Federal Review Panel for the Eastmain-1-A and Rupert Diversion Project

Commission fédérale d'examen du projet Eastmain-1-A et dérivation Rupert

Environmental Assessment of the **Eastmain-1-A and Rupert Diversion Project**



Panel REPORT

Canada

November 30, 2006

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PANEL REPORT

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CHAIRMAN'S MESSAGE

The environmental assessment of the Eastmain-1-A and Rupert Diversion Project was conducted in the specific context of harmonization within the framework of the *Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project*. Under the Agreement, signed by the Government of Canada, the Government of Quebec and the Cree Regional Authority, the Review Committee (COMEX), a standing provincial committee under the *James Bay and Northern Quebec Agreement,* and the Federal Environmental Assessment Review Panel had to take the necessary measures to prevent duplication and overlap and to co-ordinate and align the assessment and review processes.

Owing to its complexity and the responsibility it entails, an environmental assessment of this scope could not be carried out without the participation of a large number of interested parties. I would like to extend my thanks to COMEX, which has been the Panel's partner on this long journey, from the moment the proponent's environmental impact assessment was received to the preparation of this report. The Panel would not be able to submit its report today were it not for the generous collaboration of COMEX members and analysts, especially with regard to their outstanding contributions to preparing a number of sections of this report.

The environmental assessment process owes its legitimacy to the participation of the general public. During the public hearings, the review bodies heard from an impressive number of stakeholders in six Cree communities, Chibougamau and Montréal. The Panel is grateful to them for sharing their perspectives, opinions, suggestions and criticisms.

A panel cannot carry out its mandate without there being team spirit and a deep sense of duty among its members. My colleagues on the Federal Review Panel have worked together diligently from beginning to end in the spirit of sharing and mutual support and respect. Their competence, intellectual rigour and integrity inspire confidence and give me a sense of pride. I would like to take this opportunity to express my deepest gratitude and respect to Jocelyne Beaudet, Philip Awashish, Pierre Magnan and Brian Craik.

The Panel was able to count on the enthusiastic and constant support of Éric Giroux, who replaced Jean Crépault as Panel Manager early on in the review process. On behalf of the Panel, I would like to thank him for his hard work and commitment. I would also like to thank Nicholas Girard and Simon Lemay, whose support was invaluable during the public hearings.

Lastly, I would like to extend my thanks to the proponent and its team for their commitment in co-operating with the review bodies and the respect they showed from the moment we became involved and throughout the process. Philippe Mora of the *Société de l'énergie de la Baie-James* proved to be, for myself and Clément Tremblay, my counterpart on COMEX, an attentive and courteous spokesperson when approached for assistance. We are grateful to the members of his team, especially Anne-Marie Parent for her promptness in responding to our every request.

Bernard Forestell
Chairman



Report Summary

REPORT SUMMARY

1. THE PROJECT

The Eastmain-1-A and Rupert Diversion Project proposed by Hydro-Québec Production includes the partial diversion of the Rupert River, at kilometre point (KP) 314, and the creation of the Rupert diversion bays (forebay and tailbay) with a total area of 346 km^2 These two diversion bays will require the construction of four control structures, 72 dikes, 10 canals and a 2.9-km tunnel linking the two diversion bays. The water level of the Rupert forebay will be controlled by a weir located at the entrance to the transfer tunnel as well as by the Rupert River control structure.

The Rupert River flows from east to west over a distance of 560 km between its source, Lake Mistassini, and its mouth, on Rupert Bay. After diversion, the mean annual ecological instream flow of the Rupert River, downstream from the Rupert control structure, will be 184.7 m^3/s, which corresponds to approximately 29% of the mean annual flow under natural conditions. In order to maintain uses on the Rupert River downstream from the control structure, the proponent has planned to build eight structures designed to preserve the natural character of the river in the sections that they influence, as well as navigation, fishing, spawning grounds, fish feeding habitats and aquatic grass beds.

The diverted water from the Rupert River will be channelled northward to the existing Eastmain 1 reservoir in order to provide an installed capacity of 768 MW for the Eastmain-1-A powerhouse, which will be built approximately 500 m from the existing Eastmain-1 powerhouse. The diverted water will then be channelled into the Opinaca reservoir, where the Sarcelle powerhouse, with an installed capacity of 125 MW, will be built. Finally, the diverted water will be channelled further northward via the La Grande Rivière to increase the energy produced at the Robert Bourassa, La Grande-2-A and La Grande-1 generating stations. Annual output of the project is estimated at 8.5 TWh.

The proposed project will also include a large number of related support structures, including construction of the permanent Muskeg-Eastmain road and a 315 kV transmission line. The proponent also plans to establish several temporary workcamps, construct a new drinking water treatment plant to serve the community of Waskaganish, and to carry out work to stabilize river banks and riverside slopes.

The estimated cost of the project is around $4 billion, including financing costs.

2. THE REVIEW PANEL AND THE ASSESSMENT PROCESS

At the request of the Minister of Fisheries and Oceans, the federal Minister of the Environment referred the environmental assessment relating to the project to an environmental assessment review panel (Panel), pursuant to section 33 of the *Canadian Environmental Assessment Act* (CEAA). On November 1, 2004, the federal Minister of the Environment appointed the five members of the Panel, two of whom were appointed on the recommendation of the Cree Regional Authority (CRA).

The Panel's mandate was to conduct an assessment of the project's environmental effects and submit a report to the federal Minister of the Environment and the responsible authorities pursuant to section 34 of the CEAA, in this case, Fisheries and Oceans Canada and Transport Canada. Under the provisions of the Act, the responsible authorities are required to act on this assessment with the approval of the Governor in Council, and to render a decision on whether the project is justified.

The project is also subject to the Quebec environmental and social impact assessment procedure set out in Section 22 of the *James Bay and Northern Quebec Agreement* (JBNQA).

In April 2003, the governments of Quebec and Canada and the CRA signed the Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project, which provides a framework for harmonizing the two environmental assessment processes.

The first step in the harmonized process involved preparing directives for the proponent in August 2003, followed by the filing of the Environmental Impact Statement by the proponent in January 2005. The review bodies then analysed the Environmental Impact Statement and submitted some additional questions to the proponent before holding 43 public hearing sessions 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 Montréal.

The documents produced and received during the assessment process were filed with the Public Information Office created pursuant to the administrative agreement, as well as with the public registry of the Canadian Environmental Assessment Agency.

3. PUBLIC INPUT

Members of the public were given the opportunity to provide their input by submitting written briefs and presenting verbal testimony during the public hearings.

To summarize, the Crees described at length their experience to date and the impacts of hydroelectric projects on their culture and traditional way of life and on local wildlife. As a community, they had mixed feelings about the project. The participants at the public hearings in Chibougamau and Montréal discussed the issue of the project's economic spinoffs, both in the region and for the province as a whole, and compared the environmental impacts of hydropower generation with other energy sources. Environmental groups expressed their opposition to the proposed project.

4. ALTERNATIVES TO THE PROJECT

Wind power potential

The growing public interest in wind power was evident during the review, and wind power was frequently proposed as an alternative to the project. However, the proponent pointed out that electricity generated from wind power fluctuates from one period to another, depending on weather conditions, wind strength and temperature, and that the variability of wind power generation must therefore be offset by energy generation from a more controllable source, such as hydropower, in order to maintain a continuous supply of electricity. The prospects for wind power development in Quebec also appear to be limited by the ability to integrate wind power into the energy transmission system. The impacts associated with this technology, such as noise and the large land areas required for the equipment, must also be considered. Since research is continuing in this field, the potential exists for rapid advances.

The Panel concludes that, while wind power is a worthwhile complement to Quebec's core hydroelectric system, replacing viable hydroelectric projects with wind power cannot be justified under current conditions.

Energy efficiency

The current efficiency target of 8.1 TWh by 2015 set in Quebec's recent Energy Strategy largely explains the reduction in Quebec's projected energy needs compared to previous forecasts. The likelihood of meeting this target depends on a number of factors that are beyond the proponent's direct control. If the targeted level of savings is not realized, attainment of the margin of flexibility which the proponent hopes to achieve by 2014 would be compromised, even if the project under study goes ahead.

Other alternatives

Other methods of energy generation were presented and analysed. However, in the short or medium term, none of these forms of energy can compete with hydropower in terms of availability of large blocks of energy and capacity or in contributing to the collective economic well-being.

The projects currently being assessed or announced by the proponent will be part of the proponent's supply and demand forecasts over a much longer timeframe than the one chosen for the Eastmain-1-A and Rupert Diversion Project and cannot be considered alternatives for attaining the targets set for 2015.

5. PROJECT JUSTIFICATION

The project justification and the choice of hydropower were discussed at length during the public hearings. Several times the proponent had to clarify and explain details about how wind power generation is being integrated into Quebec's electricity distribution grid as well as its electricity supply and demand forecasts. These forecasts were a particular focus of attention since the proponent's data had changed during the process and in view of the Quebec government's Energy Strategy 2006-2015, released in June 2006.

In light of the lower revised forecasts for additional supplies required between now and the year 2014, it is obvious that the proponent's improved margin of flexibility and exports now constitute the primary underlying reasons for the project. The project can make a significant contribution to attaining the desired margin of flexibility of 15 TWh and will help the proponent to meet variations in domestic demand while generating profits on export markets.

The Panel considers that this project can be justified on strategic and business grounds and that it will enable the proponent to consolidate its position as an electrical

energy supplier and exporter. Current and foreseeable economic conditions support the conclusion that the project is economically viable in light of the generation costs, the implementation costs and the reasonable forecasts of profits on domestic and international markets. In particular, the proponent will be able to take advantage of existing infrastructure to generate additional energy at an advantageous cost. The project will enable the proponent to pay higher dividends to the Quebec government, which will benefit all of Quebec society.

The Panel concludes that, to date, there is no alternative or combination of alternatives that can guarantee the same operating and economic benefits as the proposed project. However, it considers that economic grounds alone are not sufficient to justify approval of the project since the project must also be considered environmentally and socially acceptable.

6. THE GEOGRAPHIC, BIOPHYSICAL AND SOCIAL CONTEXT OF THE PROJECT

The project is located in the southern part of a vast territory where major hydroelectric development projects have been carried out over the past 30 years. The La Grande Complex was the first to be built, between the 1970s and 1990s, and more recently, there has been the Eastmain-1 project.

The various biophysical components of the environment were described and analysed using an ecosystem approach. This approach had the advantage of making it easier to understand the impacts on the extensive study area. The environment was subdivided into six sectors that have or will have differing ecological characteristics particularly with respect to aquatic habitats. These sectors are:

- the Rupert diversion bays section, which comprises the flooded area upstream of the closure points of the Rupert, Lemare and Nemiscau rivers;
- the Rupert, Lemare and Nemiscau rivers section, which corresponds to the watersheds of these rivers downstream from their respective closure points;
- the Rupert Bay and Rupert River estuary section, which includes Rupert Bay, Boatswain Bay and the estuaries of the Nottaway, Broadback, Rupert and Pontax rivers;
- the increased-flow section, which begins upstream from the Eastmain 1 reservoir and continues through the Opinaca reservoir, the Boyd-Sakami, and the Robert-Bourassa and La Grande-1 reservoirs;
- the La Grande Rivière estuary and James Bay coast section, which encompasses its estuarine section and the coastal waters of James Bay;
- the sections affected by the structures and related activities, such as access roads, existing power transmission lines, camps and construction site facilities and borrow pits.

Two geographic scales were used to analyse the impacts on the human environment. The extended study area, based on the James Bay Territory as defined in Section 22 of the JBNQA, is the reference area for the study of impacts on the social and economic situation of both the Cree and Jamesian communities. This "extended" study area encompasses the *Municipalité de Baie-James* and the nine Cree communities, including Whapmagoostui. It is worth noting that the proponent's analysis with regard to the anticipated economic effects reaches beyond these boundaries.

The "limited" study area covers the 36 traplines affected by the project, distributed among the communities of Mistissini (4), Nemaska (10), Waskaganish (8), Eastmain (4), Wemindji (4) and Chisasibi (6). It also includes Rupert Bay and Boatswain Bay, along with the mouth of the La Grande Rivière and its immediate surroundings on the east coast of James Bay. The purpose of this limited study area is to identify the specific impacts of the project components and their direct impacts on the use of the territory by the Cree.

The Crees of Waskaganish, Nemaska and Mistissini make extensive use of the Rupert River while travelling by boat or snowmobile, and the river is also used for handing down Cree traditions, such as canoe brigades. A number of permanent and temporary Cree camps have been built along this river. Some, such as the camps on the left bank east of Nemiscau Lake as well as the Old Nemaska and Gravel Pit camps, include a number of homes. A few sites, such as Smokey Hill, are highly valued by the population. The Rupert River is also used for recreational canoeing and kayaking expeditions.

7. ECONOMIC IMPACTS

The economic advantages and spinoffs of the project for the proponent and for Quebec as a whole are obvious, despite the high cost of the unavoidable measures that the proponent will have to take to mitigate the anticipated adverse environmental and social effects. In addition to the direct impact and the multiplier effect of the expenditures made by the proponent during the project construction phase, the anticipated revenues

during the operation phase will represent significant added value for the Quebec economy.

At the regional level, it will be up to the Crees and Jamesians who share the territory to work together and with the proponent to ensure that the project's spin-offs are transformed into long-term structural economic impacts.

8. IMPACTS ON THE NATURAL ENVIRONMENT

The impacts on the natural environment were analysed for each of the sectors identified by the proponent. For each sector, the impacts on fish communities, terrestrial and semi-aquatic wildlife, birds and special-status species were analysed.

The Rupert diversion bays section

Fish

The forebay section is composed of a mosaic of water bodies which vary widely in size characterized essentially by lentic habitats, such as lakes and ponds, and to a lesser extent by streams of different sizes. The experimental fishing carried out by the proponent in these habitats indicates that thirteen species of fish are found there. Following impoundment, the various lakes and streams will be interconnected and form a single body of water. This expansion of the aquatic environment as a result of the project will promote the development of fish communities and, in the process, will increase the biomass of fish completing their life cycle in this environment. According to the proponent's estimates, there will be a net gain of approximately 453 tonnes of fish in the forebay and 56.4 tonnes in the tailbay, distributed mainly among the dominant species including walleye, white sucker, northern pike and lake whitefish. Given the experience acquired by the proponent over the last two decades in environments comparable to those that will be found in the Rupert diversion bays, the main species should evolve in accordance with the proponent's projections. However, the Panel considers it essential to verify these projections by means of a rigorous monitoring program. This program will have to be carefully planned in order to provide useful information for users of the territory in addition to documenting the trends affecting fish communities over time.

