estimated at 0.6 m in the forebay;</td>
</tr>
<tr>
<td></td>
<td>Increased mercury levels in fish in the forebay and tailbay and below the outlet works of Nemiscau-2, Arques Brook and Lemare River;</td>
</tr>
<tr>
<td></td>
<td>Destruction of a northern pike spawning ground by the building of the Lemare River dam;</td>
</tr>
<tr>
<td></td>
<td>Destruction of a lake whitefish spawning ground by the building of the Arques Brook dike;</td>
</tr>
<tr>
<td></td>
<td>Raised water levels in a lake trout spawning ground on Des Champs Lake, three others on Arques Lake and two on Lake RP030;</td>
</tr>
<tr>
<td></td>
<td>Raised water levels in a lake sturgeon spawning ground located at kilometre 14 on the Misticawissich River (boundary with hunting ground M26).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Impacts on the Human Milieu</strong></th>
<th>Raised water levels at 2 permanent camps (kilometres 77 and 107 - the latter having burned down in recent years);</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relocation of a permanent camp - construction of dike C-105;</td>
</tr>
<tr>
<td></td>
<td>Nearly 35 temporary camps flooded;</td>
</tr>
<tr>
<td></td>
<td>Flooding of 6 birthplaces and 8 graves;</td>
</tr>
<tr>
<td></td>
<td>5 float-plane landings lost;</td>
</tr>
<tr>
<td></td>
<td>The territory is opened up;</td>
</tr>
<tr>
<td></td>
<td>Restrictions on eating fish;</td>
</tr>
<tr>
<td></td>
<td>Changes to goose-hunting areas and fishing locations in the area of Arques, Des Champs and Goulde lakes and along the tributary located north of kilometre 78 of the diversion;</td>
</tr>
<tr>
<td></td>
<td>Danger to snowmobiles crossing below Canals S73, since freeze-up will likely take place a bit later;</td>
</tr>
<tr>
<td></td>
<td>The area between Misticawissich River and the south of Goulde Lake (between kilometres 90 and 100 from the diversion) will become inaccessible by snowmobile because the faster current will prevent solid ice from forming;</td>
</tr>
<tr>
<td></td>
<td>Danger to snowmobiles traveling in the area of Canals 4 and 5 (between kilometres 51 and 55 from the diversion) because the faster current will prevent solid ice from forming;</td>
</tr>
<tr>
<td></td>
<td>In some winters, danger to snowmobiles below the transfer tunnel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mitigation Measures</strong></th>
<th>Development of multi-species spawning grounds below Canal S73-3 (including lake sturgeon), below Canal 15 and below the Nemiscau-2, Lemare River and Arques Brook minimum flow works;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Development of lake trout spawning grounds on Des Champs Lake and the lake with no name (RP030);</td>
</tr>
<tr>
<td></td>
<td>Development of a new lake sturgeon spawning ground on the Misticawissich River (slightly above the existing spawning ground, on the boundary with hunting ground M26);</td>
</tr>
</tbody>
</table>
**HUNTING GROUND M25 (FOREBAY AND SOUTH OF THE TAILBAY)**

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Building of 2 new camps (one on the western shore of Lake Lemare, the other in the eastern part of the ground);</td>
<td></td>
</tr>
<tr>
<td>Payment for a recently built camp along the 735 kV line (7069 and 7070);</td>
<td></td>
</tr>
<tr>
<td>Installation of a shaapuhtuwaan (winter lodge) ~ 10 m long and a canvas camp on the shores of a small lake located southwest of Rupert camp (HQ will study the feasibility of this);</td>
<td></td>
</tr>
<tr>
<td>Construction of an access road leading to the new camp (HQ agrees to study the feasibility of this);</td>
<td></td>
</tr>
<tr>
<td>Installation of a gatehouse immediately north of Albanel station (construction period);</td>
<td></td>
</tr>
<tr>
<td>Construction of a launching ramp on the eastern shore of Lake Lemare;</td>
<td></td>
</tr>
<tr>
<td>Program to trap or relocate beaver and bears;</td>
<td></td>
</tr>
<tr>
<td>HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone;</td>
<td></td>
</tr>
<tr>
<td>Development of goose-hunting ponds in the sandpits (if the tallyman agrees);</td>
<td></td>
</tr>
<tr>
<td>Build a portage to safely pass the dams (Nemiscau-2 and Lemare);</td>
<td></td>
</tr>
<tr>
<td>Follow-up on boating conditions in the forebays and tailbays;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on ice conditions at snowmobile crossings at the forebays and tailbays.</td>
<td></td>
</tr>
</tbody>
</table>

**HUNTING GROUND M26 (FOREBAY)**

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>A non-Cree camp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td></td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Flooding of 15.8 km² by the Rupert forebay, covering 2.3% of the hunting ground;</td>
</tr>
<tr>
<td></td>
<td>Raised water levels on part of the Mistikawissich River;</td>
</tr>
<tr>
<td></td>
<td>Average June to September fluctuation in the forebay estimated at 0.6 m;</td>
</tr>
<tr>
<td></td>
<td>Increased mercury levels in fish in the forebay;</td>
</tr>
<tr>
<td></td>
<td>Raised water levels in a lake sturgeon spawning ground located at kilometre 14 on the Misticawissich River (on the boundary with hunting ground M25).</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>Restrictions on eating fish;</td>
</tr>
<tr>
<td></td>
<td>Changes to goose-hunting areas and fishing locations along the Rupert and Misticawissich rivers (on the boundary with M33).</td>
</tr>
</tbody>
</table>
### EXISTING INFRASTRUCTURE

About 50 km of the Route du Nord, ~35 km of the 735 kV line (7076-7077) and 22 non-Cree camps.

### INFRASTRUCTURE AND SANDPITS

- Flooding of 34.8 km² by the Rupert forebay, covering 1.52% of the hunting ground;
- Raised water levels on part of the Rupert River;
- Raised water levels on part of the Mistikawissich River;
- Average June to September fluctuation in the forebay estimated at 0.6 m;
- Increased mercury levels in fish in the forebay;
- Raised water levels in several lake trout spawning grounds in the lake with no name (RP062);
- Raised water levels in a lake sturgeon spawning ground at kilometre 325 on the Rupert River.

### IMPACTS ON THE BIOPHYSICAL MILIEU

- Restrictions on eating fish;
- Changes to goose-hunting areas and fishing locations along the Rupert and Misticawissich rivers (on the boundary with M26);
- Loss of part of a moose-hunting area;
- Loss of a float-plane landing.

### MITIGATION MEASURES

- Follow-up mercury levels in fish from a lake flowing into the Misticawissich River and inform users;
  - Development of a new lake sturgeon spawning ground on the Misticawissich River (above the existing spawning ground, on the boundary with hunting ground M25);
  - Program to trap or relocate beaver and bears;
  - Follow-up on boating conditions in the forebays and tailbays;
  - Follow-up on ice conditions at snowmobile crossings at the forebays and tailbays.

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### HUNTING GROUND M33 (SOUTH OF THE FOREBAY)

#### EXISTING INFRASTRUCTURE

About 50 km of the Route du Nord, ~35 km of the 735 kV line (7076-7077) and 22 non-Cree camps.

#### INFRASTRUCTURE AND SANDPITS

- Flooding of 34.8 km² by the Rupert forebay, covering 1.52% of the hunting ground;
- Raised water levels on part of the Rupert River;
- Raised water levels on part of the Mistikawissich River;
- Average June to September fluctuation in the forebay estimated at 0.6 m;
- Increased mercury levels in fish in the forebay;
- Raised water levels in several lake trout spawning grounds in the lake with no name (RP062);
- Raised water levels in a lake sturgeon spawning ground at kilometre 325 on the Rupert River.

#### IMPACTS ON THE HUMAN MILIEU

- Restrictions on eating fish;
- Changes to goose-hunting areas and fishing locations along the Rupert and Misticawissich rivers (on the boundary with M26);
- Loss of part of a moose-hunting area;
- Loss of a float-plane landing.

#### MITIGATION MEASURES

- Development of a lake sturgeon spawning ground at kilometre 332 on the Rupert River to replace the flooded spawning ground at kilometre 325;
- Development of two new lake trout spawning grounds in the lake with no name (RP062);
- Follow-up on water levels near the camp located along the edge of the Route du Nord and take necessary corrective measures or relocate the camp if it is flooded;
- Program to trap or relocate beaver and bears;
- Follow-up on boating conditions in the forebays and tailbays;
- Follow-up on ice conditions at snowmobile crossings at the forebays and tailbays.
## IMPACTS ON HUNTING GROUNDS — NEMASKA