Lake trout, lake sturgeon and the Rupert brook trout strain are species of especial value to the Crees and these species were the focus of particular attention in the analysis by the proponent and by the Panel. Lake trout is a species that has problems maintaining its reproduction in reservoirs. The habitat enhancements proposed by the proponent to ensure its reproduction have been deemed acceptable and consistent with standard practices. The Panel considers sufficient and acceptable the proposed measures by the proponent. However, if they prove ineffective in the diversion bays, the proponent may have to look for water bodies outside this area that are more suitable for the lake trout populations. Lake sturgeon is a species likely to be designated threatened or vulnerable. According to the proponent, the entire forebay will become a good feeding habitat, and reproduction will be sustained by the two spawning grounds developed to replace those that will be affected by the flooding. While the Panel considers the habitat enhancements proposed by the proponent to be sufficient and acceptable, it believes that their effectiveness will have to be verified as will the survival of the cohorts until they reach maturity. Although the Mesgouez Lake-Rupert River strain may colonize downstream sectors, the Panel also believes that the Opinaca reservoir strain will be protected by the topography of the site. Genetic analyses of the Rupert brook trout strain indicate that twelve of the sixteen individuals analysed had a genotype similar to the Rupert strain in Lake Mistassini. Although the number of fish analysed was relatively small, the mere confirmation that some had a genotype very similar to the giant specimens from Lake Mistassini proves that this strain is present in this area. Moreover, the small number of catches made during this study, despite the significant fishing effort aimed at brook trout in 2002 and 2003, illustrates that the Rupert strain is not very abundant downstream from Mesgouez Lake and supports the hypothesis that these individuals came from the Lake Mistassini population. The Panel therefore considers that the impact of the project on the Rupert strain will be minor at the scale of the Rupert River watershed. However, at the scale of the diversion bays area, the abundance of brook trout (all strains combined) will be reduced compared to current conditions.

Mercury and fish

The public hearings revealed that accurate mechanisms of methylmercury release in the water column remain a matter of scientific debate and the method used by the proponent to calculate changes in mercury levels has been criticized. However, as intriguing as this question may be, the Panel considers that the important point in this whole issue is the increase in mercury concentrations in fish flesh and the time it will take for these

levels to return to values comparable to the natural environment, and consequently how long it will be before the diversion bays can be used by the Crees. It should also be pointed out that even based on the values observed in lakes and streams in the region untouched by development, people who eat these fish are still well advised to follow guidelines on the frequency of consumption in order to protect their health. The network set up to monitor mercury concentrations in the flesh of fish in the La Grande Complex indicates a rapid increase in concentrations after impoundment, followed by a slow return to natural values. This process is now well understood by the scientific community.

The increase in mercury concentrations in the diversion bays is therefore unavoidable and effective mitigation measures for countering this phenomenon include the more or less selective removal of organic matter in the soil before flooding. Although feasible in theory, such measures are not very realistic in practice because of the large areas to be cleared, the difficulty of removing plant and organic matter in the soil, the time required to carry out this removal and the expense involved. The Panel is aware that the project will mean that new guidelines for consumption of fish from the diversion bays will be necessary for 20 to 30 years after impoundment of the diversion bays. Changes over time will therefore have to be monitored in order to validate the proponent's predictions. It is also important that the results be communicated quickly and explained clearly to users of the territory so these environments are not considered lost forever.

Terrestrial and semi-aquatic wildlife

The clearing of the diversion bays and construction of the structures will modify wildlife habitats, which will result in animals moving to less disturbed environments. When impoundment of the diversion bays begins, animals capable of moving quickly, such as moose and caribou, still present in the area will leave. However, some mortality may be expected among animals with limited ability to move or that are in hibernation, including certain small wildlife species, small mammals, amphibians and reptiles. Nonetheless, the Panel considers that the survival of the majority of species will not be compromised.

However, some uncertainty remains concerning the actual impacts of the project on the woodland caribou. The fact that the two ecotypes are present in winter in this area makes it more complicated to assess the impacts. Given the risks to the woodland caribou and in order to assess the adaptation of this ecotype to the project, the Panel considers that a telemetric monitoring program must be carried out in the various project sectors during the construction and operation phases. With respect to beaver and bear, the proponent has planned an intensive hunting and trapping program or relocation of the animals prior to impoundment of the diversion bays. However, the Panel considers that the proponent will have to take the necessary steps to ensure that the tallymen have sufficient time to trap or relocate the animals. Given our limited knowledge about small mammals and the fact that some of these species have special protection status, it is difficult to assess the real impacts of the project and especially to assess the impact on the biodiversity of the study area. Although monitoring of micromammals in developed or seeded wetlands is planned, it is important that the proponent enhance and detail its monitoring program in order to obtain better knowledge about the presence of these species in the territory.

Waterfowl

The most abundant waterfowl species observed in the diversion bays section, all periods combined, are in order: Canada goose, American black duck, common merganser and green-winged teal. The transformation of the habitat, from multiple water bodies of various sizes to two large bodies of water, will result in habitat losses and will affect how waterfowl use this area, in both the nesting and migration periods. However, waterfowl habitat in the diversion bays section could be improved with the potential regeneration of large riparian wetland areas. The proponent is proposing several mitigation measures such as developing bays, excavating pools, ponds and channels in the peatlands of the tailbay, creating riparian wildlife habitats, installing nesting boxes, and enhancing borrow pits and other work areas to encourage waterfowl to use the area.

While the project will have an impact on waterfowl, this impact is difficult to accurately quantify since a number of parameters associated with habitat restoration and annual variations in regional waterfowl populations cannot be incorporated in the calculation of potential losses or gains. The fact remains that the reproductive success of a certain proportion of *Anatidae* pairs nesting within the boundaries of the diversion bays will be reduced during the construction period and for several years after the start of operation of the diversion bays. The riparian environments should regenerate within a few years following impoundment of the diversion

bays, which would encourage waterfowl breeding pairs to return to this area. However, the proponent cannot identify the proportion of swamps, versus marshes, that could be regenerated. As indicated in the Supplement to the Environmental Impact Study, aquatic grass beds and marshes are the preferred habitats of waterfowl in all seasons, whereas they make little use of swamps. In any event, the areas of riparian wetlands in the diversion bays section will be larger than currently observed, which can only be positive for waterfowl. The type of water bodies created by the diversion bays should encourage Canada geese to use this sector during the spring migration and during the moulting period. Nevertheless, since large water bodies are not used by many waterfowl species during the nesting and rearing period, it is possible that some species will completely stop using this area.

In terms of the mitigation measures planned for the operation phase, the Panel believes that implementing a judicious combination of the various planned measures in order to enhance the potential for waterfowl should encourage waterfowl to use the diversion bays. Considering the significance of the impact on waterfowl, monitoring of changes in waterfowl populations over time on a regional scale should be instituted.

Other birds

Of the aquatic birds other than waterfowl, the common loon, great blue heron, Bonaparte's gull and herring gull frequent the territory during the breeding period. About ten species of shorebirds are considered breeders and ten species of birds of prey are also present in the diversion bays section. More than 50 species of forest birds have been surveyed and four special-status species have been observed, namely the sandhill crane, Bonaparte's gull, short-eared owl and bald eagle. Although no great grey owls have been observed, it is quite probable that this species uses this sector for nesting.

In addition to the standard mitigation measures relating to clearing, construction machinery and traffic, the proponent is proposing to replant the work areas in order to mitigate the impact of the construction work on birds.

The main impacts on birds will occur during the construction phase. Local birds will be affected by clearing activities to varying degrees depending on whether they nest in an open environment or a forest environment. The large number of forest birds and the area of the environments to be cleared will have an impact on the reproductive success of a very large number of songbirds (approximately 43,000 pairs) for the three years of clearing. This impact is largely associated with the clearing period, which coincides with the birds' breeding period.

The proponent has not presented any mitigation measures to reduce the impact on forest birds. Many broods would undoubtedly be spared if the clearing period were extended or changed (winter felling). Although the clearing period has been extended by one year (from two years to three), the proponent cites the following main reasons to justify its refusal to change the felling period: the need to keep to its own work schedule and the quality criteria for the felling, piling and burning activities, which require that the work be carried out on snow-free ground, i.e. from May to October.

Most of the species of songbirds that frequent the sector will be able to occupy part of the regenerated riparian environments. The clearing work, which will be carried out over a three-year period, and the disturbances caused by the construction work are expected to result in a gradual relocation of the birds during the breeding period, in view of the fact that these species already use adjacent environments. This is expected to result in habitat saturation for a few years due to competition. The loss of forest habitat will therefore reduce the abundance of a number of species at the local scale. However, since the areas with good regeneration potential should be much larger than those currently observed and since riparian habitats generally have higher bird densities than forest habitats, these new areas of riparian habitat should partially compensate for the losses of terrestrial habitats. The Panel therefore believes that the planned monitoring of songbirds in the new riparian environments is important in order to document this impact. It also points out that this impact is part of the consequences of the project that cannot be mitigated without a major change in project design and scheduling.

The Rupert, Lemare and Nemiscau rivers section

Instream flow regime

The project's ecological instream flow regime was analysed bearing in mind the eight hydraulic structures included in the project to maintain water levels and prevent significant bank exposure. The instream flow regime proposed by the proponent was analysed for three periods corresponding to the biological activities of the main fish species found in the Rupert River, namely the fall and spring spawning periods, the summer feeding season and the winter incubation period. The Panel considers the instream flow regime proposed by the proponent to be in compliance with the *Politique de débits réservés écologiques du Québec pour la protection*

du poisson et de ses habitats [Quebec government policy on instream flow for the protection of fish and their habitats]. This regime will help maintain the fish habitats necessary to allow the preservation of normal biological activities at a level deemed acceptable. However, the additional analyses requested by the review bodies revealed that there is an error associated with the estimate of instream flows, with the actual value falling within a range of flows lower and higher than the value obtained using common calculations. Consequently, the Panel considers it imperative that the proponent meet its commitments concerning adaptive management of instream flow regimes. The effectiveness of this regime in maintaining fish communities is essential, particularly from the standpoint of sustainable development. In the event that the estimates of instream flow values or periods prove to be incorrect relative to spawning habitats or prove to be incompatible with the survival of fish communities, the modification of these values will have to be considered among the possible solutions which will have been identified following complementary studies, and applied on an urgent basis.

Fish

According to the proponent, nearly 166 egg-laying areas have been surveyed on the Rupert River. Some spawning grounds will be lost following construction of the hydraulic structures, while others will be affected by the new flow regime. The proponent has undertaken to build new spawning grounds to compensate for those that will be lost and to enhance those that will be affected by the new flow regime.

The Panel agrees with the assessment of the impacts and with the mitigation or compensation measures proposed by the proponent. Nevertheless, the effectiveness of these measures is generally difficult to predict. This justifies exhaustive monitoring using appropriate indicators, such as larval drift of lake sturgeon, which is a biological indicator that incorporates reproductive conditions. Should these measures prove ineffective, other remedial measures will have to be considered, possibly even including construction of spawning grounds in other sections of the river. The regeneration of aquatic grass beds is also an important issue that will require exhaustive monitoring in order to ensure that they are used and colonized by northern pike and by forage fish. In the fall, there is traditional dip net fishing of lake cisco at the Smokey Hill site, on the right bank of the Rupert, just at the foot of the rapids at KP 24.3. The proponent is aware that the approximately 1 m drop in water level and the approximately 61% decline in mean flow velocity that will occur in this section could affect this traditional Cree fishing ground. Based on the analysis of this information and of the various opinions obtained, the Panel concludes that, under future conditions, anadromous cisco will be able to continue to migrate beyond the current spawning site. However, given the current state of knowledge, it is impossible to predict whether cisco will continue to frequent the traditional fishing site at Smokey Hill following diversion of the Rupert River. Based on its monitoring findings, the proponent will have to fulfil its commitment to develop a new dip net fishing site equivalent to Smokey Hill. The Panel believes that given the abundance of this resource, other sites along the Rupert River have the potential to provide an equivalent harvesting level.

The Rupert River fish community includes 22 species, of which the most abundant by far is walleye, followed by northern pike, lake sturgeon, lake whitefish, longnose sucker and white sucker. Despite the habitat losses in certain sections of the Rupert River, the Panel believes that the fish communities will be preserved in the short, medium and long term after the flow reduction, while stressing the importance of monitoring this aspect, particularly in order to confirm the assumptions used by the proponent in its analysis. Even though no negative impact on the feeding habitat of lake sturgeon is anticipated, exhaustive monitoring of this species will have to be carried out over a sufficiently long period in order to permit the characterization of any changes in the cohorts until they reach maturity. To this end, the lake sturgeon enhancement[1] and management measures established by the proponent will have to be accompanied by a harvesting monitoring program, with Cree participation. The success of the measures depends on a number of factors, including the rational harvesting of this resource, particularly from a sustainable development perspective.

The Panel believes that no new barriers will be created by the project and that it will have no significant impact on fish communities. A few modifications will make certain obstacles more easily passable and, consequently, improve the home range of the fish.

Terrestrial and semi-aquatic wildlife

In the Rupert, Lemare and Nemiscau rivers section, the terrestrial and semi-aquatic wildlife species chosen for analysis are caribou, moose, black bear and beaver, which are the main species valued by the Crees. The Panel believes that there will be no changes affecting

1. The word 'enhancement' has been used to translate "aménagement" from the French text.

terrestrial wildlife habitats as long as current water levels are maintained in the Lemare and Nemiscau rivers. In the Rupert River, the drop in water levels in the sections not influenced by a hydraulic structure will result in a modification of riparian habitats, although this will have only a negligible impact on large animals. Based on the monitoring carried out in the reduced-flow Eastmain and Opinaca rivers, the reduced flow in the Rupert River should have a minimal, or even positive impact on the use of riparian habitats by beaver. The program to monitor beaver colonies along the Rupert River will help assess the real impact of the decrease in water level on this species, particularly in the sections not influenced by a hydraulic structure.

Waterfowl

Since the flow of the Lemare and Nemiscau rivers will be maintained and no modification of the riparian habitats along these rivers is anticipated, only the Rupert River was considered in the analysis. In total, 26 species of geese and ducks were observed during the inventories. The most abundant species, all periods combined, are Canada goose, American black duck, common merganser and common goldeneye. According to the proponent's estimates, fewer than ten pairs may have to find new nesting sites as a result of the habitat losses caused by bank exposure during the operation phase. Based on the monitoring results for the waterfowl populations on the reduced-flow Eastmain, Opinaca and Petite Opinaca rivers, it appears that an increase in waterfowl populations, mainly dabbling ducks and geese, can be anticipated in the medium term. However, habitat quality could be variable in the long term, depending on the extent of transformation of the banks into more forested habitat. The presence of hydraulic structures should significantly lower the effects of the decrease in water levels and maintain a significant proportion of the riparian habitats. In the sections not influenced by a weir, new aquatic grass beds, mainly swamps, are expected to colonize the new environments. These riparian wetland habitats are favourable to waterfowl.

The Panel considers that the populations of waterfowl using the habitats of the Rupert River should be affected only to a minor degree by the impacts of the project. In the Panel's view, the monitoring of enhancement measures and waterfowl densities along the reduced flow section of the Rupert River should ensure that these measures are effective and that adjustments can be made, if necessary.