### HUNTING GROUND N23 (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Old Nemaska, ~40 km of the James Bay highway, ~12 km of the Waskaganish highway, the kilometre 257 truck stop, the kilometre 257 rest area (Oatmeal Rapids), some 4 km of an access road to a municipal campground and a boat launching ramp, and 3 non-Cree camps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Enlargement of the James Bay highway kilometre 257 camp (kilometre 257 truck stop); Weirs at kilometres 110.3 and 170 on the Rupert River; 2 possible quarries + 3 possible sandpits; ~4 km of temporary road to be improved (access road to a municipal campground and a boat launching ramp) and 4 km of temporary road to be built (access to the weir at kilometre 110.3 on the Rupert River).</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Lower water levels in stretches not controlled by weirs; Water level of Lake Nemiscau protected (eastern boundary of the hunting ground); Water levels below the Oatmeal Rapids (between kilometres 104 and 107) lowered by 1.9 m in summer and 1.5 m in the spring; Impassible waterfalls at kilometres 104 and 107 will become passable to fish or passable with reservations; The partially passable obstacle at kilometre 164.5 will become fully passable to fish; Reduced water quality in the Rupert River below Lake Nemiscau (increase in turbidity); Loss of fish habitat (weirs); Destruction of a walleye spawning ground by construction of the kilometre 170 weir; Tributary streams at kilometres 101.5, 107 and 136.5 on the Rupert River may become inaccessible to fish.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>The territory is opened up; Disturbance of hunting in the areas around construction of the waterworks; Displacement of fishing locations below kilometre 110.3 and between kilometres 136 and 137 on the Rupert River due to lower water levels; The stretch between kilometres 131 and 132 may become hard to navigate.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Development of a multi-species spawning ground below the kilometre 110.3 weir; Compensation for the loss of a walleye spawning ground by the enlargement of an existing walleye spawning ground near the kilometre 170 weir; Stock lake sturgeon on the stretch between kilometres 110 and 170;</td>
</tr>
</tbody>
</table>
### HUNTING GROUND N23 (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor the tributary streams entering the Rupert River at kilometres 101.5, 107 and 136.5 (accessibility for fish);</td>
<td></td>
</tr>
<tr>
<td>Seed certain newly exposed riverbanks (kilometres 107 and 120 to 155);</td>
<td></td>
</tr>
<tr>
<td>Program to trap or relocate beaver;</td>
<td></td>
</tr>
<tr>
<td>HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone;</td>
<td></td>
</tr>
<tr>
<td>Improved access to the camp at kilometre 244 on the James Bay highway;</td>
<td></td>
</tr>
<tr>
<td>Improvement of the boat launching ramp on the south shore of the Rupert River behind the camp at kilometre 257 and construction of another on the south shore above the weir at kilometre 110;</td>
<td></td>
</tr>
<tr>
<td>Construction of another path if the portage at kilometre 150 on the Rupert cannot be rebuilt in a satisfactory way;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on boating conditions on the Rupert River, particularly between kilometres 131 and 132;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on ice cover for snowmobiling.</td>
<td></td>
</tr>
</tbody>
</table>

### HUNTING GROUND N24 (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 50 km of the 450 kV line (4003-4004) and one non-Cree camp.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFRASTRUCTURE AND SANDPITS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weir at kilometre 223 on the Rupert River.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACTS ON THE BIOPHYSICAL MILIEU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s);</td>
<td></td>
</tr>
<tr>
<td>Lower water levels in stretches not controlled by weirs;</td>
<td></td>
</tr>
<tr>
<td>Natural flow maintained on the La Martre River;</td>
<td></td>
</tr>
<tr>
<td>Loss of fish habitat (weirs).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACTS ON THE HUMAN MILIEU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes to hunting and trapping activity in stretches not influenced by the waterworks (between kilometres 219 and 223 and 251 and 261);</td>
<td></td>
</tr>
<tr>
<td>Disturbance of hunting in the areas around construction of the waterworks;</td>
<td></td>
</tr>
<tr>
<td>Displacement of fishing locations between kilometres 250 and 260 on the Rupert River due to lower water levels.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of a multi-species spawning ground below the weir at kilometre 223;</td>
<td></td>
</tr>
<tr>
<td>Monitor the lake sturgeon spawning ground during and after the work;</td>
<td></td>
</tr>
<tr>
<td>Changes to the tributary at kilometre 191 to improve its potential for brook trout;</td>
<td></td>
</tr>
</tbody>
</table>
### HUNTING GROUND N24 (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
<th>Seed certain newly exposed riverbanks (between kilometres 205 and 218 and between kilometres 235 and 290);</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relocation of three camps inland (tallyman will decide after the diversion);</td>
</tr>
<tr>
<td></td>
<td>Arrangements with the tallyman to prevent the work from interfering with hunting;</td>
</tr>
<tr>
<td></td>
<td>Limited access to the shoreline connecting the dock at kilometre 6 on the Nemiscau River and the access road to the weir at kilometre 223 during the work;</td>
</tr>
<tr>
<td></td>
<td>Rebuilding the portage at kilometre 217.5 to ensure access to the fishing site at kilometre 216;</td>
</tr>
<tr>
<td></td>
<td>Follow-up on ice cover for snowmobiling;</td>
</tr>
<tr>
<td></td>
<td>If needed, build other snowmobile trails inland, parallel to the river.</td>
</tr>
</tbody>
</table>

### HUNTING GROUND N24A (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 6 km of the 735 kV line (7080), ~20 km of the 735 kV line (7081-7082) and 1 non-Cree camp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s);</td>
</tr>
<tr>
<td></td>
<td>Lower water levels in stretches not controlled by weirs;</td>
</tr>
<tr>
<td></td>
<td>Natural flow maintained on the La Martre River.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Increased distance between landings and camps at kilometres 255 and 258 on the Rupert River because of the new shoreline exposed;</td>
</tr>
<tr>
<td></td>
<td>Changes to hunting and trapping activity in stretches not influenced by the waterworks (between kilometres 251 and 261 and 275 and 279);</td>
</tr>
<tr>
<td></td>
<td>Displacement of fishing locations between kilometres 240 and 260 on the Rupert River due to lower water levels.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Seed certain newly exposed riverbanks (between kilometres 235 and 290);</td>
</tr>
<tr>
<td></td>
<td>Move a camp located on hunting ground N25 to a place of his choice (or build a new camp);</td>
</tr>
<tr>
<td></td>
<td>Improve the old winter road located to the south of hunting ground N25 to provide access to the La Martre River (if the tallyman of hunting ground N25 agrees);</td>
</tr>
<tr>
<td></td>
<td>Move the camp at kilometre 258 on the Rupert River to a place the tallyman chooses if the newly exposed riverbanks interfere with using it;</td>
</tr>
<tr>
<td></td>
<td>Follow-up on ice cover for snowmobiling.</td>
</tr>
</tbody>
</table>
### Existing Infrastructure

About 18 km plus ~3 km of the Route du Nord highway, ~12 km of an automobile road (starting from the Route du Nord, almost opposite the Rupert dam), ~4 km of an automobile road connecting a Cree camp to the Route du Nord, ~15 km of the 735 kV line (7076-7077), ~20 km of the 735 kV line (7081-7082), ~50 km of the 735 kV line (7078), ~35 km of the 735 kV line (7080) and 1 non-Cree camp.

### Infrastructure and Sandpits

- Rupert River dam and spillway;
- Spur dike at kilometre 290 on the Rupert River;
- Jolly Bay dike (kilometre 311 on the Rupert River);
- 1 possible quarry + 18 possible sandpits;
- Large amount of material left over from construction of the Rupert River dam and spillway. Must be disposed of on the hunting ground (or on hunting ground M25);
- Permanent access highway to the Rupert River dam (4 km).

### Impacts on the Biophysical Milieu

- Flooding of 1.5 km² of land by the Rupert forebay, covering ~0.1% of the hunting ground;
- Lower water levels in stretches not controlled by weirs;
- Raised water levels on part of the Rupert River; dam and spillway on the Rupert River; reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); water levels directly below the dam will go down by 2.1 m between kilometres 314 and 294 (August-September period);
- Natural flow maintained on the La Martre River;
- Increased mercury levels in fish in the tailbay and below the Rupert River spillway;
- Loss of fish habitat (dam + spur dike);
- Disturbance of two walleye and longnose sucker spawning grounds directly below the Rupert dam;
- Possible changes in flow conditions on a lake sturgeon spawning ground below the spur dike at kilometre 290;
- The tributary at kilometre 299.5 may become inaccessible to fish;
- The partly passable obstacles at kilometres 308.5 and 310 will become fully passable to fish;
- Falls at kilometre 309 that fish cannot pass will become passable or passable with reservations.

### Impacts on the Human Milieu

- A temporary camp flooded (on ground R21);
- Restrictions on eating fish from the tailbay and directly below the Rupert River spillway;
- The territory is opened up;
- Increased distance between the landing and the camp at kilometre 280 on the Rupert River because of the new shoreline exposed;
## IMPACTS ON THE HUMAN MILIEU

*Disturbance of hunting in the areas around construction sites;*

*Partial flooding of a goose-hunting area;*

*Loss of part of a moose-hunting area and a trapping area;*

*Loss of fishing grounds on the Rupert River above kilometre 314;*

*Changes to hunting and trapping activity in stretches not influenced by the waterworks (between kilometres 310 and 314);*

*Boating impossible on parts of the Rupert River above kilometre 314 and on lakes Goulde and Des Champs;*

*Changes to boating conditions in the forebay and tailbay.*

## MITIGATION MEASURES

*Development of a multi-species spawning ground below the discharge at kilometre 314;*

*Follow-up and if needed improve the lake sturgeon spawning ground below the spur dike at kilometre 290;*

*Follow-up the lake sturgeon spawning ground at kilometre 281;*

*Follow-up fish populations on Sipastikw Arm;*

*Changes to the tributary at kilometre 311 to improve its potential for brook trout;*

*Improvements to brook trout habitats in the lakes south of the camp at kilometre 311 on the Rupert River;*

*Monitor on the tributary at kilometre 299.5 (accessibility to fish);*

*Seed certain newly exposed riverbanks (between kilometres 235 and 290);*

*Move the camp at kilometre 311 to a place the tallyman chooses;*

*Remove the equipment at the temporary camp to be flooded;*

*Possibly build an access road to reach the new camp from the road along 735 kV line (7078-7080);*

*Program to trap or relocate beaver and bears;*

*Development of the bay at kilometre 311 (Jolly Bay);*

*Development of goose-hunting ponds in the sandpits if the tallyman agrees;*

*Follow-up on boating conditions on the Rupert River, on Sipastikw Arm and particularly on the stretch between kilometres 281 and 290;*

*Follow-up on ice cover for snowmobiling.*
### HUNTING GROUND R16 (NORTH SIDE OF THE NEMISCAU RIVER)

<p>| EXISTING INFRASTRUCTURE                                                                 | Nemaska village, ~10 km of the Nemaska highway, ~55 km of the Route du Nord, the Nemiscau camp, the Hydro-Quebec residences, ~3 km of the Nemiscau-Eastmain-1 highway, Nemiscau airport, 3 km of the Lac Jolliet camp access road, ~3 km of the 450 kV line (4003-4004), Nemiscau substation, ~33 km of the 69 kV line paired with the 735 kV line (7062-7063), ~4 km of the 735 kV line (7061), ~4 km of the Nemiscau-Eastmain-1 315 kV line (under construction) paired with the 735 kV line (7061), ~10 km of the 735 kV line (7080), ~10 km of the 735 kV line (7081-7082) and 2 non-Cree camps. |
| INFRASTRUCTURE AND SANDPITS                                                          | Lac Jolliet camp; Weir at kilometre 170 on the Rupert River; 1 possible quarry + 3 possible sandpits; 3 km of temporary road to be built + 3 km of road to improve (access to weirs at kilometres 170 and 223 on the Rupert River and at Lac Jolliet camp). |
| IMPACTS ON THE BIOPHYSICAL MILIEU                                                   | Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Restored flow on the Nemiscau River (restored natural flow of 11.6 m³/s at the Nemiscau-1 worksite and 2.0 m³/s at Nemiscau-2); Loss of fish habitat (weir); Destruction of a walleye spawning ground by construction of the weir at kilometre 170. |
| IMPACTS ON THE HUMAN MILIEU                                                         | The territory is opened up; Disturbance of hunting in the areas around construction sites. |
| MITIGATION MEASURES                                                                 | Compensation for the loss of a walleye spawning ground by enlargement of an existing walleye spawning ground located near the weir at kilometre 170; Installation of a security fence near the weir at kilometre 170; Maintenance of the access road to the weir at kilometre 170; Construction of an ATV (all-terrain vehicle) trail ~2 km long to reach new camps at kilometre 10 on the Nemiscau River (HQ agrees to study the possibility of building this access trail); Construction of a boat launching ramp with parking near the weir at kilometre 170; Development of goose-hunting ponds in the sandpits if the tallyman agrees; HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; |</p>
<table>
<thead>
<tr>
<th><strong>EXISTING INFRASTRUCTURE</strong></th>
<th>About 50 km of the Route du Nord, ~28 km of the 450 kV line (4003-4004), ~16 km of the 450 kV line (4003-4004) maintenance road (southbound), ~10 km of an automobile road (northbound) along the 450 kV line (4003-4004) and 2 non-Cree camps.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFRASTRUCTURE AND SANDPITS</strong></td>
<td>Lac Jolliet camp (at the boundary with hunting ground R16); 3 possible sandpits; 18 km of road to be improved: the access road to Lac Jolliet camp and the maintenance road for the 450 kV line (4003-4004).</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE BIOPHYSICAL MILIEU</strong></td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Lower water levels in stretches not controlled by weirs; Reduced water quality in the Rupert River (increased turbidity); Destruction of a walleye spawning ground by the construction of the weir at kilometre 170; Impassible waterfalls at kilometre 156 will become passable to fish or passable with reservations; The partly passable obstacle at kilometre 164.5 will become fully passable to fish; The tributary at kilometre 136.5 may become inaccessible to fish.</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE HUMAN MILIEU</strong></td>
<td>Boating may become difficult between kilometres 131 and 132; Displacement of the fishing location between kilometres 136 and 137 due to lower water levels.</td>
</tr>
<tr>
<td><strong>MITIGATION MEASURES</strong></td>
<td>Compensation for the loss of a walleye spawning ground by enlargement of an existing walleye spawning ground located near the weir at kilometre 170; Stocking of the stretch between kilometres 110 and 170 with lake sturgeon fry; Seed certain newly exposed riverbanks (between kilometres 120 and 155); Follow-up the tributary at kilometre 136.5 (accessibility to fish, boating difficulties); Measures needed to ensure that the camps at kilometres 146 and 128 can be used or that new camps are built elsewhere; HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; Development of goose-hunting ponds in the sandpits if the tallyman agrees; Follow-up on boating conditions on the Rupert River, particularly between kilometres 131 and 132; Follow-up on ice cover for snowmobiling.</td>
</tr>
<tr>
<td>EXISTING INFRASTRUCTURE</td>
<td>A boat launching ramp on the north bank of the Nemiscau River to reach Lake Nemiscau or Old Nemaska, ~1 km of the 450 kV line (4003-4004) maintenance road, ~20 km of the automobile road alongside the 450 kV line (4003-4004), ~18 km of the 450 kV line (4003-4004), ~20 km of the 735 kV line (7080), ~20 km of the 735 kV line (7081-7082) and 1 non-Cree camp.</td>
</tr>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Weirs at kilometres 223 and 170 on the Rupert River; 1 possible quarry + 13 possible sandpits; ~3 km of temporary road to build (access to the weir at kilometre 170); Improvement of ~13 km of the 450 kV line (4003-4004) maintenance road + construction of ~15 km of temporary road (access to the weir at kilometre 223).</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Lower water levels in stretches not controlled by weirs; Level of Lake Nemiscau protected; Restored flow on the Nemiscau River (restored average natural flow of 11.6 m³/s at the Nemiscau-1 worksite and 2.0 m³/s at Nemiscau-2); Loss of fish habitat (weirs); Destruction of a walleye spawning ground by the construction of the weir at kilometre 170; The tributary at kilometre 254.3 may become inaccessible to fish.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>The territory is opened up; Disturbance of hunting in the areas around waterworks construction sites; Increased distance between the landing and the camp at kilometre 205 on the Rupert River because of the new shoreline exposed; Changes in hunting and trapping on the stretches not affected by waterworks (between kilometres 219 and 223, 251 and 261, 275 and 279); Displacement of fishing locations located below kilometre 223 and between kilometres 250 to 260 due to lower water levels.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Development of a multi-species spawning ground below the weir at kilometre 223; Changes to the tributary at kilometre 191 on the Rupert River to improve its potential for brook trout; Compensation for the loss of a walleye spawning ground by the enlargement of an existing walleye spawning ground near the weir at kilometre 170; Follow-up on the lake sturgeon spawning ground at kilometre 216 during and after the work; Follow-up on the tributary at kilometre 254.3 (accessibility to fish); Seed certain newly exposed riverbanks (between kilometres 235 and 290); Limited access to the shoreline connecting the dock at kilometre 6 on the Nemiscau River and the access road to the weir at kilometre 223 of the Rupert River during the work;</td>
</tr>
</tbody>
</table>
**EXISTING INFRASTRUCTURE**

- About 7 km of the Route du Nord, 40 km of the Nemiscau Eastmain-1 highway, ~10 km of access roads to certain dikes at the Eastmain 1 Reservoir, ~27 km of the 735 kV line (7061) paired with the 315 kV Eastmain 1-Nemiscau line (under construction), ~7 km of the 735 kV line (7079) and 1 non-Cree camp.

**INFRASTRUCTURE AND SANDPITS**

- 2 quarries.

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### HUNTING GROUND R18 (BETWEEN THE RUPERT AND NEMISCAU RIVERS)

| MITIGATION MEASURES | Flyover of the hunting ground with the tallyman to verify that all sites have been restored and all debris picked up; |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------
|                     | Follow-up on water quality and take measures if needed, if users can no longer take their water from the Rupert River; |
|                     | HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; |
|                     | Development of goose-hunting ponds in the sandpits if the tallyman agrees; |
|                     | Follow-up on boating conditions on the Rupert River; |
|                     | Follow-up on ice cover for snowmobiling. |

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### HUNTING GROUND R19 (NORTH SIDE OF THE NEMISCAU RIVER)

| EXISTING INFRASTRUCTURE | About 7 km of the Route du Nord, 40 km of the Nemiscau Eastmain-1 highway, ~10 km of access roads to certain dikes at the Eastmain 1 Reservoir, ~27 km of the 735 kV line (7061) paired with the 315 kV Eastmain 1-Nemiscau line (under construction), ~7 km of the 735 kV line (7079) and 1 non-Cree camp. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------
| INFRASTRUCTURE AND SANDPITS | 2 quarries. |

| IMPACTS ON THE BIOPHYSICAL MILIEU | Flooding of 4.9 km² by the Rupert tailbay, covering 0.4% of the hunting ground; |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------
|                                    | Raised water levels and increased flow in part of Caché Brook; |
|                                    | Flooding of ~5% to 10% of the hunting ground by the Eastmain 1 Reservoir; |
|                                    | Increased flow in the Eastmain River; |
|                                    | Restored flow on the Nemiscau River (restored average natural flow of 11.6 m³/s at the Nemiscau-1 worksite and 2.0 m³/s at Nemiscau-2); |
|                                    | Increased mercury levels in fish in the forebay and Eastmain 1 Reservoir. |

| IMPACTS ON THE HUMAN MILIEU | Restrictions on eating fish from the forebay. |

| MITIGATION MEASURES | Follow-up on mercury levels in fish from the Nemiscau River and inform users; |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------
|                     | Build an access road from the Nemiscau Eastmain-1 highway to the camp at Lake Utish (feasibility to be evaluated). |
### HUNTING GROUND R20 (NORTH SIDE OF THE NEMISCAU RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 18 km of the Route du Nord, 9.3 km of the 735 kV line (7069-7070) maintenance road, ~7 km of the 735 kV line (7069-7070), ~16 km of the 735 kV line (7059), ~16 km of the 735 kV line (7079) and 1 non-Cree camp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>6 possible sandpits; Improve the 735 kV line (7069-7070) maintenance road to make it the permanent highway leading to Rupert camp (9.3 km).</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Restored flow on the Nemiscau River (restored average natural flow of 11.6 m³/s at the Nemiscau-1 worksite and 2.0 m³/s at Nemiscau-2); Increased mercury levels in fish below the Nemiscau-1 and 2 outlet works.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>Restrictions on eating fish from directly below the Nemiscau-1 and 2 outlet works.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Follow-up on water quality and take measures if needed, should users no longer be able to take their water from the Nemiscau River; Follow-up on mercury levels in fish from the Nemiscau River and inform users; Maintain certain access roads to sandpits; Development of goose-hunting ponds in the sandpits if the tallyman agrees.</td>
</tr>
</tbody>
</table>