Special-status plant species

The inventories have confirmed the presence of four special-status plant species, but only one species, *Gratiola aurea*, will apparently be affected by the project. In view of the large number of specimens of *Gratiola aurea* surveyed and the fact that most of the individuals are found in Rivière à la Marte and Lake Nemiscau, where the water levels will be maintained, the Panel believes that the impact of the project on this plant species will be minor.

The Rupert Bay and Rupert River estuary section

Fish

Inventories conducted in Rupert Bay and the estuaries of its main tributaries indicate that 40 fish species are found there. The large area of freshwater and the fact that Rupert Bay is the southernmost bay on the east coast of James Bay and Hudson's Bay account for the wide specific diversity of fish observed in Rupert Bay, which is greater than that found in other northern estuaries. Consequently, species that are tolerant or intolerant to saltwater can be found there. Seasonal migration of Salmonidae, northern sucker and walleye was observed, as was the presence of larvae of numerous fish species.

The Panel finds that the project's impact on fish communities found in the river's estuary and Rupert Bay will be minor. Maintaining an instream flow regime will help preserve spawning grounds in the first series of rapids and minimize saltwater intrusion farther upstream in the bay. The permanent freshwater area will still stretch from the river's estuary to halfway between the Pontax River and Pointe du Peuplier. All other species of interest observed in Rupert Bay tolerate a certain degree of salinity. The modeling of physical parameters indicates a permanent freshwater section upstream from Jolly Island in post project conditions, meaning that freshwater fish will not be affected. Although a low degree of salinity could be observed occasionally downstream from the island, fish intolerant to saltwater could move toward the river when this occurs. In this respect, the Panel finds that the project will not affect the unique character and representativeness of the Waskaganish biodiversity reserve.

Waterfowl

The James Bay coast is recognized as an important spring and fall migration corridor for waterfowl. Birds find various types of habitat there, such as resting areas, feeding grounds and moulting areas. Spring waterfowl inventories in Rupert Bay identified 25 bird species,

with the most abundant species being brant, Canada goose, northern pintail and green-winged teal. Rupert, Boatswain and Cabbage Willow bays are among the most frequented by waterfowl. Thousands of birds stop there during their spring migrations. Very large flocks of brant and a few thousand Canada geese gather in areas slightly further south of Rupert Bay, on the western shores of the Waskaganish community and the area around the mouth of the Octave River. Lastly, a few thousand Canada geese gather in the section between Pointe du Peuplier and the mouth of the Pontax River.

Approximately 100,000 migratory shorebirds were observed in Rupert Bay in 2002 and 26 shorebird species were noted. Thirteen of the species observed are considered to be Arctic breeders, while six other species are classified as migratory breeders. The others consist of passage migrants, which are uncommon in Quebec. Of the species surveyed in 2002, 19 are considered to be in decline in Canada, and 9 are in serious decline in Quebec. These birds are found mainly on bare foreshores and in low marshes. Lastly, 13 bird species of special status were observed during various inventories.

The reduction of the Rupert River's freshwater inflow into the bay will cause the saltwater intrusion area to shift slightly southward in the bay. This will impact low marsh plant communities, which are found in the area affected by the diurnal tide. The distribution of birds in the bay reveals that, with the exception of brant, which seem to prefer environments ranging from freshwater to slightly brackish waters, thousands of dabbling ducks and Canada geese are found in freshwater, transitional, brackish and saltwater areas. It is unlikely that these changes will significantly impact wild birds.

Eelgrass

Underwater dives revealed that very little submerged vegetation lines the main corridor of the Rupert River's estuary. The sequence of waterside vegetation in Rupert Bay stretches from stable terrain to open water, in a series of swamps and high and low marshes. A salinity gradient that increases progressively downstream in the bay has caused changes in marsh flora. All research efforts concerning eelgrass in Rupert Bay have revealed that the species is not found there or forms only small beds. The Panel notes that minor impacts are expected to be felt in the estuary of the Rupert River, though the impacts will likely benefit fish and waterfowl. A minor impact is also expected in the mixing zone between freshwater and brackish waters on the east coast of Rupert Bay. The change will affect the vegetation sequence in the low marsh, which is especially important for waterfowl during both migration and brood-rearing.

The increased-flow section

Fish

When the Rupert River is diverted, the Eastmain 1 Reservoir will be approximately five years old. The composition of its fish community will be similar to that of the Opinaca Reservoir after the same amount of time; cisco, lake whitefish, northern pike, white sucker, northern sucker and walleye will be the main species found there. These conditions will represent the reference state for the project under study. The diversion of the Rupert River should not impact fish or their habitat, as the drawdown will remain within the range of the reservoir's fluctuations before the diversion.

The remaining stretch of the Eastmain River is between the Eastmain-1 Dam and the Opinaca Reservoir. Current conditions in that section are the same as those that will result after the impoundment of the Eastmain 1 Reservoir and the eventual commissioning of the Eastmain-1 power plant, before the Rupert River's diversion. This stretch is one of the two main areas where sturgeon is concentrated in the Opinaca Reservoir and its tributaries; northern pike, lake whitefish, lake sturgeon, white sucker, longnose sucker and cisco are also found there. The lake sturgeon spawning ground immediately below the Eastmain-1 Dam was dried up after the cutoff of flow caused by the impoundment of the Eastmain 1 Reservoir. Three spawning grounds were created to maintain the sturgeon's spawning potential. A genetic study showed that lake sturgeon in the Eastmain–Opinaca basins and those in the Rupert River basin form two genetically distinct populations, whose differences have apparently been stable over time.

Considering the specific situation where reference conditions are still evolving, it is difficult for the Panel to draw a conclusion on the sustainability of lake sturgeon spawning grounds in this stretch of the Eastmain River. However, the Panel does feel it is essential that the monitoring program for the Eastmain-1 power plant be taken into account when developing the comprehensive monitoring program for the project under study. The Panel believes it is important that the program be extended beyond the commissioning of the Eastmain-1-A power plant by adjusting its content to the results obtained between 2006 and 2012. In the event that the lake sturgeon in the Rupert River successfully become established in the Eastmain–Opinaca system, a dike that was used to divert the Opinaca River toward the

Boyd–Sakami diversion is an impassable barrier, isolating individuals living in the downstream stretch of the Opinaca River and protecting the integrity of this genetic strain.

Since the Sarcelle control structure was brought into operation in the early 1980s, a number of species found in the Boyd–Sakami section adopted the area immediately below the structure as spawning grounds. Experimental fisheries conducted in the first kilometre from the structure revealed that lake whitefish, walleye and white sucker spawn there and that the spawning grounds are located along the shoreline. The Crees have also identified the section as a spawning ground for lake sturgeon and lake trout. The Panel finds that the measures taken to enhance the area immediately below the future Sarcelle power plant as habitat suitable for the spawning of these species are acceptable and sufficient for minimizing the impact of the construction and operation of the power plant. However, the proponent will have to ensure the successful outcome of these habitat enhancements and take the necessary corrective measures in the event of failure. The status of lake sturgeon in the Boyd–Sakami section will have to be monitored closely to ensure that there is recruitment of juveniles in this area and to check if, in contrast, recruitment is solely ensured by the downstream migration of individuals from the Opinaca Reservoir.

Fish and mercury

The issue of increased mercury levels in fish must also be taken into account for the stretch below the Eastmain 1 Reservoir, considering the dissemination of mercury through the downstream migration of fish through the power plant turbines or control structures. The phenomenon of increased bioaccumulation caused by changes in the diet of non-piscivorous species must be addressed in a mercury level monitoring program following the commissioning of all of the project's components. The monitoring of mercury levels in fish in the diversion bays must include stations downstream from the Eastmain-1-A power plant that will take into account all species that could be affected by the phenomenon. Although the phenomenon is especially serious downstream from the power plant, owing to the effect of turbines on fish passing through them, questions can also be raised on the extent of mercury dissemination downstream from the KP 314 control structure on the Rupert River and downstream from release structures for the flow of the Lemare and Nemiscau rivers, and the Sakami structure. The Panel finds that the mercury level monitoring program should also include monitoring stations downstream from these structures.

Terrestrial and semi-aquatic wildlife

In the increased-flow section, the operational levels of the Opinaca Reservoir, the Boyd–Sakami stretch and the Robert-Bourassa and La Grande-1 reservoirs will remain within the present fluctuation range, even if they trend toward the upper end. Surveys conducted along the shorelines of Boyd Lake and Sakami Lake showed a low density of beaver colonies. The Panel finds that terrestrial and semi-aquatic wildlife in this section will not suffer major consequences owing to the small number of changes to the environment in terms of the species' home range.

Waterfowl

Surveys revealed large concentrations of *Anatidae* belonging to 21 species in Boyd Lake, Sakami Lake and the Opinaca Reservoir. Most of them were geese, but large flocks of American black ducks and green-winged teals were also observed. The relatively large flocks of geese observed during springtime surveys suggests that the geese were migrating to areas farther north. Seven breeder species were found in Boyd and Sakami lakes and five were observed in the Opinaca Reservoir. Most of the broods observed were of American black duck, green-winged teal and Canada geese. Large concentrations of waterfowl observed in July in the Opinaca Reservoir, Boyd Lake and Sakami Lake also indicate that these bodies of water are important moulting areas. Lastly, observations made over the course of the fall migration period reveal that this corridor is less popular in fall than in spring.

The Panel finds that the anticipated impacts on waterfowl in the increased-flow section are minor. The construction of the Eastmain-1-A and Sarcelle power plants and the Sakami structure will disrupt waterfowl habitat temporarily in specific areas. During the operational phase, the increase in water levels will not be sufficient to significantly reduce the nesting habitat of geese and ducks, especially since water levels are expected to be relatively steady during the summer.

During the public hearings held in Cree communities, a number of intervenors expressed concern regarding the apparent decrease in Canada geese populations along the James Bay coastline and in Rupert Bay since the construction of the La Grande Complex. They pointed out that the geese are now using the inland reservoirs during their stopovers. A certain number of

geese no doubt used the thawed bodies of water located inland, without necessarily forming large flocks in those areas. With the creation of reservoirs and diversion lakes inland, it appears that large flocks began to use these new water bodies. Telemetry technology and monitoring have recently made it possible to identify two migratory corridors used by the geese: one on the coast, and another farther inland.

The La Grande Rivière estuary and the James Bay coast section

Fish

The estuarine stretch of La Grande Rivière has undergone major physical changes in the last 25 years, including total cutoff of flow during the winter of 1978–1979, during the impoundment of the Robert-Bourassa Reservoir, followed by a gradual increase in flow at the La Grande-1 site. Attention should also be drawn to the current instability of the fish habitat in this section, owing to major daily fluctuations in flow, flow velocity and water levels.

Since 1994, a gradual increase in fishing yields have been observed downstream from the La Grande-1 power plant in summer. Northern pike, lake whitefish and longnose sucker dominate the fish community, while burbot, white sucker, cisco, brook trout and round whitefish are much less abundant. Longnose sucker has dominated the fish community since 1977 at the Fort George station. The relative abundance of walleye and cisco has decreased, while that of brook trout and round whitefish has increased since the Robert-Bourassa power plant has been in operation. As the La Grande Rivière flows into James Bay, a few anadromous species, such as cisco and lake whitefish, and marine species, such as fourhorn, shorthorn and Arctic sculpin, American and northern sand lance, Greenland cod and slender eelblenny and daubed shanny, penetrate the river in fall to spawn or winter.

The Panel finds that the proponent's conclusion that the Rupert River's diversion will not cause any significant impact on the fish community or its habitat in the estuary of La Grande Rivière and along the James Bay coast is reasonable, considering that subsequent hydrological changes will fall within the existing range of flow fluctuations.

Marine mammals

Despite the lack of data on the biological components of James Bay, the project's impacts would likely be minor and localized, especially for the beluga population, which is concentrated north of Akimiski Island and along the northwestern coast of James Bay. With respect to walrus, which are likely to be found at the mouth of La Grande Rivière, the impacts of the Rupert River's diversion are also likely to be minor and localized, considering that subsequent hydrological changes will fall within the existing range of flow fluctuations.

Flora

Riparian vegetation in the estuarine stretch downstream from Chisasibi does not seem to have been affected by the increase and fluctuations in river flow caused by the commissioning of the La Grande Complex. However, riparian habitat upstream from Chisasibi remains unstable as a result of the submersion and exposure cycles stemming from the management of the Robert-Bourassa, La Grande-2-A and La Grande-1 power plants. In terms of aquatic vegetation, grass beds are especially observed on the right bank, where the slope is generally gentler and where shoals, conducive to the development of submerged vegetation, are found. As is the case of riparian vegetation, aquatic vegetation seems to be more stable in the section of the estuary downstream from Chisasibi. The east coast of James Bay is suitable for the development of vast submerged eelgrass beds and salt marshes, which are vital for a number of migratory bird species, such as *Anatidae* and shorebirds. More specifically, eelgrass is an essential food resource for migrating Canada geese and brants.

The Panel agrees with the proponent's conclusions with regard to the development of flora in the estuarine stretch of La Grande Rivière. It is probable that fluctuations in hydrological and hydraulic parameters likely to impact vegetation will remain within existing range of fluctuations downstream from Chisasibi. With respect to the section upstream from Chisasibi, the proponent recognizes that riparian and aquatic vegetation will remain unstable owing to daily fluctuations in hydraulic parameters. It is plausible that the project will neither change nor worsen the situation, for the same reasons as those for the estuarine stretch affected by the tide.

Owing to its importance for geese populations, the issue of the decline in eelgrass was noted by a number of stakeholders, many of whom said they have observed a decrease in eelgrass along the James Bay coast in the last few years. They attribute the decrease to the commissioning of the La Grande Complex, as well as to a decline in geese in the same area. The proponent's studies indicate that eelgrass beds have declined significantly along the James Bay coastline since 1998. However, identifying

the factors impacting eelgrass habitat is a complex issue. The Panel does not expect the diversion of the Rupert River to affect the current eelgrass situation along the James Bay coast, considering the fact that the resulting hydraulic changes will fall within the existing range of fluctuations. Nevertheless, the Panel considers that the proponent should, together with the Crees, carry out long-term monitoring on the status of eelgrass beds along the eastern coast of James Bay, so as to contribute to the better assessment of the potential impacts of the commissioning of the La Grande Complex and, eventually, the diversion of the Rupert River.

Avifauna

The issue of avifauna was not addressed in the impact study, nor in responses to additional questions on the estuary of La Grande Rivière and the James Bay coast. Yet, eelgrass beds are essential for a number of migratory bird species, especially migrating Canada geese and brants. Furthermore, the issue of the decline in geese populations along the eastern coast of James Bay was raised by some stakeholders. At the public hearings, the proponent reported the increase in the number of geese in the reservoir section. It was also suggested that the apparent decrease in geese populations on the eastern coast of James Bay could be attributable to a change in migration corridors, but this has not been studied. However, recent discussions with specialists at Environment Canada revealed that Canada geese do not feed on eelgrass, but rather on carex and other emergent plants found in coastal marshes. Although the brant's diet consists largely of eelgrass, brant do not account for a significant portion of Aboriginal harvests.