### HUNTING GROUND R21 (NORTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 30 km of the Route du Nord, from Albanel station, ~5 km of the 735 kV line (7069-7070) maintenance road, ~3 km of the 735 kV line (7059), ~16 km of the 735 kV line (7078), ~4.5 km of the 735 kV line (7079).</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Rupert River dam; Spur dike at kilometre 290; 1 possible quarry + 41 possible sandpits; 1 km of permanent road from the Rupert River dam to a dike + 5 km of temporary access road to Rupert camp from Albanel station; 14.7 km of temporary access road to the weir at kilometre 290 + ~8 km to extend the road to kilometre 281 on the Rupert River.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Flooding of 11.5 km² by the Rupert tailbay, covering 1.7% of the hunting ground; Lower water levels in stretches not controlled by weirs; Raised water levels on part of the Rupert River; dam and spillway on the Rupert River; reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); water level down 2.1 m directly below the dam between kilometres 314 and 294 (August to September);</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>Restriction on eating fish from directly below the Nemiscau-1 and 2 outlet works.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Follow-up on water quality and take measures if needed, should users no longer be able to take their water from the Nemiscau River; Follow-up on mercury levels in fish from the Nemiscau River and inform users; Maintain certain access roads to sandpits; Development of goose-hunting ponds in the sandpits if the tallyman agrees.</td>
</tr>
</tbody>
</table>
### IMPACTS ON THE BIOPHYSICAL MILIEU

- Raised water levels on part of the Misticawissich River (boundary with hunting ground M25);
- Restored flow on the Lemare River (restored average annual flow of 16.2 m³/s);
- Restored flow on Kayechischekaw Brook (restored average annual flow of 0.4 m³/s); water levels 1.4 m lower in spring and up to 2.3 m in summer;
- Loss of fish habitat (dam + spurs);
- The partly passable obstacles at kilometres 308.5 and 310 will become fully passable to fish;
- Impassible waterfalls at kilometre 309 will become passable to fish or passable with reservations;
- Possible changes in flow conditions on the lake sturgeon spawning ground below the spur at kilometre 290;
- Disturbance of two walleye and longnose sucker spawning grounds directly below the Rupert dam.

### IMPACTS ON THE HUMAN MILIEU

- 2 temporary camps flooded;
- Restrictions on eating fish from the tailbay directly below the Rupert River spillway;
- The territory is opened up;
- Lost boating routes in the stretches of the Rupert River above kilometre 314 and on lakes Goulde and Des Champs;
- Lost fishing grounds on the Rupert River above kilometre 314;
- Disturbance of hunting in the areas around construction sites;
- 3 grave sites flooded (on hunting ground M25);
- Changes to boating conditions in the head and tailbays;
- Boating may become difficult between kilometres 281 and 290;
- Increased distance between the landing and the camp at kilometre 304 on the Rupert River because of the new shoreline exposed;
- Changes in hunting and trapping on the stretches not affected by waterworks (between kilometres 310 and 314).

### MITIGATION MEASURES

- Development of a multi-species spawning ground below the outlet works;
- Follow-up on the lake sturgeon spawning ground below the spur dike at kilometre 290;
- Follow-up on the lake sturgeon spawning ground at kilometre 281;
- Seed certain newly exposed riverbanks (between kilometres 235 and 290);
- Construction of a new camp in the western part of the hunting ground;
- Moving of equipment from flooded temporary camps;
HUNTING GROUND N1 (SOUTH SIDE OF THE RUPERT RIVER)

**EXISTING INFRASTRUCTURE**

About 70 km of the Waskaganish highway and ~60 km of the Waskaganish 69 kV line (under construction).

**INFRASTRUCTURE AND SANDPITS**

Kauschiskach camp;

Weirs at kilometres 33, 49 and 85 on the Rupert River;

About 22.4 km of temporary roads (~4.5 km of access road to the weir at kilometre 33, ~5.3 km of access road to the weir at kilometre 49, ~12.6 km of access road to the weir at kilometre 85);

6 possible quarries + 15 possible sandpits.

**IMAPS ON THE BIOPHYSICAL MILIEU**

Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s);

Lower water levels in stretches not controlled by weirs;

Present summer water level in Kapeshi Eputpeyach Bay (kilometre 47.8) maintained by the weir at kilometre 33;

Change of ~1.5 m in average summer levels between kilometres 66 and 77;

Water levels lowered between kilometres 96 and 103 by ~1 m to 2.5 m in summer and 1 m to 2 m in spring;

Temporary (1 year) exposure above water of a northern pike spawning ground below the weirs at kilometres 49 and 85;

Loss of fish habitat (weirs);

Impassible waterfalls at kilometre 49 will become passable to fish or passable with reservations;

The partly passable obstacles at kilometres 65.9 and 77 will become fully passable to fish;

Reduced water quality in the Rupert River (increase in turbidity).

HUNTING GROUND R21 (NORTH SIDE OF THE RUPERT RIVER)

**MITIGATION MEASURES**

Extending access to the weir at kilometre 290 with a road to kilometre 281 (the tallyman must consult the other tallymen involved – N25, N24, N24A and R18);

The tallyman may decide to keep the access roads to sandpits;

HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone;

Development of goose-hunting ponds in the sandpits if the tallyman agrees;

Program to trap or relocate beaver and bears;

Follow-up on boating conditions on the Rupert River, particularly on the stretch between kilometres 281 and 290 and on Kayechischekaw Brook (North Arm);

Follow-up on ice cover for snowmobiling.

IMPACTS ON HUNTING GROUNDS — WASKAGANISH
**HUNTING GROUND N1 (SOUTH SIDE OF THE RUPERT RIVER)**

**IMPACTS ON THE HUMAN MILIEU**
- The territory is opened up;
- Disturbance of hunting in the areas around waterworks construction sites;
- Displacement of fishing locations located between kilometres 250 and 260 on the Rupert River due to lower water levels.
- Tributary at kilometre 74.5 may become inaccessible.

**MITIGATION MEASURES**
- Changes to the tributary at kilometre 41 to improve its potential for brook trout;
- Construction of a new camp away from the area of the weir worksite (vicinity of kilometre 84 on the Waskaganish highway);
- Construction of four-season access to Houré Lake (to evaluate);
- The tallyman may decide to keep the access roads to the sandpits (not yet decided);
- Recover the remnants of past use of a sandpit beside a lake located southeast of the weir at kilometre 85;
- Development of goose-hunting ponds in the sandpits if the tallyman agrees;
- Program to trap or relocate beaver;
- Follow-up on boating conditions on the Rupert River;
- Follow-up on ice cover for snowmobiling;
- Follow-up the tributary at kilometre 74.5 (boating).

**HUNTING GROUND N2 (SOUTH SIDE OF THE RUPERT RIVER)**

**EXISTING INFRASTRUCTURE**
- About 15 km of the Waskaganish highway, the Gravel Pit camp, ~2 km of access road to Gravel Pit, ~15 km of the Waskaganish 69 kV line (under construction).

**INFRASTRUCTURE AND SANDPITS**
- Rock blanket at kilometre 20.4 on the Rupert River;
- ~3 km of temporary road leading to the rock blanket at kilometre 20.4 (parallel to the Gravel Pit road);
- 2 possible quarries + 7 possible sandpits.