The Panel reiterates its opinion that the proponent should, together with the Crees, carry out long-term monitoring regarding the status of eelgrass beds along the eastern coast of James Bay so as to contribute to the better assessment of the potential impacts of the commissioning of the La Grande Complex on this plant and possibly on geese populations. It would also be important to expand the study on the diets of Canada geese and brants migrating along James Bay because information on this issue appears to be contradictory.

The sections affected by the structures and related activities

Fish

The main elements affecting fish and their habitats during the construction of permanent and temporary roads are work done in the water and encroachment at crossing points. The enforcement of applicable Quebec standards and the proponent's standardized environmental clauses should sufficiently mitigate the impacts during construction. However, in its position paper, Fisheries and Oceans Canada expressed concern regarding the free movement of fish. Since the paper's submission, the proponent has been in touch with the Department, with which it agreed to establish a monitoring program for watercourse crossings characterized by the lack of impassable obstacles near the structures.

Terrestrial and semi-aquatic wildlife

The impacts on terrestrial and semi-aquatic wildlife in the Sarcelle–Eastmain-1 power line section and project roads will be minor. However, considering the increased movement of large wildlife stemming from the disturbances caused in the Muskeg–Eastmain-1 road section and the southern portion of the Sarcelle–Eastmain-1 line, it is desirable that appropriate roadside signage be installed to prevent accidents.

Avifauna

The deforestation anticipated for the construction of roads, camps, power lines and borrow pits will impact bird habitat. Despite the number of breeding forest bird pairs affected by the deforestation, the impacts will essentially be temporary, as an important portion of the bird habitat will be restored after the work is completed.

9. SOCIAL IMPACTS

Overview of the situation

At the beginning of the third millennium, a slowdown is noted in the advancement of Cree community-based institutions in comparison to the progress achieved since the signing of the JBNQA in 1975. We are seeing the emergence of a group of Crees holding steady employment, who are interested in furthering their children's education. However, this same group is also interested in preserving access to wildlife resources and maintaining a lifestyle based on using 4x4 vehicles, motorboats and snowmobiles that allow them quicker access to hunting opportunities in their spare time. Those in the community who spend all their time hunting and fishing are, to a certain point, dependent on members of their extended families who belong to this group of workers, as the current Income Security Program (ISP) is deemed inadequate by the Crees who wish to make a living practicing traditional activities. The Crees looking for work, whose numbers include many young people, have not yet succeeded in defining their lifestyle and are

the main driving force behind the development of the collective and private economy. The continued increase in employment and investment opportunities depends largely on the development of every sector: hydroelectricity, mines, forestry, tourism, trade and the retail sector. Such growth underscores the importance of the educational system to train the Crees for specialized or professional jobs.

The end of major hydroelectric projects and the decline of the mining and, more recently, forestry industries, have resulted in a significant drop in the local Jamesian population. It is evident the Jamesians' prosperity rests on the development of all resources in the area: hydroelectricity, forestry, mines and tourism.

The health of the Crees

It is difficult to distinguish between the impacts on the health of a population directly related to a project and those attributable to other causes. Nonetheless, the Panel believes the proponent should co-operate fully with Cree health authorities so that they can document the effects the project has on the key determinants of health of the Crees by targeting certain indicators pertaining to the project's impacts.

The Panel considers the various measures the proponent has undertaken to implement in order to minimize alcohol abuse on construction sites to be sufficient. However, Cree workers and their families may still need support and psychosocial help.

The Panel wholly recognizes the extent of the problem of mercury contamination in fish, which occurs naturally and is exacerbated by hydroelectric projects. The Panel is also aware of the difficulties the Aboriginal population living near the projects will have to face in adjusting to the project and the changes imposed on their diet. The Panel feels that the question of knowing whether or not the Crees will choose to consume fish is complex and depends on the availability of fish versus other options, related costs, subjective elements and the population's understanding of the relative health risks related to choosing fish or other options. However, the Panel believes that based on the information brought to its attention, this challenge is not insurmountable with the application of sustained management, planning, monitoring and communication processes, supporting resources and the involvement of all the stakeholders concerned. The Panel notes that the many facets of this problem must be addressed in a global, concerted manner. The Cree Board of Health and Social Services of James Bay (CBHSSJB) is best placed to manage this file, to implement, with the proponent's ongoing support, health policies and programs, to undertake research initiatives on mercury and Cree health and to develop the most appropriate communication tools for keeping people informed.

At the public hearings, some community members largely attributed problems such as diabetes, heart disease, family break-up, alcoholism, drugs and other types of social problems to changes arising from hydroelectric development. As is explained in this report, the Panel believes that it is impossible to attribute these problems to a single cause. It is also difficult to assess the potential cumulative impact of this new project on these problems. However, the Panel is somewhat reassured by the CBHSSJB, which feels it will be capable of addressing situations arising from the project.

Despite responses given by the proponent, most of the Crees consulted are convinced that the quality of water will permanently change following the river's diversion. Current users may no longer deem the water acceptable should there be a change in the water's colour and turbidity resulting from flow changes in the river and its tributaries, which would restrict their use of the water. The proponent should therefore monitor water quality and provide local authorities with the relevant information.

The Panel is aware of the feeling of loss some members of the Cree community, who are most familiar with the Rupert River, will feel. Some burial sites will be flooded in hunting grounds and traplines located in the diversion bays. The most affected families living on this land have given their consent to the project, and measures have been planned to ensure that these families can come to an agreement on how they wish to express their attachment to their deceased family members.

Water supply

Participants in consultations repeatedly expressed their concerns about the project's impacts on water quality. The numerous hydraulic and hydrological changes and the erosion of the banks resulting from the diversion of the river could alter the sediment dynamics. The water of the Rupert River is currently used for many domestic purposes. Once the diversion of the river takes place, the change in water colour and turbidity caused by the modifications to the flow of the river and its tributaries will lead to a reduction in the use of this water by the Crees, who may no longer consider it suitable for their needs.

As for the community of Waskaganish, the Panel believes the construction of a new water treatment plant by the proponent and the expansion of the pumping station's capacity will significantly enhance the community's water supply system.

Land use by the Crees

Using the land is an intrinsic part of Cree identity. Cree cultural values are closely intertwined with respecting the Earth and its resources. While modern civilization may have led to substantial changes to the traditional Cree way of life, the Crees feel that living in the forest represents an important cultural activity, even if their visits are short. Time spent in the forest is, for the Crees, a time when they can strengthen family ties and improve their health. After only a few years, Cree society has gone from being almost entirely based on traditional hunting, fishing and trapping activities and the sharing of resources to a market economy requiring appropriate training and paid employment. Their presence on the land has since changed due to several factors, such as work schedules and the need to remain in the village during the school year. Given that acquiring the practices, knowledge and rules for living in the forest requires long periods on the land, it is becoming more and more difficult for Cree youth, who are pursuing their studies and cannot spend long periods of time in the forest outside of school vacations, to acquire this traditional knowledge. External factors, like the drop in the price of furs, the ever increasing cost of gas and the equipment needed to practice forest activities and the allowances from the ISP for Cree Hunters and Trappers, deemed insufficient by the Crees who want to live by engaging in traditional activities, considerably reduce the financial benefits related to a forest-based lifestyle. Fewer and fewer people are adopting a strictly traditional way of life. Nevertheless, many people hold seasonal jobs and spend weeks and even months in the forest. Many Crees have stated they would like to return to live on the land as soon as they finish working.

The project's most significant impacts will occur in the hunting grounds affected by the creation of the Rupert diversion bays. The loss of land will be even greater as it entails a reduction in the areas prized by the users. The exposure of the banks resulting from the lowering of the water level of the Rupert River and the increase of the flow of the La Grande Rivière will also have an impact on certain hunting and trapping activities. Several fishing spots, goose hunting grounds and a few moose hunting grounds will be affected by the changes. Furthermore, several sites of cultural importance, burial sites and birth places will be flooded. Although a lingering sense of loss will remain, a fund provided for in the Boumhounan Agreement allows for a symbolic or veritable transfer of the interred, with the permission of the families of the deceased or the communities concerned. The presence of new water bodies and the accelerated erosion of the banks will have impacts on the travel network, especially for boats and snowmobiles. In addition to the flooding of the land, the users of the hunting grounds will have to cope with the inconveniences associated with the clearing of trees, construction of roads and structures, transport, increased vehicle traffic and the presence of workers during the construction phase. During the operation phase, access roads, dikes and other hydraulic structures and numerous borrow pits and quarries will significantly alter the landscape. However, the Panel believes the users of the hunting grounds will be able to continue to harvest the resources on their land, though they will have to reorganize their activities. They will need to develop their own strategies to adapt to the new conditions.

Opening of the territory

The area under consideration for the project already includes several public roads. In addition, new roads and power lines to be built as part of the project will add to the Crees' concerns regarding the existing road network, especially with respect to safety.

The opening of the territory resulting from this project could help to develop recreational and tourist activities, such as recreational boating and sport hunting and fishing. Although the impact is difficult to evaluate, increased accessibility to the land could affect the competition for wildlife resources between non-Aboriginals and the Crees in the medium and long terms. Note that non-Aboriginal hunters and fishermen would have to comply with regulatory harvesting limits. The Panel believes the proponent's employees must be informed of wildlife management procedures and harvesting activities in the area. Through the pursuit of its mandate, the Weh-Sees Indohoun Corporation will contribute to mitigating the impacts of the project on sport hunting and fishing.

It must be pointed out that the opening of the territory will have repercussions on other types of projects, mainly in the mining, forestry and industrial sectors.

Navigation

Navigation conditions will change in the diversion bays, the reduced-flow stretch of the Rupert River and

Rupert Bay, as well as in the increased-flow section of the river, requiring users to reacquaint themselves with the areas in question. Navigation conditions will no longer be the same, with some rapids becoming accessible, and others not. The project will alter the natural character of the Rupert River, which could lead to changes in the type of clientele practicing recreational boating in that body of water. The Panel recognizes that the potential of the Rupert River as a canoeing and camping destination could diminish, based on the assumption that this niche could be developed further than it is today.

Although it is difficult to accurately predict the new conditions before the commissioning of the various dams and dikes that are part of the project, the Panel feels that these watercourses will remain navigable with the implementation of the proposed mitigation measures.

Development of recreation and tourism activities

Tourism in the James Bay area will survive the implementation of the project because numerous distinctive attractions exist outside the area directly affected by the project. Tourism can contribute significantly to the regional economy insofar as the various agencies and stakeholders, including Hydro-Québec, work together to develop different promotional strategies aimed at tourists visiting the area and, in particular, the hydroelectric structures.

However, it is difficult to identify the impacts of the project on the future demand for vacation leases. The proponent does not believe there will be a rise in the demand for such leases as the project is located north of the area in which nearly 90% of the existing leases are found.

Furthermore, there is a question surrounding the viability of the local emerging and expanding tourism industry after the implementation of the project. For example, a visit to the Eastmain Complex could surely not match the appeal of a visit to the La Grande Complex, with its giant's stairway and the world's largest underground power plant. Given the fairly low numbers of hikers vacationing in the area, the Panel doubts the drawing power of lake kayaking when similar facilities exist at destinations much closer to large urban centres.

The Panel recognizes the diversity of the tourist offer in the Rupert River corridor and the possibility that specific first-rate products may be developed there in the future. Nevertheless, there remains a risk that the project might have a negative impact on the products already offered and that the expansion of the tourist industry in the area affected by the project could be compromised. Two types of development are evident. On one hand, sport hunting and fishing and visits to the La Grande Complex are tourist activities that will be barely affected by the project. From a financial perspective, Hydroelectricity will clearly be much more profitable in the short and long terms. Tourism cannot replace the project as an economic engine; rather, it would serve to complement it. It would be up to the Crees to develop this complementary industry to the fullest. Secondly, the possibility of developing an emerging and expanding industry such as wilderness tourism and cultural tourism in the Rupert River corridor will require more in-depth feasibility studies.

Archaeology, heritage and burial sites

The work linked to building the structures and the impoundment of the diversion bays will lead to the disappearance of some archaeological sites and burial sites. These sites are highly prized by the Crees for transmitting traditional knowledge from one generation to the next, so flooding them would result in them losing part of their culture. Other sites of value to the Crees will not be flooded, but will still be affected. Smokey Hill, near Waskaganish, is a traditional community gathering place. Located next to spectacular rapids, Smokey Hill is an important site for dip-net fishing for lake cisco, as well as a cultural campground that serves to initiate young people to the traditional Cree way of life. Given the uncertainty surrounding the impacts of the project regarding fishing at the current Smokey Hill site, the Panel finds it hard to evaluate the impact on this heritage site. A monitoring program and the measures taken once the preliminary results of the monitoring are known will prove crucial.

The Panel is unsure as to the usefulness of a follow-up study on the landscape to assess the impact of the reduced flow on the Gorge Rapids and evaluate the possible mitigation measures to preserve the appeal of the landscape and the use of these rapids for tourists. Attempting to divert the flow into one main channel, as the proponent proposes, will detract from the area's wilderness character. The Panel thinks it would be difficult to maintain the turbulent nature of the rapids and concludes that the project will reduce the appeal of this site as a tourist attraction.

The Rupert River will thus be modified in a manner that will change its natural appearance. Although the proponent has proposed several mitigation measures to render the impacts more acceptable for both the

biophysical environment and humans, the fact remains that the intrinsic value of the river will be altered.

10. SAFETY OF STRUCTURES

Dam safety is one of the major concerns of the Cree communities located near the bodies of water affected by the diversion of the Rupert River, especially Chisasibi, a community located next to hydroelectric structures LG-1 and LG-2. The residents are afraid a potential catastrophe would occur if these structures are destroyed. The perspective of additional water being channelled to the Robert-Bourassa and LG-1 reservoirs, as well as the proponent's dam rupture scenarios in the impact study, has fuelled their worries and feelings of unease. The proponent has agreed to provide the Crees with an annual report on the nature, duration and scope of its monitoring programs for the La Grande Complex. Furthermore, the proponent agreed to build an area of high ground near the community to which the residents could flee in the event of an emergency.

Owing to its stringent nature and the regulatory requirements related to the design, construction and periodic inspection of hydro-electric structures, Quebec's dam safety plan includes all of the requisite elements to ensure public trust in the integrity and safety of the structures.

The Panel's analysis of the facts revealed nothing that leads the Panel to objectively conclude that the fears expressed by the Cree community concerning dam safety and contingency plans are founded. Nevertheless, the Panel is troubled by the intensity of the Cree community's fears, which it attributes to a lack of effective communication between the proponent and the community. It believes that an in-depth review of the proponent's communications strategy is required in this matter.

The Panel believes that Cree community leaders also have an important role to play in helping the proponent determine the type of information and the means of communication to be used to reassure the population of dam safety issues. It is also their duty to facilitate the dissemination of this information by the most effective methods in their communities.

11. CUMULATIVE IMPACTS ON THE ENVIRONMENT AND RESIDENTS

Despite the fact that the Panel is aware of problems in this matter, including the lack of reference data and thresholds, it questions the proponent's selection of Valued Environmental Components (VEC) and indicators in its analysis of the project's cumulative impacts.