**IMPACTS ON THE BIOPHYSICAL MILIEU**
- Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s);
- Lower water levels in stretches not controlled by weirs;
- The rock blanket at kilometre 20.4 should enable water levels to be maintained, while also protecting against a 100-year flood at the Gravel Pit dock, preserving dip-net fishing at the Smokey Hill site, maintaining boating and the free passage of fish at kilometre 20.4, conserving the visual appearance of the area and reducing the risk of freezing in spawning areas in winter;
- Changes in fish habitat (rock blanket);
- Reduced water quality in the Rupert River (increase in turbidity).
### HUNTING GROUND N9 (SOUTH SIDE OF THE RUPERT RIVER)

<table>
<thead>
<tr>
<th><strong>EXISTING INFRASTRUCTURE</strong></th>
<th>The village of Waskaganish, Waskaganish airport, ~20 km of the Waskaganish highway, ~20 km of the Waskaganish 69 kV line (under construction), the water intake, ~4.5 km of the access road to the water intake.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFRASTRUCTURE AND SANDPITS</strong></td>
<td>6 possible sandpits.</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE BIOPHYSICAL MILIEU</strong></td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m$^3$/s); Lower water levels at low tide in the mouth of the river (50 to 70 cm); Reduced water quality in the Rupert River (increase in turbidity).</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE HUMAN MILIEU</strong></td>
<td>Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by waterworks (between kilometres 5 and 15).</td>
</tr>
<tr>
<td><strong>MITIGATION MEASURES</strong></td>
<td>Improvement of ATV access to the camp (HQ agrees to study the feasibility of this); Program to trap or relocate beaver; Follow-up on boating conditions on the Rupert River; Follow-up on ice cover for snowmobiling.</td>
</tr>
</tbody>
</table>
**HUNTING GROUND R4 (NORTH SIDE OF THE RUPERT RIVER)**

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Infrastructure and Sandpits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMPACTS ON THE BIOPHYSICAL MILIEU</strong></td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Lower water levels at low tide in the mouth of the river (50 to 70 cm); Reduced water quality in the Rupert River (increase in turbidity).</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE HUMAN MILIEU</strong></td>
<td>Presence of the planned Waskaganish Biodiversity Reserve.</td>
</tr>
<tr>
<td><strong>MITIGATION MEASURES</strong></td>
<td>Visit the sites after restoration and cleanup; Follow-up on water quality and take measures if needed, should users no longer be able to take their water from the Nemiscau River; Program to trap or relocate beaver; Follow-up on boating conditions on the Rupert River and the channels on the north shore at the mouth; Follow-up on ice cover for snowmobiling.</td>
</tr>
</tbody>
</table>

**HUNTING GROUND R5 (NORTH SIDE OF THE RUPERT RIVER)**

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Infrastructure and Sandpits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMPACTS ON THE BIOPHYSICAL MILIEU</strong></td>
<td>Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s); Lower water levels at low tide in stretches not controlled by weirs; Reduced water quality in the Rupert River (increase in turbidity).</td>
</tr>
<tr>
<td><strong>IMPACTS ON THE HUMAN MILIEU</strong></td>
<td>Presence of the planned Waskaganish Biodiversity Reserve; Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by waterworks (between kilometres 5 and 15).</td>
</tr>
<tr>
<td><strong>MITIGATION MEASURES</strong></td>
<td>Construction of another camp if the new camp at kilometre 5 is no longer accessible due to boating conditions; Program to trap or relocate beaver; Follow-up on boating conditions on the Rupert River and the channels on the north shore at the mouth; Follow-up on ice cover for snowmobiling.</td>
</tr>
</tbody>
</table>
### Existing Infrastructure

**Infrastructures and Sandpits**
- Rock blanket at kilometre 20.4 and weirs at kilometres 33 and 49 on the Rupert River.

### Impacts on the Biophysical Milieu

**Reduced flow on the Rupert River**
- Compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s.
- Lower water levels in stretches not controlled by weirs.
- The rock blanket at kilometre 20.4 should enable water levels to be maintained, while also protecting against a 100-year flood at the Gravel Pit dock, preserving dip-net fishing at the Smokey Hill site, maintaining boating and the free passage of fish at kilometre 20.4, conserving the visual appearance of the area and reducing the risk of freezing in spawning areas in winter.
- Present summer water level in Kapeshi Eputupeyach Bay (kilometre 47.8) maintained by the weir at kilometre 33.
- Average summer water levels will change by ~1.5 m between kilometres 66 and 77.
- Temporary (1 year) exposure above water of a northern pike spawning ground below the weir at kilometre 49.
- Modification (rock blanket) and loss of fish habitat (weirs).
- Reduced water quality in the Rupert River (increase in turbidity).
- Impassible waterfalls at kilometre 49 will become passable to fish or passable with reservations.
- The partly passable obstacle at kilometre 65.9 will become fully passable to fish.

### Impacts on the Human Milieu

**Presence of the Smokey Hill site and the planned Waskaganish Biodiversity Reserve**
- Disturbance of hunting in the areas around waterworks construction sites.
- Increased distance between the landing and the camp at kilometre 8.5 on the Rupert River because of the new shoreline exposed (on hunting ground R5).
- Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by waterworks (between kilometres 27 and 29).

### Mitigation Measures

**Changes to the tributary at kilometre 41 to improve its potential for brook trout**
- Seed certain newly exposed riverbanks (between kilometres 27 and 30).
- Move a goose-hunting camp on hunting ground R5 to kilometre 8.5 (banks exposed) if the tallyman agrees.
- Program to trap or relocate beaver.
- Follow-up on the Smokey Hill site and develop one or more other fishing locations on the south shore if the Smokey Hill site is affected by lower water levels.
- Follow-up on ice cover for snowmobiling.
## HUNTING GROUND R12 (NORTH SIDE OF THE RUPERT RIVER)

### EXISTING INFRASTRUCTURE

About 10 km of the Waskaganish 69 kV line (under construction) and ~8 km of a road.

### INFRASTRUCTURE AND SANDPITS

- Weir at kilometre 85 of the Rupert River;
- About 4 km of temporary roads (~14 km of access road to the weir at kilometre 85, but using 10 km of the construction road for the Waskaganish 69 kV line);
- 1 possible quarry + 5 possible sandpits.

### IMPACTS ON THE BIOPHYSICAL MILIEU

- Reduced flow on the Rupert River (compensatory flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m³/s);
- Lower water levels in stretches not controlled by weirs;
- Water levels lowered between kilometres 96 and 103 by ~1 m to 2.5 m in summer and 1 m to 2 m in springtime;
- Temporary (1 year) exposure above water of a northern pike spawning ground below the weir at kilometre 85;
- Loss of fish habitat (weir);
- The tributary at kilometre 74.5 may become blocked to fish;
- The partly passable obstacle at kilometre 77 will become fully passable to fish;
- Reduced water quality in the Rupert River (increase in turbidity).

### IMPACTS ON THE HUMAN MILIEU

- Presence of the planned Waskaganish Biodiversity Reserve;
- The territory is opened up;
- Disturbance of hunting in the areas around waterworks construction sites;
- Displacement of fishing locations located between kilometres 78 and 79 on the Rupert River due to lower water levels.

### MITIGATION MEASURES

- Follow-up on the tributary at kilometre 74.5 (accessibility to fish);
- Build a snowmobile trail from the camp at kilometre 282 on the James Bay highway toward lakes Machisakahikanish and Machisakahi-kan;
- Construction of a new camp on the shore of Lake Machisakahikanish;
- Development of goose-hunting ponds in the sandpits if the tallyman agrees;
- Program to trap or relocate beaver;
- Follow-up on boating conditions on the Rupert River;
- Follow-up on ice cover for snowmobiling.
## Existent Infrastructure

About 21 km of the James Bay highway, ~25 km of the North Road, ~12 km of a road beginning at the James Bay highway, and ~35 km of 69-kV line from Waskaganish.

## Infrastructure and Sandpits

- Camp at kilometre 257 (on the border of the area);
- Kilometre 110.3 weir of the Rupert River;
- About 3 km of temporary roads to be improved, followed by ~2 km of temporary roads to build for access to the kilometre 110.3 weir;
- 4 potential sand pits.

## Impacts on the Biophysical Milieu

- Reduced flow in Rupert River (reserved flow equivalent to 29% of the average annual flow at the damming point, i.e. 184.7 m³/s);
- Reduction of water levels in the sections not controlled by the weirs;
- Lowering of water levels below the Oatmeal Rapids (between kilometre 104 and 107) from 1.9 m in summer and 1.5 m in spring;
- Loss of fish habitat (weir);
- Exposure of 15 m of the right bank of the river at the head of the Oatmeal Rapids in summer;
- Impassable waterfall located at kilometre 103 will become passable to fish or passable with reservations;
- Deterioration of the water quality in the Rupert River (increase in turbidity).

## Impacts on the Human Milieu

- Presence on the Reserve of the biodiversity project of Waskaganish;
- The territory is opened up;
- Disruption of hunting activity near the construction sites of hydraulic structures;
- Increase in the distance between the landing site and the workcamp located at kilometre 128 on the Rupert River, due to exposure of the banks.