The Panel believes that looking at the issue of mercury alone is insufficient for determining the cumulative impacts on health, as the analysis shows the importance of evaluating other elements related to this VEC, such as mental and spiritual health. Although the proponent acknowledges the existence of mercury, which is an issue of particular concern to women who are pregnant or seeking to become so and children, it underestimated its importance in its assessment. Nevertheless, the proponent shows a willingness to work with Cree health authorities, i.e. CBHSSJB, to implement the necessary measures for mitigating the impact of mercury as much as possible. It remains that this undesirable by-product of the project places a heavy burden on women in the Cree community, requiring them to make an extra effort in maintaining a healthy diet. Considering the scientific data and possible solutions, which range from a more effective public communications strategy to the availability of alternative food sources, the Panel finds that the issue can be managed effectively if there is co-operation between the proponent, Cree health authorities and the Cree community. It should be noted that the CBHSSJB, and not the proponent, is primarily responsible for advising the public on this issue.

In terms of the quality of life of the Crees, the negative impacts of the project, combined with the effects of previous hydro-electrical projects, could exacerbate problems relating to opening and developing the land and harvesting traditional foods. The Panel believes that although the impact of the project appears minimal when looking at the big picture, the communities will still suffer the consequences. It feels that the cumulative impact is real, but difficult to quantify, making it impossible to specify the relative significance of the incremental cumulative impact and the causes of change attributable to the project. Although the Panel is aware of certain positive factors, such as the development of a road network, population growth, better social services infrastructure and lower common disease rates that are comparable to those of other First Nations and the general population, it did not have the opportunity to examine global studies that would have enabled it to focus on the relative importance of the cumulative benefits of hydro-electrical development for the Cree nation. It therefore had to rely on its own judgment in this respect.

The Panel is of the opinion that the cumulative impacts of the La Grande Complex, coupled with the effects of the increased flow of the Rupert River, should be evaluated for the Chisasibi, Eastmain and Wemindji communities. The study could look at habitat management, the status of fish stocks, beaver populations and other fur-bearing animals, the need to adjust the perimeters of hunting grounds (if required) and the impacts of the construction of roads, access roads and watercourse crossings. The study would enable the proponent to better tailor the proposed mitigation measures and establish new ones to address the needs identified by the follow-up program.

Like Nunavut stakeholders and experts who have expressed opinions on the issue, the Panel finds that the data that are currently available are insufficient to quantify the cumulative impacts on James Bay and Hudson's Bay or separate them from the major factors affecting these ecosystems, including inter-annual variability and climate change. Although the diversion of the Rupert River will have a cumulative impact on the bays, the effects will be minor in terms of the project's contribution to the hydro-electrical structures that have been built since the early 1980s. Because the effects extend beyond the borders of the province and affect many jurisdictions, including those of the federal government and the governments of Quebec, Ontario, Manitoba and Nunavut, the Panel considers that a formal analysis of these impacts cannot be conducted without establishing a large-scale research and follow-up program, a measure which the Panel recommends. Furthermore, greater recognition needs to be given to traditional environmental knowledge when directing research efforts.

The Panel finds that natural river heritage will be lost as a result of the diversion of the Rupert River, representing yet another change to Quebec's system of rivers classified as "exceptional" and "remarkable" by the *Fédération québécoise de canot et de kayak*. However, it does recognize the societal choice underlying the transformation of rivers for the purpose of hydro-electrical development and believes that a renewed debate on this issue might be in order.

The analysis also shows the need for an overall vision with respect to the land's development to ensure that knowledge of the cumulative impacts are taken into account in regional planning and in selecting development projects. In this context, the regional development plan for public land that is to be prepared by the Quebec government is key to preventing disputes and overdevelopment. The Panel believes that it would be important to initiate discussions on a more systemic approach to the analysis of cumulative impacts or on the possibility of making greater use of strategic environmental assessment in the evaluation of governmental policies and programs.

12. INVOLVEMENT OF THE CREE COMMUNITY AND TRADITIONAL KNOWLEDGE

Despite the proponent's efforts to consult and cooperate with the tallymen affected, at the hearing, the proponent heard extensive testimony given by Aboriginal individuals, who expressed great dismay at the proponent's lack of attention to acquiring and incorporating traditional knowledge in its studies. The Panel finds that the proponent could have done more and recognizes the added value of intimate knowledge of the land, its inhabitants and their customs in gathering data for scientific analysis of various subjects of study for a project of this scale. It considers the consultation and ongoing involvement of individuals with traditional knowledge to be essential to enabling the proponent to apply it in its planning, development and follow-up studies, thereby ensuring that its project and the necessary mitigation measures are fully adapted to the environmental and social contexts.

13. THE PARAMOUNT IMPORTANCE OF MONITORING AND ADAPTIVE MANAGEMENT

In its report, the Panel has indicated that the project under study is likely to have numerous environmental and social impacts, which can only be deemed justifiable insofar as they can be controlled through the implementation of effective mitigation measures at the proponent's expense, which are followed up under a rigorous monitoring program and adjusted according to needs. In this regard, as stated many times already, the monitoring program is of paramount importance.

In relation to such monitoring, the proponent has agreed to comply with adaptive management principles for the anticipated ecological instream flow downstream from the Rupert River's diversion point and for wildlife enhancement work for restoring, replacing or compensating for habitat that is affected or lost as a

result of the project's implementation. Although they are developed in a rigorous manner and in accordance with best practices, wildlife enhancement projects always entail a degree of uncertainty related to intrinsic variability in the behaviour of organisms and ecosystems. The adaptive management principle advocates that adjustments be made following completion of any action or work that does not meet the objectives established at the design stage. In the context of ecological instream flow, the adaptive management principles would require that modulation periods and flow values be reviewed in order to remedy any situations identified through monitoring or observations made by users of the land. The same can be said for any wildlife enhancement work, if monitoring reveals that it does not meet the established objectives.

14. COMMUNICATION

During hearings in Cree communities, the Panel learned of the numerous communication problems between the communities and Hydro-Québec. These problems are unfortunate and cause tension, mistrust and a lack of understanding between the parties. It is in the parties' best interest to come to an agreement in the spirit of partnership promoted in the *Paix des braves* and the Boumhounan Agreement. A good number of criticisms directed at the proponent by Cree stakeholders are a testament to their experiences during the construction of the La Grande Complex. These criticisms make it difficult for them to have much confidence in a new project. The recounting of unilateral action taken and insensitivity shown by Hydro-Québec and its employees and contractors during that period, resulting from a lack of communication, is widespread in villages.

As part of the proposed project, the proponent's representatives must address past issues and the resulting perceptions in their efforts to improve consultation and communications with the communities. The project's technical aspect compounds this challenge.

The Panel hopes that relations can be improved by giving more importance to the Cree culture and language and by further adapting the information and means of communication to the communities' ways of doing things. Explaining complex and technical data in laymen's terms to make them accessible to everyone should also be considered. Communications adapted to the environment and respectful of the population should not only come from Hydro-Québec's management or public relations team, but also from all of the proponent's employees, foremen and contractors.

The Crees, for their part, will have to demonstrate openness and a willingness to become informed and establish and maintain close communications with Hydro-Québec.

15. THE PANEL'S OVERALL FINDING

Overall finding

Having reviewed every aspect of the project in accordance with the *Canadian Environmental Assessment Act* and in compliance with the Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project, the Panel finds that the project meets requirements from a technical, strategic, commercial and economic perspective and that no alternative is currently better. In light of its analysis, the Panel believes that the anticipated environmental and social impacts will be numerous and widespread, but the impacts are definable and can be mitigated in a satisfactory manner if all of the necessary conditions are put into effect. For these reasons, and considering the project's clear benefits, the Panel finds that the acceptance of these impacts is justifiable.

Consequently, the Panel recommends that the project be submitted to the decision-making processes of the competent federal authorities on condition that the proposed recommendations be incorporated into their approval requirements, in addition to Hydro-Québec's commitments.

Differing opinion

A member of the Panel does not agree with the majority decision for specific reasons. The member's differing opinion is presented in the report after the recommendations.

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Introduction

Note: This English translation of the panel report originally submitted in French from the Eastmain 1-A and Rupert Diversion federal review panel has not been reviewed by any of the federal review panel members.

INTRODUCTION

Project submission

In November 2002, Hydro-Québec Production notified provincial and federal authorities of its plans for a hydroelectric project to include construction of two generating stations: the 768-MW Eastmain-1-A powerhouse at the Eastmain-1 reservoir and the 125-MW Sarcelle powerhouse at the outlet of Opinaca reservoir. The project would require partial diversion of the waters of the Rupert River while maintaining an ecological instream flow regime (R6)[2] . The proposed project is known as the Eastmain-1-A and Rupert Diversion project.

Project proponent

Hydro-Québec is a government corporation with four administrative divisions: Hydro-Québec Production, Hydro-Québec TransÉnergie, Hydro-Québec Distribution and Hydro-Québec Équipement. The Hydro-Québec Production division is the project proponent. This division's mandate is to promote and develop Quebec's accessible hydroelectric potential and to operate the associated generating facilities for commercial purposes. Hydro-Québec Production generates electricity, sells it in various markets and provides a heritage pool of electricity of up to 165 TWh per year. In December 2004, its generating fleet consisted of 51 hydroelectric powerhouses, 5 thermal powerhouses and a wind farm, for a total installed capacity of 33,473 MW.

Hydro-Québec TransÉnergie is responsible for designing, operating and maintaining Quebec's power transmission system. The system includes 32,539 km of lines, over 500 substations and 18 interconnections with neighbouring systems outside Quebec. Hydro-Québec Distribution, the primary electricity distributor in Quebec, serves nearly 2.7 million residential customers, 152,000 commercial customers and 255 corporate customers across Quebec.

Within the territory governed by the *James Bay and Northern Québec Agreement* (JBNQA)[3], Hydro-Québec Production assigns the construction of hydroelectric development projects to the *Société d'énergie de la Baie James* (*SEBJ*), a subsidiary of Hydro-Québec. The *SEBJ* will therefore be carrying out the Eastmain-1-A and Rupert Diversion Project.

General background

To begin with, an overview of some of the events that led Hydro-Québec Production to develop the Eastmain-1-A and Rupert Diversion Project is in order. On February 7, 2002, the Government of Quebec, the Crees of Quebec, the Grand Council of the Crees (GCC) and the Cree Regional Authority (CRA) reached an Agreement Concerning a New Relationship Between the Government of Quebec and the Crees of Quebec, known as the *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."

It 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."

That same day, Hydro-Québec, the *SEBJ*, the GCC, the CRA, the Eastmain Band, the Nemaska Band, the Waskaganish Band and the Cree Nation of Mistissini signed the Boumhounan Agreement (M70.5). The Agreement sets out the definition, description, design study, and the participation of the Crees in the various phases of the Eastmain-1-A and Rupert Diversion Project. It provides for the creation of funds, to be administered by the Crees, to mitigate the impacts of the project on the territory and its residents.

In November 2002, the proponent triggered the environmental assessment process by submitting preliminary project information.

2. The list of references used in the report is presented in the documentation in Appendix 1.
3. The list of bookmarks and acronyms used in the report is presented in Appendix 2.



1

The Environmental Assessment Process

1. THE ENVIRONMENTAL ASSESSMENT PROCESS

In accordance with the legal provisions, the project was submitted to the provincial and federal authorities for review. At the provincial level, the project is subject to the environmental and social impact assessment process set out in Section 22 of the JBNQA and in Chapter II of the *Environment Quality* Act (R.S.Q., c. Q-2) (EQA). The provincial administrator specified in the JBNQA and the EQA is therefore responsible for overseeing the steps in the provincial assessment process. The Government of Canada carries out its analysis of the project in accordance with the process set out in the *Canadian Environmental Assessment Act* (S.C. 1992, c. 37) (CEAA). The Canadian Environmental Assessment Agency is responsible for administering the Act.

In April 2003, with a view to harmonizing the two environmental assessment processes, the governments of Quebec and Canada and the CRA signed the Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project (P1). Section 1.3 describes the key provisions of the agreement.

The first step in the harmonized process involved preparing directives respecting the scope and nature of the impact statement that the proponent would have to submit to obtain the necessary approvals for the project. Draft directives were developed by the Evaluating Committee (COMEV), a tripartite Canada–Quebec–Cree body created pursuant to Section 22 of the JBNQA, in cooperation with the Canadian Environmental Assessment Agency. On May 9, 2003, the draft directives were published, and the public was given 60 days to comment on the points to be included in the final directives. From May 28 to June 11, 2003, public hearings were held in Montréal, Mistissini, Waskaganish, Chibougamau, Nemaska and Chisasibi. The preliminary directives were amended to reflect the input received from the public, and on August 8, 2003, the final directives (P2 and P3) for the preparation of the environmental impact statement were forwarded to the proponent by the provincial administrator and the federal Minister of the Environment.

In late December 2004, the proponent tabled its impact statement with the provincial administrator, Fisheries and Oceans Canada and the Canadian Environmental Assessment Agency. In January 2005, the proponent submitted some 30 sectoral studies complementing the impact statement and a synthesis report in English, French and Cree. All the documents were then sent to the provincial Review Committee (COMEX) and the federal Review Panel (Panel) to allow them to analyse and review the project. COMEX, as described in Section 1.1 of this report, and the Panel, as described in Section 1.2, will henceforth be jointly referred to as "the review bodies."

On January 31, 2005, the review bodies announced the start of public consultations on the compliance of the Environmental Impact Statement. The public was given 90 days to submit written comments. A number of briefs and letters from members of the public and various organizations were received and taken into consideration by the review bodies.

On May 5, 2005 and June 23, 2005, preliminary requests for additional information were forwarded to the proponent so that it could work on compiling the missing information over the summer. The final request for additional information, which would make it possible to complete the impact statement, was officially forwarded to the proponent on August 2, 2005 (COE11).

The proponent submitted successive blocks of additional information beginning on September 27, 2005. After analysing all the documentation, the review bodies decided that the available information was sufficient to proceed with the public hearings. On January 26, 2006, they announced that the hearings would begin on March 15, 2006.

Between the tabling of the impact statement and the announcement of the public hearings, the proponent and the review bodies held seven technical information meetings to clarify certain aspects of the project. The full minutes of the meetings were made available to the public (see references VRT1 to VRT9).

Public hearings concerning the project and its environmental and social impacts were held 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 Montréal. The main concerns raised by the various participants at the hearings are described in Chapter 3 of this report.

The documents produced and received during the assessment process were filed with the Public Information Office created pursuant to the administrative agreement, as well as with the public registry of the Canadian Environmental Assessment Agency.

1.1 Role of the provincial review committee

COMEX is a permanent body created following the signing of the JBNQA in 1975. COMEX is in charge of assessing projects located within the James Bay region, south of the 55th parallel, which are subject to the environmental and social impact assessment process provided for in Section 22 of the JBNQA and in Chapter II of the EQA. It is composed of three members appointed by the Government of Quebec, including the chairperson, and two members appointed by the CRA.