## Mitigation Measures

- Development of a multi-species spawning ground downstream from the kilometre 110.3 weir;
- Stocking of yellow sturgeon fry between kilometre 110 and 170;
- Installation of security fences near the kilometre 110.3 weir;
- Replacement of the workcamp situated at kilometre 109.3 with a new one located ~600 m upriver from the weir;
- Maintenance and extension of the access road from the weir of kilometre 110.3 to the site of the new workcamp;
- Development of a boat launching ramp near the new workcamp;
- Development of goose-hunting ponds in the sand pits, if requested by the tallyman;
- Program to trap or relocate beaver;
- Follow-up on the tributaries located at kilometre 101.5 and 107 (boating);
- Follow-up on ice cover for snowmobiling;
### IMPACTS ON THE HUNTING GROUNDS EASTMAIN

#### HUNTING GROUND RE1 (WEST OF THE EASTMAIN 1 RESERVOIR)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 30 km of the Nemiscau-Eastmain-1 route, the dam and the</td>
<td>~30 km of the Eastmain-1-Nemiscau 315-kV line (under construction),</td>
</tr>
<tr>
<td>Eastmain-1 generating station (under construction), ~30 km</td>
<td>~25 km of the 69 kV line (614), ~40 km of the 69-kV line (615), ~50 km</td>
</tr>
<tr>
<td>of the Eastmain-1-Nemiscau 315-kV line (under construction),</td>
<td>of temporary road for the construction of the 69-kV line (615), ~30 km</td>
</tr>
<tr>
<td>the spillway at Eastmain, the Muskeg station, ~25 km of the</td>
<td>of the 69 kV line paired with the 735-kV line (7062-7063) and the 735-kV</td>
</tr>
<tr>
<td>69 kV line (614), ~40 km of the 69-kV line (615), ~50 km</td>
<td>line (7061) for ~45 km, ~30 km of the 450-kV line (4003-4004) and two</td>
</tr>
<tr>
<td>of temporary road for the construction of the 69-kV line (615)</td>
<td>non-Cree encampments.</td>
</tr>
<tr>
<td>~30 km of the 450-kV line (4003-4004) and two non-Cree</td>
<td></td>
</tr>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td></td>
</tr>
<tr>
<td>Eastmain workcamp;</td>
<td></td>
</tr>
<tr>
<td>Generating station Eastmain-1-A;</td>
<td></td>
</tr>
<tr>
<td>18 potential sand pits;</td>
<td></td>
</tr>
<tr>
<td>Permanent road from Muskeg-Eastmain-1 (~40 km);</td>
<td></td>
</tr>
<tr>
<td>Temporary road for construction of the 315-kV Sarcelle-Eastmain-1-A line (~50 km);</td>
<td></td>
</tr>
<tr>
<td>315-kV line Sarcelle-Eastmain-1A (~50 km);</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPLACIONS ON THE BIOPHYSICAL MILIEU</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>~10 % of the area will be flooded by the Eastmain 1 Reservoir;</td>
<td></td>
</tr>
<tr>
<td>Increase in the flow of the Eastmain 1 Reservoir;</td>
<td></td>
</tr>
<tr>
<td>Increase in the flow of the Eastmain River over ~42 km (between the spillway of Eastmain-1 and the OA-11 dam) and reduced flow for ~14 km (between the spillways of Eastmain-1-PK217 and PK203) and ~24 km (between the OA-11 dam and weir 5);</td>
<td></td>
</tr>
<tr>
<td>Maximum operating levels of the Eastmain 1 Reservoir vary between 274.11m and 283.11 m (possible fluctuation range of 9 m), average predicted fluctuations vary between 275.10 m and 282.61 m (anticipated fluctuation range 7.51 m);</td>
<td></td>
</tr>
<tr>
<td>Loss of fish habitat (tailrace of the Eastmain 1-A generating station);</td>
<td></td>
</tr>
<tr>
<td>Increase in mercury content of fish in the Eastmain River below the Eastmain-1 and Eastmain-1-A generating stations;</td>
<td></td>
</tr>
<tr>
<td>Increase in mercury content of fish in the Eastmain 1 Reservoir;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPLACIONS ON THE HUMAN MILIEU</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction on eating fish in the Eastmain 1 Reservoir and in the Eastmain River downstream from the generating station;</td>
<td></td>
</tr>
<tr>
<td>The territory is opened up;</td>
<td></td>
</tr>
<tr>
<td>Presence of areas opened for community goose-hunting</td>
<td>(Eastmain River downstream of the OA-11 dam to weir 5);</td>
</tr>
<tr>
<td>Changes in boating conditions on the Eastmain River with reduced flow;</td>
<td></td>
</tr>
<tr>
<td>Eastmain River between the Eastmain-1 generating station and the head of the Opinaca Reservoir (kilometre 193) inaccessible to snowmobiles due to unstable ice cover;</td>
<td></td>
</tr>
<tr>
<td>Dangerous snowmobile travel between the entrance to the Eastmain 1 Reservoir (between kilometres 20 and 30 and between kilometres 51.3 and 55 of the drift) because the rapid flow makes ice formation difficult and areas with open patches will exist all winter in the excavated portions.</td>
<td></td>
</tr>
</tbody>
</table>
### HUNTING GROUND RE1 (WEST OF THE EASTMAIN 1 RESERVOIR)

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>HQ agrees to recommend to the appropriate authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone;</td>
</tr>
<tr>
<td>Modification of the route of the 315-kV Sarcelle-Eastmain-1 line to follow closer to the Muskeg-Eastmain-1 route and avoid a moose-hunting zone at the request of the tallyman;</td>
</tr>
<tr>
<td>Before construction of the Sarcelle-Eastmain-1 line, a survey will be carried out with the tallyman over the entire length of the planned corridor;</td>
</tr>
<tr>
<td>Program to trap or relocate beaver;</td>
</tr>
<tr>
<td>Follow-up on ice conditions on the Eastmain River and at the points crossed by the Opinaca reservoir.</td>
</tr>
</tbody>
</table>

### HUNTING GROUND VC33 (NOT INCLUDED IN THE 36 HUNTING GROUNDS AFFECTED BY THE PROJECT ACCORDING TO HQ)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 30 km of the James Bay highway, ~18 km of the 450-kV line (4003-4004) and the relay station of kilometre 381 of the James Bay highway.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>~20 km of permanent road to be improved.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Reduced flow on the Opinaca River;</td>
</tr>
<tr>
<td></td>
<td>Reduced flow on the Eastmain River.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MITIGATION MEASURES</th>
</tr>
</thead>
</table>
## HUNTING GROUND VC34 (NORTH OF THE OPINACA RESERVOIR)

### EXISTING INFRASTRUCTURE
Sarcelle regulatory facility (OA-03), Opinaca dam (OA-05), Opinaca spillway and one telecommunications tower.

### INFRASTRUCTURE AND SANDPITS
- Sarcelle encampment;
- Sarcelle generating station (bordering hunting ground VC22 - Wemindji);
- Sarcelle substation;
- ~10 km of the Sarcelle-Eastmain-1 315-kV line;
- ~7 km of permanent road to improve (access to Sarcelle inlet)

### IMPACTS ON THE BIOPHYSICAL MILIEU
Presence of the Opinaca reservoir (closure of the Opinaca River - dam OA-05 - at the boundary of hunting grounds VC34 and VC23);

Increase in the water level of the Opinaca reservoir;

Maximum operating levels of the Opinaca reservoir vary between 211.84 m and 216.41 m (possible fluctuation range of 4.57 m), average expected fluctuations vary between 211.84 and 212.82 m (predicted fluctuation range of 0.98 m) - average expected drop of 0.51 m relative to the average level;

Loss of fish habitat (runoff canal at the Sarcelle generating station) affecting reproduction of walleye, longnose suckers and lake whitefish.

### IMPACTS ON THE HUMAN MILIEU
The territory is opened up;

Presence of two sectors suitable for use by the community for goose-hunting (the OA-04 dike sector and the Sarcelle regulatory facility) and a sector suitable for community use for fishing (proximity of the OA-04 dike and OA-04 dam);

Encroachment of the Sarcelle camp on a goose-hunting zone;

Boating on the Opinaca reservoir is difficult;

Opinaca reservoir is accessible to snowmobilers.

### MITIGATION MEASURES
Development of a multi-species spawning ground in the river section downstream from the Sarcelle site;

Program to trap or relocate beaver;

HQ agrees to promote the establishment of a controlled-use area by the Weh-Sees Indohoun Corporation;

Move the Sarcelle-Eastmain-1 line to the west to avoid a goose-hunting zone at the request of the tallyman;

Use of a helicopter, paid for by HQ, to return to the eastern part of the hunting ground during work periods;

Cleanup of debris on the banks of the Opinaca reservoir southwest of the Sarcelle generating station to facilitate goose-hunting activities on the island south of the generating station and along the west bank of the reservoir, as far as the Sarcelle work camp;

Conversion of the site of the Sarcelle work camp for goose-hunting when the work is finished;

Follow-up on ice conditions at crossing points on the Opinaca reservoir.
## EXISTING INFRASTRUCTURE

About 25 km of various roads leading to Hydro-Quebec installations, dams OA-08A, OA-08B, OA-09, OA-10B and OA-11, weir 5 on the Eastmain River, ~35 km of the 735 kV line (7061), ~35 km of the 735 kV line (7062-7063), 3 non-Cree camps and a telecommunications tower.

## INFRASTRUCTURE AND SANDPITS

~45 km of permanent road to improve (south part of the road linking the Muskeg substation to the Sarcelle regulatory facility);

~40 km of temporary road (construction road for the 315-kV Sarcelle-Eastmain-1 line);

~35 km of the 315-kV Sarcelle-Eastmain-1 line.

## IMPACTS ON THE BIOPHYSICAL MILIEU

Presence of the Opinaca reservoir;

Increased flow in the Opinaca reservoir;

Maximum operating levels of the Opinaca reservoir vary between 211.84 m and 216.41 m (possible fluctuation range of 4.57 m), predicted average fluctuations between 211.84 m and 212.82 m (fluctuation range of .98 m) - predicted average lowering of 0.51 m relative to the average level;

Increased flow in the Eastmain River over ~30 km (between kilometre 190 of the Eastmain River and the OA-11 dam) and reduced flow over ~40 km (between the OA-11 dam and the southwest extremity of the area);

Increased level of mercury in the fish in the Eastmain River downstream from the generating stations.

## IMPACTS ON THE HUMAN MILIEU

Restriction on eating fish from the Eastmain River below the generating station;

The territory is opened up;

Presence of sectors suitable for goose-hunting use by the community (Eastmain River downstream from the OA-11 dam to weir 5);

Boating on the Opinaca reservoir is difficult;

Changes to boating conditions on the Eastmain River due to increased flow;

Eastmain River between the Eastmain-1 generating station and the head of the Opinaca reservoir (kilometre 193) inaccessible to snowmobilers due inconsistent ice cover;

Opinaca reservoir accessible for snowmobiling except in the two arms of the Wabamisk pass where the ice cover is insufficient.