When COMEX receives an impact statement from the provincial administrator, it is required to ensure that the proponent has supplied the information needed to analyse the project and that the information conforms to directives. It can also conduct public hearings on the environmental and social acceptability of the project. After reviewing the project, COMEX prepares a recommendation concerning the approval or rejection of the project, including any conditions associated with its approval. COMEX forwards its recommendation to the provincial administrator, who makes the final decision on whether to authorize the project, with or without conditions. If the administrator disagrees with the COMEX recommendation, the administrator must consult COMEX again before making a final decision.

Subsection 22.2.4 of Section 22 of the JBNQA and section 152 of the EQA specify that COMEX must pay particular attention to the following guiding principles:

- Protection of Aboriginal hunting, fishing and trapping rights in the territory concerned, in connection with activities associated with projects affecting the territory.
- Environmental and social protection, particularly through measures proposed as part of the social and environmental impact assessment process in order to minimize the negative impacts on Aboriginal peoples of activities associated with projects affecting the territory.
- Protection of Aboriginal people, societies, communities and economies in connection with any activities associated with projects affecting the territory.
- Protection of wildlife resources, ecosystems and physical and biological environments in connection with any activities associated with projects affecting the territory.
- Rights and guarantees for Aboriginal people on category II land.
- Cree participation in implementing the environmental and social protection regime.
- Rights and interests of non-Aboriginal people.
- The right to carry out projects in the territory.

1.2 Mandate and legal framework for the federal review panel

On February 27, 2003, at the request of the Minister of Fisheries and Oceans, the federal Minister of the Environment referred the environmental assessment relating to the project to a review panel, pursuant to section 33 of the CEAA. The Panel was created and, on November 1, 2004, the federal Minister of the Environment appointed the five members, two of them on the recommendation of the CRA.

The federal Minister of the Environment defined the Panel's mandate[4] for the review of the project. The mandate (P4) includes the responsibilities, the scope of the issues that need to be addressed, a description of the process and the duration of the mandate. The Panel must conduct an assessment of the project's environmental effects and submit a report to the federal Minister of the Environment and the responsible authorities pursuant to section 34 of the CEAA, i.e., Fisheries and Oceans Canada and Transport Canada. The Government of Canada must subsequently respond to the Panel's report to enable the responsible authorities to issue their respective permits pursuant to the *Fisheries Act* and the *Navigable Waters Protection Act*.

1.3 Provisions of the administrative agreement concerning the environmental assessments of the project

In April 2003, the governments of Canada and Quebec and the CRA reached an Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project (P1). The Agreement specifies that the parties shall strive, insofar as possible, to harmonize the federal and provincial assessment procedures in order to avoid duplication, and that they shall work together to ensure appropriate and effective assessment.

4 The mandate of the Panel and a brief introduction to the members and the manager are provided in Appendix 3.

This Agreement[5], which is specific to the Eastmain-1-A and Rupert Diversion project, specifies that COMEV, in collaboration with the Canadian Environmental Assessment Agency, shall make recommendations concerning the directives governing the scope of the environmental impact statement, in accordance with Section 22 of the JBNQA and Chapter II of the EQA.

The Agreement stipulates that the project analysis and review shall be carried out by COMEX and the Panel and that these organizations shall act independently in this regard. It also stipulates that the duration of the analysis and review process should not exceed 20 months, from the time COMEV receives the requisite information until COMEX tables its final recommendations. This period does not include the time taken by the proponent to prepare and submit the impact statement and provide additional information. In view of the parties' firm commitment to harmonize the analysis and review processes and their desire to work together to ensure an effective and thorough assessment addressing their respective concerns, the schedule provided for federal panel review procedures was adjusted to bring it into line with the steps and time frames set forth in the administrative agreement.

The Agreement also provides for the creation of a financial assistance program to facilitate public participation in the project review process during the following stages: preparation of directives, compliance evaluation of the impact statement and analysis of the environmental and social impacts. An amount of $400,000, half of which was provided by the *Ministère du Développement durable, de l'Environnement et des Parcs*, and half by the Canadian Environmental Assessment Agency, was allocated to various organizations. The review bodies were not involved in the financial assistance program.

The agreement provides for the creation of a Public Information Office (PIO) to respond to requests for information from the public in English, French and Cree. The PIO, located in Montréal, was established and operated from August 2003 to June 30, 2006.

A table showing the main steps in assessment of the Eastmain-1-A and Rupert diversion project is provided in Appendix 5.

5 A copy of the Agreement is included in Appendix 4.



2

The Project and its Environment

2. THE PROJECT AND ITS ENVIRONMENT

The project selected by the proponent is located in the southern part of a vast territory where major hydroelectric development projects have been completed over the past 30 years. The La Grande Complex was the first to be built, between the 1970s and 1990s and more recently, there has been the Eastmain-1 project, currently under development and scheduled to be completed by 2007. In order to place the project under study in context, the following paragraphs provide a brief description of the various James Bay hydroelectric developments and the projects under study by the proponent. The location of the project and the study area are shown in Figure 2-1.

The La Grande Complex

The signing of the JBNQA in 1975 paved the way for hydroelectric development projects in the JBNQA territory, including the La Grande Complex on the La Grande Rivière, which was completed in two phases over a 20-year period.

The first phase of the work began in 1973 and ended in 1985. It resulted in the construction of the Robert-Bourassa (La Grande-2), La Grande-3 and La Grande-4 generating stations, each with a reservoir, plus the reservoirs of the diverted rivers, namely the Caniapiscau, Eastmain and Opinaca. The installed capacity of the three generating stations is 10,282 MW and their annual output is 64.6 TWh. The total area of the reservoirs created is nearly 11,343 km^2.

Work on the second phase of the La Grande Complex began in 1987 and ended in 1995. Five generating stations were added, namely La Grande-1, La Grande 2-A, Laforge-1, Laforge-2 and Brisay. These generating stations increased the installed capacity by 4,954 MW and the annual output by 18.3 TWh. Three new reservoirs with a total area of 1,618 km^2 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, six 735-kV transmission lines and one 450 kV direct current line, for a total length of more than 10,000 km, were built. These lines carry the energy generated to southern Quebec. Some 1,300 km of permanent roads were built, as well as seven airports.

The Eastmain-1 development project

On February 7, 2002, the GCC, the CRA, the Eastmain Band, the Cree Nation of Mistissini, the Nemaska Band, the Waskaganish Band, Hydro-Québec and the *SEBJ* signed the Nadoshtin Agreement (M70.2), which provides for the construction, operation and maintenance of the Eastmain-1 project. The purpose of this Agreement is to reduce the project's impact on the Crees, protect their way of life, promote community development, foster advantageous conditions for the Crees and facilitate compensation arrangements. One part of this Agreement deals with environmental, remedial and impact mitigation measures.

The Eastmain-1 development project includes a dam on the Eastmain River, the Eastmain-1 powerhouse with a capacity of 480 MW and an annual output of 2.7 TWh, a permanent access road, a 315 kV transmission line and a workcamp. This development project also includes creation of the Eastmain-1 reservoir, with an area of 603 km^2. Work began in the spring of 2002 and impounding of the reservoir was completed in the summer of 2006. All the work is scheduled to be completed by 2007.

The Eastmain-1 development is located in the study area of the project currently being considered, and hence has an impact on its analysis and assessment. A number of references to this development will be made during analysis of the various issues relating to the Eastmain-1-A and Rupert diversion project.

For comparison purposes and before undertaking the detailed analysis of the project, a brief description of the Eastmain-1-A and Rupert diversion project and the Nottaway-Broadback-Rupert project (mentioned in Section 8 of the JBNQA) is provided.

The Eastmain-1-A and Rupert diversion project

The Eastmain-1-A and Rupert diversion project includes the partial diversion of the Rupert River, at kilometre point (KP) 314, and the creation of the Rupert diversion bays with a total area of 346 km^2. It also includes construction of the Eastmain-1-A powerhouse, with an installed capacity of 768 MW, and the Sarcelle powerhouse, with an installed capacity of 125 MW. The water diverted from the Rupert River will be channelled northward via the La Grande Rivière to increase the energy produced at 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 section of the Rupert River, the proponent plans to install eight hydraulic structures in order to reduce bank

exposure, among other objectives. The project includes construction of the 40-km permanent Muskeg-Eastmain road and a 101-km 315 kV transmission line. It also includes establishment of several temporary workcamps for the anticipated 5,500 workers. The estimated cost of the project is $4 billion, including financing costs.

The Nottaway-Broadback-Rupert project

The Nottaway–Broadback–Rupert (NBR) project, mentioned in Section 8 of the JBNQA, proposed the complete diversion of the Rupert and Nottaway rivers into the Broadback River and the creation of several reservoirs to control the diversion flows, as well as the construction of two powerhouses on the Rupert River, seven powerhouses on the Broadback River and two powerhouses at the outlet of the Evans and Quenonisca reservoirs. The project would have had a total capacity of approximately 8,700 MW and an annual output of 45 TWh. No final draft design for the NBR project was ever prepared and the technical and environmental considerations were not assessed.

As agreed in the *Paix des braves*, should the Eastmain-1-A and Rupert diversion project be approved, Hydro-Québec would abandon the NBR project. According to the proponent, abandonment of the NBR project in return for implementation of the Eastmain-1-A and Rupert diversion project offers significant environmental benefits, as the following table shows.

2.1 Analysis of the variants

2.1.1 The Rupert diversion

The project involves the partial diversion of water from the Rupert River watershed to the Eastmain-1 reservoir, from where it will be channelled into the La Grande Rivière via existing hydroelectric developments. An ecological instream flow regime will be maintained in the Rupert River downstream of the diversion point.

Variants studied by the proponent

The proponent analysed three variants:

- The Cramoisy variant: diversion of the Rupert River at KP 314, for a total output, including existing equipment, of 12.8 TWh. This variant includes a maximum diversion flow of 800 m^3/s and flooding of an area of 356 km^2, a part of which is category II land.
- The Arques variant: diversion of the Rupert River at KP 314, for an output of 12.7 TWh. This variant includes a maximum diversion flow of 800 m^3/s, flooding of an area of 631 km^2, and would impact Mesgouez Lake among other water bodies.
- The Île-de-l'Est variant: diversion of the Rupert River at KP 490, for an output of 10.8 TWh. This variant includes a maximum diversion flow of 700 m^3/s and flooding of a total area of 617 km^2 located entirely within Mistissini category II land, where all hunting, fishing and trapping rights are reserved for the Crees. It would impact water bodies including Mesgouez, Woollettt and Bellinger lakes.

To select the variant, the proponent conducted a comparative analysis based on energy, technical and hydrological criteria, applying an instream flow of 10% of the mean annual flow to each. This minimum instream flow value was subsequently revised upwards to 20%. The environmental aspect was not considered at this stage in the analysis. In the case of the Cramoisy and Arques variants, the closure point would be located at

Table 2-1 **Brief comparison of the Eastmain-1-A and Rupert diversion project and the Nottaway-Broadback-Rupert project**

Characteristics	Eastmain-1-A and Rupert diversion project	Nottaway-Broadback-Rupert project
Reservoirs	Creation of 2 diversion bays	Creation of 4 major reservoirs and diversion bays upstream of the 11 planned powerhouses
Total area flooded	346 km^2	6,497 km^2
Number of dams	4	Approximately 20
Number of dikes	74	Over 130

Source: Proponent's documents

the same location on the Rupert River. However, the larger forebay of the Arques variant would require more and larger retaining structures and would raise the water level of Mesgouez Lake. In both cases, a control structure was planned in order to release an instream flow regime into the Rupert River. Control structures required to restore the mean flow in the Lemare and Nemiscau rivers were planned, since the course followed by the diverted water is essentially the same for both variants. However, for the Arques variant, the arrival point of the water in the Eastmain-1 reservoir is shifted slightly eastward. These two variants require construction of 104 km (Cramoisy) or 58 km (Arques) of 735 kV transmission lines and the dismantling of 76 km or 51 km of transmission lines respectively (Table 2-2).

The Île-de-l'Est variant is based on a diversion of the Rupert River at its headwaters (KP 490). The first structures are located approximately 10 km downstream of Lake Mistassini. The water is then channelled toward the closure point, at KP 490, by a series of control structures and rejoins the Eastmain River via the Thereau River, 99 km upstream of the Eastmain-1 reservoir. Three diversion bays would be created by the diversion. This variant requires the construction of 150 km of access roads. Instream flow release structures are planned at the closure point on the Natastan, Thereau and Rupert rivers. The area of the diversion bays would be larger than with the Cramoisy variant, but less than with the Arques variant. No transmission lines would be affected by this variant.

To make a selection from among the variants presented, a process was undertaken involving experts from all the engineering disciplines as well as the Mistissini Crees. The comparison criteria selected had to allow each variant to be assessed on the basis of 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 rivers downstream of closure points;
- Minimize any increase in fish mercury.

To attain these objectives, the proponent assessed the impacts of the variants on components such as terrestrial wildlife habitats, forest stands and Cree hunting, fishing and trapping areas.

According to the proponent, the Cramoisy variant would meet most of the objectives since it results in the smallest area of natural water bodies raised and leaves Mesgouez, Thereau and Woollett lakes untouched. The Île-de-l'Est and Cramoisy variants are equivalent in terms of increased fish mercury levels, since the land areas flooded are similar. However, the Arques variant compares less favourably in this respect, since it floods 631 km^2 of land. The Île-de-l'Est variant scores lowest on most of the selected comparison criteria, especially the distance over which rivers are affected by reduced flow and the impacts on rivers downstream of closure points. The Cramoisy variant would better preserve the integrity of territory, but would require relocating 76.4 km of 735-kV lines (Table 2-3). For these reasons, and based on the conclusions presented in the Environmental Impact Statement, the initial Cramoisy variant was selected by the proponent and was optimized before being presented to the Cree and subsequently included in the Boumhounan Agreement.

According to the text of this 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 Woollett, Lake Bellinger and Mesgouez Lake will not be affected by the Project." These commitments made by the proponent definitively eliminate the Arques and Île-de-l'Est variants.

Although the three variants presented did not initially include mitigation measures designed to reduce the impact of the partial diversion on the lower Rupert River, the Boumhounan Agreement states that "Hydro-Québec shall, at the option of Cree users, design and construct up to 10 weirs along the Rupert River downstream from the diversion point [...]. The design and location of these weirs will be determined in concert with the Crees." The proponent provided an explanation for the locations selected and a description of the advantages and drawbacks of each. Section 5.2 of the report deals with the rationale for the weirs and their effectiveness in mitigating the impacts of the diversion.