## MITIGATION MEASURES

Installation of road signs indicating the presence of Cree camps and warning truck drivers to reduce speed;

Program to trap or relocate beaver;

HQ agrees to promote the establishment of a controlled-use zone by the Weh-Sees Indohoun Corporation;

Follow-up on ice conditions at crossing points on the Opinaca reservoir.
### Existing Infrastructure

The Eastmain-1 dam (under construction) on the border of the area, the Eastmain-1 spillway (under construction) on the border of the area, LE-3 and LE-4 dikes and 4 non-Cree camps.

### Infrastructure and Sandpits

**Impacts on the Biophysical Milieu**

- About 20% of the area submerged by the Eastmain 1 Reservoir;
- Increased flow in the Eastmain 1 Reservoir;
- Maximum operating levels of the Eastmain 1 Reservoir vary between 274.11 m and 283.11 m (possible fluctuation range of 9 m), the average predicted fluctuations vary between 275.10 m and 282.61 m (predicted fluctuation range of 7.51 m);
- Increased levels of mercury in the fish in the Eastmain 1 Reservoir;
- Eastmain River has reduced flow (between kilometre 217 and 203) and increased flow (between kilometre 203 and 193);
- Increased levels of mercury in fish below the Eastmain-1 and Eastmain-1-A generating stations;
- Loss of fish habitat (tailrace canal Eastmain-1-A).

**Impacts on the Human Milieu**

- Restrictions on eating fish;
- Changes in fishing activities along the excavated section of the Eastmain River with reduced flow from kilometre 217-193);
- Changes in boating conditions along the excavated section of the Eastmain River with reduced flow from kilometre 217-193);
- Eastmain River between the Eastmain-1 generating station and the mouth of the Opinaca reservoir (kilometre 193) inaccessible for snowmobiling due to inconsistent ice cover.

**Mitigation Measures**

- Program to trap or relocate beaver.
**IMPACTS BY HUNTING GROUND – WEMINDJI**

<table>
<thead>
<tr>
<th><strong>HUNTING GROUND VC20 (NORTH OF LAKE SAKAMI)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXISTING INFRASTRUCTURE</strong></td>
</tr>
<tr>
<td>About 95 km of the Trans-Taiga Road, ~6 km of a road linking the La Grande-3 airport to LG-3, ~3 km of a branch road linking the Trans-Taiga Road to LG-3, ~7 km of a road linking the Trans-Taiga Road to the Robert Bourassa reservoir, ~3 km of a road linking the Trans-Taiga Road to the Robert Bourassa reservoir (at the mouth of the Sakami River, ~3 km of 735-kV line (7062-7063), ~16 km of 735-kV line (7061), ~2 km of 735-kV line (7057-7059), ~75 km of 735-kV line (7060), 11 non-Cree camps and 1 telecommunications tower.</td>
</tr>
</tbody>
</table>

| **INFRASTRUCTURE AND SANDPITS** |
| Lake Sakami work camp; |
| Sakami canal and weir; |
| 0.9 km to improve + 2.3 km of temporary road to build (access roads to the Lake Sakami workcamp and the Sakami weir). |

| **IMPACTS ON THE BIOPHYSICAL MILIEU** |
| Presence of Lake Sakami; |
| Increase in the flow and level of water in Lake Sakami (average rise of .048 m relative to the average.) |
| Sakami river at natural flow for ~30 km as far as the lake and increased flow between the Sakami weir and the Robert Bourassa reservoir. |

| **IMPACTS ON THE HUMAN MILIEU** |
| The territory is opened up; |
| Boating on the Sakami River remains difficult; |
| Sakami River (between kilometre 0 and 20) is inaccessible for snowmobiling, the speed of the current prevents formation of a permanent ice cover and creates large accumulations of frazil. |

| **MITIGATION MEASURES** |
| Development of goose-hunting ponds in the sand pits, if desired by the tallyman; |
| The tallyman would like a wetland located near the Trans-Taiga Road to be seeded so that it can be developed for goose-hunting (HQ agrees to study the possibility of seeding this area); |
| Development of access off the Trans-Taiga Road to reach the network of lakes leading to their camp near the Ukau Amikap pass; |
| Repair an existing access to Bonfait Lake; |
| Keep the access road to the canal (Sakami weir); |
| Prepare a chart of boating conditions and trails for snowmobiles on the ice cover on Lake Sakami (HQ agrees to examine the possibility of producing this chart); |
| Follow-up on the boating conditions on Sagami Lake; |
| Follow-up on ice conditions at the crossing points on Sagami Lake. |
### HUNTING GROUND VC21 (SOUTH OF LAKE SAKAMI)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 30 km of 735-kV line (7059), ~6 km of 735-kV line (7069-7070), 1 non-Cree camp and 1 telecommunications tower.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Presence of Sakami Lake; Increase in the flow and water level on Lake Sakami (average predicted rise of 0.48 m relative to the average); Sakami River at natural flow.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Boating on Sakami Lake remains difficult.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Follow-up on water levels near the camp located to the east of the Amunischiminuch fish pass. HQ agrees to relocate the camp if necessary; Develop a snowmobile trail along the corridor of a former winter road; Follow-up on boating conditions on Sagami Lake and take any measures needed, such as cleaning up debris along certain banks; Follow-up on ice conditions at the crossing points on Sakami Lake, in particular the sections between kilometre 18 and 25D, kilometre 65 and 75 and in the vicinity of kilometre 50.</td>
</tr>
</tbody>
</table>

### HUNTING GROUND VC22 (LAKE BOYD)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>The Sarcelle regulatory facility (overlap with hunting ground VC34 of the Eastmain community), ~5 km of road linking the Sarcelle regulatory facility to dike OA-01, ~7 km of 735-kV line (7061) and one telecommunications tower.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Sarcelle workcamp (bordering hunting ground VC23); Sarcelle generating station (overlap with the VC34 hunting ground of the Eastmain community); ~7 km of permanent road to be improved; ~10 km of the 735-kV Sarcelle-Eastmain-1 line (overlap with the VC34 hunting ground of the Eastmain community); 1 potential stockpiling site; Large amount of excess material from construction work on the Sarcelle generating station.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Presence of Boyd Lake; Increase in the flow and water levels of Boyd Lake (average predicted rise of 0.60 m relative to the average); Loss of fish habitat (spillway from the Sarcelle generating station) including breeding areas of walleye, longnose suckers, and lake whitefish.</td>
</tr>
</tbody>
</table>
## Hunting Ground VC22 (Lake Boyd)

<table>
<thead>
<tr>
<th><strong>Impacts on the Human Milieu</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The territory is opened up;</td>
<td></td>
</tr>
<tr>
<td>Relocation of fishing site used by members of several communities located below the Sarcelle generating station due to the increase in debris;</td>
<td></td>
</tr>
<tr>
<td>Boating conditions on Lake Boyd continue to be difficult;</td>
<td></td>
</tr>
<tr>
<td>New boating conditions on the Boyd River due to the increased speed of currents;</td>
<td></td>
</tr>
<tr>
<td>In some winters, snowmobiling dangerous between kilometre 133 and 128;</td>
<td></td>
</tr>
<tr>
<td>Boyd River (between kilometre 90 and 110) inaccessible to snowmobiles due to the speed of the current preventing formation of permanent ice cover and creating large accumulations of frazil.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mitigation Measures</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of multi-species spawning grounds in the section of the river downstream from the Sarcelle site;</td>
<td></td>
</tr>
<tr>
<td>Program to trap or relocate beaver;</td>
<td></td>
</tr>
<tr>
<td>HQ agrees to promote the establishment of a controlled-use area by the Weh-Sees Indohoun Corporation;</td>
<td></td>
</tr>
<tr>
<td>Possibly organize a commemorative ceremony with the users of other hunting grounds nearby about the flooding of birth places and burial grounds during work on the La Grande complex;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on water levels near camps located on the banks of lakes Lablois, Usausinak and Boyd, and if necessary take corrective measures or relocate the camps;</td>
<td></td>
</tr>
<tr>
<td>Construction of a boat-launching ramp on the shore of Boyd Lake just east of the Sarcelle generating station;</td>
<td></td>
</tr>
<tr>
<td>Installation of a gatehouse controlling access to the site so as to limit entry by recreational hunters and fishermen;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on boating conditions on Boyd Lake and take whatever measures are needed, such as cleaning up debris on certain banks;</td>
<td></td>
</tr>
<tr>
<td>Follow-up on boating conditions on Boyd Lake and take whatever measures are needed, such as cleaning up debris on certain banks;</td>
<td></td>
</tr>
</tbody>
</table>

## Hunting Ground VC23 (West of Opinaca Reservoir)

<table>
<thead>
<tr>
<th><strong>Existing Infrastructure</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>About 10 km of the James Bay route, the OA-055 dam, the Opinaca spillway, the OA-04 dike, ~6 km of access road to the Opinaca dam, ~20 km of access road to the Sarcelle regulatory facility, a spur and weir 9 on the Opinaca River, ~20 km of the 450-kV line (4003-4004), ~40 km of the 735-kV line (7062-7063), ~40 km of the 735-kV line (7061) and 2 non-Cree camps.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Infrastructure and Sandpits</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarcelle work camp (bordering hunting ground VC34 of the Eastmain community);</td>
<td></td>
</tr>
<tr>
<td>~20 km of permanent road in need of improvement;</td>
<td></td>
</tr>
<tr>
<td>~20 km of the 735-kV Sarcelle-Eastmain-1 line;</td>
<td></td>
</tr>
<tr>
<td>1 potential stockpiling site.</td>
<td></td>
</tr>
</tbody>
</table>
**HUNTING GROUND VC23 (WEST OF OPINACA RESERVOIR)**