During the public hearings, the review bodies received a brief from the *Fondation Rivières* (M59) pointing out that the proponent did not conduct a complete analysis of the variants since it had not considered the modified Île-de-l'Est variant, presented as the "Langelier variant." This variant proposes diverting water from the Rupert River at the closure point of the Île-de-l'Est variant and channelling the water via a network of water bodies (four of which are large), canals and a tunnel, to rejoin the Eastmain River upstream of the Eastmain-1 reservoir. It also includes construction of two run-of-the-river plants on the Eastmain River (Eastmain-2 and Eastmain-3) before the diverted water

Table 2-2 Characteristics of the variants

	Closure point KP 314								Closure point KP 490				
	Cramoisy variant				Arques variant				Île-de-l'Est variant				
Output	12.8 TWh/year				12.7 TWh/year				10.8 TWh/year				
Area of the diversion bays (km²)									**Div. bays**		**Eastmain**		**Total**
land area flooded	221				350				194		93		287
total area affected	356				631				431		186		617
Diverted and restored flows (m³/s)													
diverted flow/inflow	585/677				581/670				465/525				
maximum diversion flow	800				800				700				
restored flow	92				89				60				
Main rivers affected (km)	**Rup**	**Lem**	**Nem**	**Tot**	**Rup**	**Lem**	**Nem**	**Tot**	**Rup**	**Nat**	**The**	**East**	**Tot**
length in diversion bays	18	30	37	85	79	30	32	111	65	–	40	–	105
length with reduced flow	314	45	135	494	314	45	150	509	490	132	45	–	667
length with increased flow	–	–	–	–	–	–	–	–	–	–	–	99	99
Main lakes affected													
higher water level	Des Champs Arques Cramoisy Du Glas				Mesgouez Des Champs Arques Du Glas				Woollett Thereau Nasacauso De la Marée				
lower water level	Teilhard Biggar Des Montagnes Caumont Nemiscau				Des Montagnes Caumont Nemiscau				Bellinger Des Pygargues La Bardelière Mesgouez Nemiscau				
Structures													
dams and dikes	3 dams and 38 dikes				3 dams and 65 dikes				7 dams and 28 dikes				
canals (m)	10,900				1,115				1,700				
earthwork (m³)	11,600,000				14,250,000				3,350,000				
roads (km)	81.0				85.0				150 km and 4 bridges				
lines to dismantle (km)	76.4				51.3								
lines to rebuild (km)	104.0				58.0								

Notes : Rup : Rupert Nat : Natastan Lem : Lemare The : Thereau Tot : Total
Source: Proponent's documents

Table 2-3 **Advantages and drawbacks of the variants**

Cramoisy variant	Arques variant	Île-de-l'Est variant
Advantages		
Minimizes area flooded and associated effects on physical and biological environment. Raises smallest area of natural water bodies. Does not affect Mesgouez, Thereau and Woollett lakes. Does not impinge on the area's wildlife reserves.	Avoids flooding category II land.	Does not affect existing 735-kV lines.
Drawbacks		
Floods 33 km^2 of Nemaska category II land. Requires dismantling 76.4 km and rebuilding 104.0 km of 735-kV lines.	Floods the largest area (631 km). Produces greatest rise in fish mercury levels. Impinges slightly on wildlife reserves. number of traplines. Impinges on wildlife reserves. Requires building longest roads.	Floods 431 km^2 of Mistissini category II land. Floods 186 km^2 along Eastmain River. Affects largest

Source: Proponent's documents

rejoins the Eastmain-1 reservoir. According to the information available, this variant, like the Île-de-l'Est variant, would affect category II land and would have significant impacts on Mesgouez and Woollett lakes as well as on a long stretch of the Rupert River and on the proposed Albanel-Témiscamie-Otish Park.

The Panel accepts the choice of the Cramoisy variant for technical reasons and because it was the option preferred by the Cree Nation at the signing of the Boumhounan Agreement. Since the "Langelier variant" has impacts considered unacceptable by the signatories to the Boumhounan Agreement, such as flooding of category II land, it cannot be selected.

2.1.2 Eastmain-1-A and Sarcelle powerhouses

Eastmain-1-A powerhouse: variants studied by the proponent

The Eastmain-1-A powerhouse would be part of an existing and operational hydroelectric development, namely the Eastmain-1 reservoir and the powerhouse of the same name located at KP 203 of the Eastmain River. Consequently, the number of variants presented by the proponent is restricted by the existing infrastructures. Essentially, two variants were studied. Variant 1 would be located near the dam and spillway, at KP 213, and variant 2 near the Eastmain-1 powerhouse, at KP 204. The variants are technically very similar, except for the maximum capacity, which will be 626 MW in the case of variant 1 and 768 MW for variant 2. It will be recalled that the Boumhounan Agreement sets the maximum capacity of the Eastmain-1-A powerhouse at 770 MW. In addition, 10 km of transmission lines will have to be built for variant 1 versus 0.6 km for variant 2. In terms of cost, variant 2 is the least expensive.

In addition, the tailrace canal of variant 1 would be constructed in bedrock and clay, while the tailrace canal of variant 2 would be constructed completely in bedrock. From an environmental perspective, it should be pointed out that lake sturgeon spawning grounds

were recently established at KP 207 of the Eastmain River and at the foot of the first rapid of Rivière à l'Eau Claire during implementation of the Eastmain-1 project. According to the documents tabled by the proponent, these spawning grounds would compensate for the loss of the spawning ground at KP 215 due to commissioning of the Eastmain-1 powerhouse. In addition to these infrastructures, a weir was constructed at KP 207 of the Eastmain River to maintain the water level as far as KP 215 in order to preserve the lake sturgeon habitat and minimize bank erosion. This work has been completed.

The location of the Eastmain-1-A powerhouse must take these existing developments into consideration. Variant 1 would modify the flow conditions in the stretch developed for lake sturgeon since, once the two powerhouses are in operation, the mean annual flow between the powerhouses and the Eastmain-1 dam would be 58 m^3/s, while implementation of variant 1 would raise the mean flow to 661 m^3/s, which requires adjustments to the sites enhanced for fish. The proponent considers variant 2 to have the lesser impact, in view of the operational linkages between the two powerhouses and the mitigation measures already implemented during the Eastmain-1 project. Variant 2 would keep flow conditions in the stretch of the Eastmain River between the dam and the powerhouse identical to those that will exist following commissioning of the Eastmain-1 powerhouse without the Rupert diversion. The flow of this stretch would increase only during the flood season, especially in the spring, when the reservoir's spillway will have to be used, at an estimated frequency of one year in four rather than two years in three under baseline conditions (prevailing conditions once Eastmain-1 becomes operational). A subsequent section of the report deals with the effect of these spills on the spawning grounds established during the Eastmain-1 project.

The Panel accepts the variant selected for the location of the Eastmain-1-A powerhouse (variant 2) since the new powerhouse will be developed and managed in close conjunction with the existing Eastmain-1 powerhouse. In addition, this variant will have fewer impacts on the stretch developed for lake sturgeon downstream of the Eastmain-1 dam during the Eastmain-1 project. It would however be advisable for the proponent to coordinate the two environmental monitoring programs in order to enhance environmental protection and derive as much information as possible from these programs.

Sarcelle powerhouse

There are no variants for the Sarcelle powerhouse. However, the Boumhounan Agreement mentions that the future facilities at the Sarcelle site would be either a new control structure or a powerhouse, depending on the decision of the Crees, if they exercise their option concerning the existing control structure. Following signing of this Agreement, the Crees agreed to replace the existing control structure at the outlet of the Opinaca reservoir with a powerhouse which would recover head of 10.8 m and generate 125 MW. The powerhouse would be located in line with the existing flow.

Because of the decision to build a powerhouse to replace the Sarcelle control structure, it is included in the project.

2.1.3 Transfer structures between the bays

Variants studied by the proponent

The water diverted from the Rupert River will be channelled through the diversion bays into the Eastmain-1 reservoir, following a route directed and contained by the construction of dams, dikes, canals and a tunnel. For the transfer of water between the forebay and tailbay, two variants were studied by the proponent.

The first variant studied would include a transfer canal located to the west of Lac de la Sillimanite comprised of the following components:

- an open intake canal approximately 2,500 m long;
- a control structure on the surface located at the downstream end of the canal;
- two long canals of 1,450 m and 2,900 m to carry water from the control structure to Arques Lake.

Construction of two large dikes would be required to the west of the canals to contain the water and carry it down into Arques Lake. Approximately 7,000,000 m^3 of excavated material would be generated by the construction of this variant and the two planned dikes would require approximately 500,000 m^3 of fill.

The second variant involves digging a tunnel linking the Lemare River watershed to the Nemiscau River watershed and passing under Lac de la Sillimanite. This tunnel would have a control structure at its intake portal and two canals that would carry water down into Arques Lake. The total length of these structures is 3,800 m. The excavated material generated would be approximately 2,530,000 m^3 and, approximately 160,000 m^3 of fill would be needed for the two small dikes required to the west of this structure.

The tunnel option was selected by the proponent because it is less expensive and offers greater flexibility

in scheduling construction since work could continue year-round rather than just in the summer. Two types of structures were studied for the control structure: a concrete control structure with two gates and a concrete weir. According to the proponent, the weir would have more technical, economic and environmental advantages since it is simpler to use and would maintain the water level in the Rupert forebay with no gates to operate at the tunnel. The main environmental advantages associated with construction of the tunnel to transfer the water to the tailbay would appear to be protection of Lac de la Chlorite and Lac de la Sillimanite, a smaller flooded area in the tailbay as well as a lower volume of excavated material.

According to the Supplement to the Environmental Impact Statement (RP10), the proponent made an addition to its tunnel project by planning a second route for the diverted water in the event of a reduction in the tunnel's discharge capacity. This bypass option, which would be used only in the event of major work in the tunnel, would divert part of the water from the Rupert River to Cabot Lake until such time as the tunnel is returned to service.

The option selected by the proponent for transferring water between the diversion bays is considered acceptable by the Panel, since this option has several advantages, including eliminating the need to empty Lac de la Chlorite and Lac de la Sillimanite, reducing the volume of excavated material and reducing the area flooded in the tailbay by 5 km^2.

2.1.4 Workcamps

Construction work will be spread over five years. The peak workforce required for all construction work is estimated at 5,500 workers, who will be accommodated in eight workcamps: three existing workcamps (the Eastmain and Nemiscau workcamps and the workcamp at KM 257 of the Route de la Baie-James), and five workcamps that will be built for this purpose and dismantled once the work is complete (the Sakami Lake, Sarcelle, Rupert, Jolliet Lake and Kauschiskach workcamps).

To determine the best location for the workcamps, the proponent used the following selection criteria: the area of land available, the type of foundation soil, the topography, drinking water supply, wastewater discharge, land drainage, water table level, the location of the site relative to the work areas and site accessibility.

The proponent has identified a potential site located very close to the construction sites for the Sakami Lake, Sarcelle, Jolliet Lake and Kauschiskach workcamps. Although the proponent has provided only an approximate location and final sites will not be selected until the project implementation phase, it is unlikely that the workcamps will be located elsewhere. For the eventual replacement of the Kauschiskach workcamp, the proponent is considering the possibility of accommodating workers at the existing workcamp at KM 257 of the Route de la Baie-James. The final decision between the two options will be made once construction work commences.

Given the number, distribution and size of the construction sites that will be active in the area of the two diversion bays, a study of variants was carried out to choose the location of the Rupert workcamp. The proponent first examined the possibility of establishing one or two workcamps based on the criteria of cost of the facilities, worker travel and location relative to the work site. On completion of this exercise, the strategy selected was to build just one temporary workcamp in the area of the diversion bays and to use the current Nemiscau workcamp for additional accommodations, if necessary.

Four possible locations were considered for the Rupert workcamp:

- site C-1: located along the access road to the Rupert forebay, approximately 2 km south of the Lemare control structure;
- site C-2: located along the Lemare River, at future dike C-R-15, approximately 2 km west of the access road to the Rupert forebay;
- site C-3: located along the Lemare River, at future dike C-R-14, approximately 4 km west of the access road to the Rupert forebay;
- site C-4: located between the two diversion bays, approximately 5 km northwest of the access road to the transfer tunnel.

Only sites C-3 and C-4 met the proponent's criteria for the Rupert workcamp. Site C-4 was selected because of its geographic location relative to the work sites, its cost and its lower impact on the environment. It is located less than 5 km from a rough passable road. This choice would make it possible to move a 15-km stretch of the future access road to the Rupert diversion bays to a section with less impact on Nemaska category II land.

The Panel considers that the site selected (C-4) is the best choice from a technical and environmental standpoint.

2.1.5 Road profiles

The proponent will have to build approximately 255 km of roads and upgrade about another 105 km.

For development of the road network required for the project, the proponent considered a number of technical, economic, environmental and social criteria to gradually optimize the profiles studied. The criteria used include the location of potential borrow pits, a preference for the shortest route possible, the sensitive environmental components liable to be modified by the presence of a road, the number of watercourses crossed and the areas of special value to the tallymen.

A study of variants was carried out for the permanent access roads. Following consultations with Cree trappers, a number of modifications were made to the profiles in order to keep them as far away as possible from the areas of special value. All the preferred profiles for the main roads and secondary roads already discussed with territory users were presented in the Environmental Impact Statement.

For the roads to be built or upgraded, the following design criteria were selected:

- Type I roads: These are the main roads to access the territory. With a standard nominal 25-m right-of-way, they are designed for a speed of 70 km/h and have a standard nominal width of 9.6 m.
- Type II roads: These are the main roads to access strategic project sites. With a standard nominal 25-m right-of-way, they are designed for a speed of 50 to 70 km/h. They also have a standard nominal width of 9.6 m in order to ensure safe movement of machinery and heavy trucks.
- Access roads to dikes and control structures: These permanent secondary roads will have a six meter-wide road surface.
- "Temporary" roads: Designed to accommodate construction machinery, trucks and pick-ups, they will have a seven meter road bed, with a "rough" natural gravel road surface and are designed for a speed of 40 km/h. These roads will be used only during the construction work, and the environment will subsequently be restored, unless there is a special agreement with the tallymen.

Permanent access road to the diversion bays

This type I road will be 31 km long and will link the Albanel substation to the transfer tunnel's intake canal via the Rupert workcamp site. The first 5 km will follow a maintenance road for two 735-kV transmission lines (Circuits 7069 and 7070). In summer, the Crees use motor vehicles on this road, while the rest of the year, they use all-terrain vehicles (ATVs) or snowmobiles. This 5 km stretch of the maintenance road will be upgraded in order to meet the type I road criteria.

From KM 5 of this line maintenance road, the proponent studied two variants for the location of the permanent access road to the diversion bays:

- A direct link between KP 5 and the Lemare control structure, with an extension to the Rupert workcamp site. This link will require building 12 km of road (approximately 10 km of which will be on Nemaska category II land) to reach the Lemare control structure, as well as building 9.5 km of road to access the Rupert workcamp site;
- Using the Circuit 7069 and 7070 maintenance road, between KP 5 and KP 17, in order to directly access the Rupert workcamp site. This variant includes upgrading the existing road over 12.4 km and building a 4.4-km stretch of road to reach the Rupert workcamp site. With this variant, the road will be extended to the transfer tunnel's intake canal, passing approximately 5 km north of the Lemare control structure.

Variant 2 was preferred by the proponent because it eliminates the need to build 12 km of road, 10 km of which are on category II land, as well as the need to build the Rupert workcamp earlier.