<table>
<thead>
<tr>
<th>IMPACTS ON THE BIOPHYSICAL MILIEU</th>
<th>Opinaca River has reduced flow.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>The territory is opened up.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>HQ agrees to promote the establishment of a controlled-use area by the Weh-Sees Indohoun Corporation; Construction of a new camp in a site chosen by the tallyman to compensate for the loss of use of the camp located in a sand pit near the Sarcelle work camp. If at all possible that loss will be avoided; Relocation of the Sarcelle-Eastmain-1 line at the request of the tallyman; Installation of road signs indicating the presence of Cree camps and warning truck drivers to reduce speed; Connection of their camp along the Sarcelle route to the Hydro-Quebec network at the 25-kV line - accepted, but at the tallyman’s expense; Follow-up on the water level in Boyd Lake to determine if it threatens to cross the water basin into the De Rotis Lake sector. If so a dike could be built.</td>
</tr>
</tbody>
</table>

**HUNTING GROUND VC28 (EXTREME NORTH OF THE OPINACA RESERVOIR)**

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 6 km of road linking the Sarcelle regulatory facility to the OA-01 dike and the OA-02 dike</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>1 potential stockpiling site; Large amount of excess material from construction work on the Sarcelle generating station.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Opinaca reservoir; Increased flow in the Opinaca reservoir; Maximum operating levels of the Opinaca reservoir vary between 211.84 m and 216.41 m (possible fluctuation range of 4.57 m), predicted average fluctuations vary between 211.84 and 212.82 m (predicted fluctuation range of 0.98 m on average); Maximum operating levels of the Eastmain 1 Reservoir vary between 274.11 m and 283.11 m (possible fluctuation range of 9 m), average fluctuations vary between 275.10 m and 282.61 m (possible fluctuation range of 7.51 m); Opinaca River at natural flow.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>Boating remains difficult on the Opinaca River.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td>Development of a multi-species spawning ground in the section downstream from the Sarcelle site; Follow-up on the ice conditions at crossing points on the Opinaca reservoir.</td>
</tr>
</tbody>
</table>
# IMPACTS ON HUNTING GROUNDS — CHISASIBI

## HUNTING GROUND CH1 (FG1) (NORTH OF THE LA GRANDE RIVER)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>About 26 km of the Long Point road.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td></td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Water levels rising an average of 0.30 m upstream from kilometre 89 of the La Grande-1 reservoir.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>No change to boating conditions on the La Grande River;</td>
</tr>
<tr>
<td></td>
<td>No change to ice conditions on the La Grande River.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td></td>
</tr>
</tbody>
</table>

## HUNTING GROUND CH2 (FG2) (NORTH OF THE LA GRANDE-1 RESERVOIR)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>La Grande-1 generating station and ~5 km of the Long Point road.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td>Rock blankets or riprap armouring at kilometre 34 on the north shore of the La Grande River.</td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>Water levels rising an average of 0.30 m upstream from kilometre 89 of the La Grande-1 reservoir.</td>
</tr>
<tr>
<td>IMPACTS ON THE HUMAN MILIEU</td>
<td>No change to boating conditions on the La Grande River or the La Grande-1 reservoir.</td>
</tr>
<tr>
<td></td>
<td>No change to ice conditions on the La Grande River or the La Grande-1 Reservoir.</td>
</tr>
<tr>
<td>MITIGATION MEASURES</td>
<td></td>
</tr>
</tbody>
</table>

## HUNTING GROUND CH9 (FG9)
(NORTH OF THE ROBERT BOURASSA RESERVOIR AND THE LA GRANDE-1 RESERVOIR)

<table>
<thead>
<tr>
<th>EXISTING INFRASTRUCTURE</th>
<th>Spillway from the Robert Bourassa reservoir, the Robert Bourassa dam, ~20 km of secondary roads and 1 non-Cree camp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE AND SANDPITS</td>
<td></td>
</tr>
<tr>
<td>IMPACTS ON THE BIOPHYSICAL MILIEU</td>
<td>About 15% of the land flooded by the Robert Bourassa reservoir;</td>
</tr>
<tr>
<td></td>
<td>No change in the headwater level of the Robert Bourassa reservoir - average water level equivalent to the reference level with a more pronounced drop during the spring and summer;</td>
</tr>
<tr>
<td></td>
<td>Water levels rising an average of 0.30 m upstream from kilometre 89 of the La Grande-1 reservoir.</td>
</tr>
</tbody>
</table>
### HUNTING GROUND CH9 (FG9) (NORTH OF THE ROBERT BOURASSA RESERVOIR AND THE LA GRANDE-1 RESERVOIR)

**EXISTING INFRASTRUCTURE**  
The village of Chisasibi, Chisasibi airport, the La Grande-1 generating station, ~20 km of the 315-kV line (3152-3153), ~45 km of the road linking Chisasibi to the James Bay road, ~10 km of access roads to the La Grande-1 generating station, ~25 km of various roads and 2 telecommunications towers.

**INFRASTRUCTURE AND SANDPITS**  
~1 km of temporary road to build (access to granular blanket);  
9 rock blankets (between kilometres 9.7 and 22.7 of the La Grande River);  
17 potential sand pits.

**IMPACTS ON THE BIOPHYSICAL MILIEU**  
Presence of a sector improved for use by the community for goose-hunting along the bank of the La Grande River between Chisasibi and the LG-1 generating station;  
Presence of a site for use by the community on Lake Wastawawmakw;  
The territory is opened up;  
No change to boating conditions on the La Grande river;  
No change to ice conditions on the La Grande river.

**MITIGATION MEASURES**  
No entry permitted into the part of the territory stretching from east to west parallel to the Chisasibi road, at the request of the tallyman;  
Development of goose-hunting ponds in the sand pits, if requested by the tallyman.

### HUNTING GROUND CH33 (VC1) (SOUTH OF THE LA GRANDE RIVER)

**EXISTING INFRASTRUCTURE**  
About 35 km of the route joining Chisasibi to the James Bay highway,  
~35 km of 3315-kV line (3152-3153) and 1 non-Cree camp.

**INFRASTRUCTURE AND SANDPITS**  
~1 km of temporary access roads.

**IMPACTS ON THE HUMAN MILIEU**  
No change to boating conditions on the La Grande River or the La Grande-1 reservoir;  
No change to ice conditions on the La Grande River or the La Grande-1 reservoir.

### HUNTING GROUND CH35 (VC3) (SOUTH OF THE LA GRANDE-1 RESERVOIR)

**EXISTING INFRASTRUCTURE**  
Water levels rising an average of 0.30 m upstream from kilometre 89 of the La Grande-1 reservoir.
## Hunting Ground CH35 (VC3) (South of the La Grande-1 Reservoir)

### Impacts on the Human Milieu

- The territory is opened up;
- No change to boating conditions on the La Grande River or the La Grande-1 reservoir.

### Mitigation Measures

- Installation of road signs indicating the presence of Cree camps and warning truck drivers to reduce speed;
- Preserve access roads to the sand pits;
- Follow-up on erosion of the banks of the La Grande River in the area around a shelter. HQ pledges to relocate the shelter if it is threatened;
- Development of goose-hunting ponds in the sand pits if requested by the tallyman.

## Hunting Ground CH36 (VC4) (West of the Robert Bourassa Reservoir and South of the La Grande-1 Reservoir)

### Existing Infrastructure

- The village of Radisson, the La Grande River airport, ~45 km of the James Bay Highway, ~6 km of the road linking Chisasibi to the James Bay Highway, ~50 km of various roads leading to HQ installations, the Robert Bourassa generating station, the La Grande-2A generating station, the Radisson substation, ~8 km of the 315-kV (3152-3153) line, ~15 km of the 315-kV line (3162-3163), ~13 km of the 735-kV line (7088-7089), ~45 km of the 44-kV line (440), ~50 km of the 69-kV line (606), ~30 km of the 450-kV line (4003-4004), ~45 km of the 735-kV line (7060-7061), ~32 km of the 735-kV line (7062-7063), 21 non-Cree camps and 2 telecommunications towers.

### Infrastructure and Sandpits

### Impacts on the Biophysical Milieu

- About 60% of this hunting ground will be flooded by the Robert Bourassa reservoir;
- No change in the water level of the Robert Bourassa reservoir - water level equivalent to the average with a more significant drop in spring and summer;
- Water levels rising an average of 0.30 m upstream from kilometre 89 on the La Grande-1 reservoir;
- Increased flow in the Sakami River.

### Impacts on the Human Milieu

- No change to boating conditions on the La Grande River or the La Grande-1 reservoir;
- No change to ice conditions on the La Grande River or the La Grande-1 reservoir.

### Mitigation Measures

- Installation of road signs indicating the presence of Cree camps and warning truck drivers to reduce speed;
- Preserve access roads to the sand pits;
- Follow-up on erosion of the banks of the La Grande River in the area around a shelter. HQ pledges to relocate the shelter if it is threatened;
- Development of goose-hunting ponds in the sand pits if requested by the tallyman.