Following an infrastructure optimization analysis, four major sections (4 km, 5 km, 2 km and 7 km) of the access road to the Rupert forebay were moved in order to keep them further away from the lakes or reduce their impact on the environment.

The Panel agrees with the proponent's selection for the location of the permanent access road to the diversion bays linking the Albanel substation to the transfer tunnel intake canal and for the modifications made to the access road to the forebay.

Permanent Muskeg-Eastmain-1 road

This 40-km road, provided for in the Boumhounan Agreement in order to facilitate access to this section of the territory for the tallymen and the community of Eastmain, will require building a bridge with a 22-m span over the Acotago River and the installation of 94 culverts.

The proponent began studies for the construction of this road in 1993. As part of this project, four corridor variants were examined. The criteria used to select the preferred corridor were: total length, construction constraints due to rocky surfaces, peatlands and number of watercourses to be crossed, the advantages of the corridor profile in terms of favourable soil conditions and the

location of borrow pits, and the impacts on wildlife. This examination included validation of field data as well as a characterization of potential sources of fill material.

The Panel agrees with the route profile selected by the proponent for the location of the Muskeg-Eastmain-1 road, which will become an important part of the road network of the James Bay territory.

2.1.6 Transmission line corridors

The project includes the construction of two 315-kV transmission lines, namely the line connecting the Eastmain-1-A powerhouse to the Quebec grid (1 km) and the line connecting the Sarcelle powerhouse to the Quebec grid (101 km). In addition, two 25-kV lines are planned, namely the line linking the Albanel substation to the Lemare control structure (30 km) and the line linking the Albanel substation to the Rupert control structure (30 km).

There were no studies of corridor variants for the location of the 25-kV lines since they will run along existing roads: respectively along the access roads to the diversion bays and along the Route du Nord and the access road to the Rupert control structure.

For the 315-kV lines, corridor variants were studied only for the line connecting the Sarcelle powerhouse to the Quebec grid (101 km). In this case, the Opinaca reservoir was the main obstacle between the two points to be connected.

The proponent used various technical, economic and environmental criteria to determine the preferred corridor, including: occupation and land use, obstacles (Opinaca reservoir, watercourses and peatlands), wildlife habitats, existing access roads, length, technical construction problems and ease of maintaining the line.

Three corridors were studied for the location of the transmission line:

- The east corridor: 115 km long, it bypasses the Opinaca reservoir to the north and east. Located entirely in a section where there is no road infrastructure, this corridor creates a new inroad into the territory.
- The central corridor: 90 km long, it crosses the Opinaca reservoir in the middle, in a section where the reservoir narrows. Crossing the Opinaca reservoir requires the construction of several rockfill islands on which to erect the towers for the reservoir crossing. Three or four of these towers will be installed in deep water (approximately 16 m).
- The west corridor: 101 km long, it bypasses the Opinaca reservoir to the west and south. Over virtually its entire length, this corridor runs along existing roads (taking into account the Muskeg-Eastmain-1 road). It also runs along existing lines over a good part of its length.

The west corridor was selected by the proponent because it offers the most technical, economic and environmental advantages. This corridor would present few technical problems and there is already an access infrastructure that would facilitate construction of the power line.

The Panel agrees with the proponent's choice of the west corridor.

2.2 Project overview

The Rupert River flows from east to west over a distance of 580 km between its source, Lake Mistassini, and its mouth, Rupert Bay. Its watershed covers an area of 43,260 km^2.

The project will divide the Rupert River watershed into two, in the middle, along a north-south axis. This axis, approximately 70 km long, links the southeastern end of the Eastmain-1 reservoir (i.e., Caché Creek) to the northwestern end of Mesgouez Lake, passing through the proposed site of a control structure on the Rupert River (i.e., KP 314 of the river). Map 1 in Appendix 6 shows an overview of the project and Figure 2-2 presents a schematic diagram of the project.

The partial diversion of the Rupert River to the Eastmain-1 reservoir, located in the Eastmain River watershed, will be effected by means of the Rupert forebay (to the south) and the Rupert tailbay (to the north). These two diversion bays require the construction of four control structures, 72 dikes, 10 canals and a tunnel linking the two diversion bays.

The Rupert forebay will cover an area of 228.7 km^2, which will flood part of the Rupert River watershed, including part of the sub-watersheds of the Misticawissich River, Kayechischekaw Creek and Lemare River. At the northern end of this diversion bay, a 2.9-km tunnel under Lac de la Sillimanite will transfer water from the Rupert forebay to the Rupert tailbay. The water level of the Rupert forebay will be controlled by a weir located at the entrance to the transfer tunnel as well as by the Rupert River control structure. These two structures will limit the maximum water level of the Rupert forebay so as to avoid modifying the natural water level of Mesgouez Lake. As stipulated in the

Boumhounan Agreement, the natural water levels and natural water flows of Mesgouez, Woollett and Bellinger lakes will not be affected by the Rupert forebay.

The Rupert tailbay, covering an area of 117.5 km^2, will flood part of the Nemiscau River watershed, which includes the sub-watershed of Arques Creek. It will flow into the watershed of Caché Creek, which is a tributary of the Eastmain-1 reservoir.

The water from the Rupert River will then follow the path of the water from the Eastmain-1 reservoir to the mouth of the La Grande Rivière, in Chisasibi, passing through the Eastmain River, the Opinaca reservoir, Boyd Lake, Sakami Lake, the Sakami River, the Robert-Bourassa reservoir and the La Grande Rivière.

The Rupert diversion project was designed so that future water levels of the Eastmain-1 reservoir, the Opinaca reservoir, Boyd Lake, Sakami Lake and the Robert-Bourassa reservoir will not exceed the existing authorized maximum level for each of these water bodies. However, the diversion of water from the Rupert River will increase the maximum flow authorized by the Sakami Lake Agreement, as was agreed upon in the Boumhounan Agreement. The increased water flows in the Boyd Lake and Sakami Lake section will require construction of a canal and a concrete weir at the Sakami Lake outlet. The Sakami weir will limit the maximum level of Sakami Lake at the location of its outlet to 186.7 m, i.e., below the maximum level of 187.04 m stipulated in the JBNQA.

The project entails the construction of the Eastmain-1-A powerhouse (768 MW), at the outlet of the Eastmain-1 reservoir, and the construction of the Sarcelle powerhouse (125 MW), at the outlet of the Opinaca reservoir. In addition, at the outlet of the Robert-Bourassa reservoir, the water will be channelled either through the Robert-Bourassa generating station or the La Grande-2-A generating station, and then through the La Grande-1 generating station.

With the construction of a flow control structure at KP 314 of the Rupert River, the river's natural hydrograph will be modified. Between the Mesgouez Lake outlet (at KP 332.5) and the control structure (at KP 314), the riverbed will be flooded in the Rupert forebay. Between the control structure (at KP 314) and its mouth (at KP 0), the Rupert River will receive an ecological instream flow regime which will be managed at the Rupert control structure.

All the water from a tributary whose mouth is located east of the 70-km-long north-south axis dividing the Rupert River watershed will be channelled for the needs of the hydroelectric project, as is the case for the Natastan and Misticawissich rivers. However, the natural flows of all the tributaries of the Rupert whose mouths are located west of this north-south axis will either be preserved, as is the case for the Rivière à la Marte and the Jolliet River, or restored, using a flow control structure, if they are affected by a diversion bay, as is the case for the Lemare River, the Nemiscau River, Arques Creek and Kayechischekaw Creek.

At the closure point of the Rupert River, at KP 314, the channelled flow is 637.3 m^3/s, since it includes the flow from the Misticawissich River, whose mouth is 10 km upstream of the dam.

The restored flow of the Nemiscau River will help maintain the water levels of Teilhard, Biggar and Caumont lakes, and preserve the water level of Champion Lake, where the community of Nemaska is located. The restored flow of the Nemiscau River, the ecological instream flow of the Rupert River and the construction of a weir at the Nemiscau Lake outlet will help preserve the natural water levels of Nemiscau Lake at the Old Nemaska site.

After diversion, the mean annual ecological instream flow of the Rupert River, downstream of the Rupert control structure, will be 184.7 m^3/s, which corresponds to approximately 29% of the mean annual flow under natural conditions.

In order to maintain usage of the Rupert River downstream of the control structure, the proponent has planned to build eight structures designed to preserve the natural character of the river in the sections that they influence, as well as navigation, fishing, spawning grounds and fish feeding habitats, plus aquatic grass beds.

In the increased flow section, the water diverted from the Rupert River will reach James Bay via the La Grande Rivière. Between the La Grande-1 generating station and Chisasibi (26 km), the banks of this river are currently showing signs of erosion. Although the changes will most likely be minor, the effect of the Rupert diversion on the stability of these banks cannot be accurately predicted. The proponent has therefore planned stabilization work which involves installing nine granular blankets at the foot of the slopes at risk. These granular blankets will be located on the south bank of the river. Approximately nine kilometres of banks will thus be protected against erosion. The proponent is also considering the possibility of constructing small spur dikes perpendicular to the granular blankets in order to improve bankside fishing conditions.

Figure 2-2 **Schematic diagram of the Eastmain-1-A and Rupert diversion project**

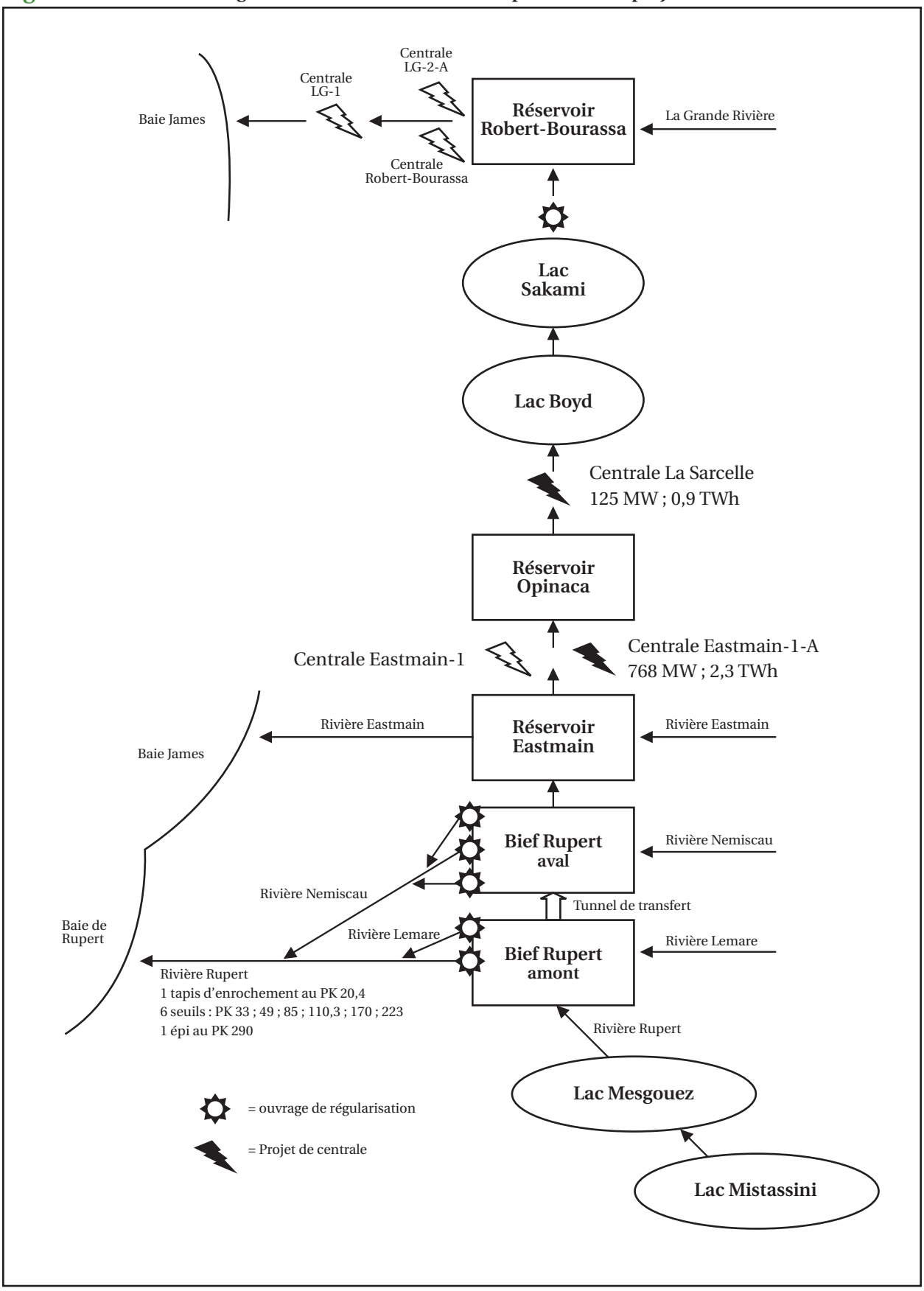


Table 2-4 **Mean annual flow (m^3/s) of the Rupert diversion channelled by the two diversion bays**

	Mean annual flow (m^3/s)		
	channelled	**restored**	**diverted**
Rupert forebay			
Rupert River	621.4	184.7	436.7
Misticawissich River	15.9	0.0	15.9
Kayechischekaw Creek	0.4	0.4	0
Lemare River	16.2	16.2	0
Rupert tailbay			
Arques Creek	2.3	2.3	0
Nemiscau River South (Nemiscau-2)	2.0	2.0	0
Nemiscau River North (Nemiscau-1)	11.6	11.6	0
Total	669.8	217.2	452.6

Source: Proponent's documents

The project includes the construction of a new drinking water treatment plant to serve the community of Waskaganish, as well work to stabilize riverside slopes on the south shore of the Rupert River, at Waskaganish and at the plant's water intake.

2.2.1 Design of the main structures

Rupert forebay

The partial diversion of the Rupert River, at KP 314, will be achieved by means of a rockfill dam, 474 m long and 29 m high with a crest width of 9 m. This dam will be the starting point for water retention in the Rupert forebay that will flood part of the watersheds of the Rupert River, Kayechischekaw Creek and the Lemare River. To create this diversion bay, the proponent also plans to install a dam on the Lemare River as well as 31 dikes, ranging in length from 22 to 1,994 m and in height from 1 to 20 m, with crests ranging from 6 to 7.5 m. The dam and dikes will be constructed of earth, with riprap or rockfill on the upstream side. Map 2 in Appendix 6 shows the main forebay structures.

The Rupert forebay, with an area of 228.7 km^2, will flood a land area of 128.1 km^2. From Mesgouez Lake, this 50-km-long diversion bay will have an average depth of about 10 m and a maximum depth of 17 m at the Rupert dam. The average summer drawdown is estimated at 70 cm, with a maximum of 2 m, while the maximum winter drawdown is estimated at 2 m. The maximum flow of the diversion bay will be 800 m^3/s, with an annual mean of 453 m^3/s. During the period of maximum flow, the diversion bay will have a difference in elevation of 40 cm, and the estimated mean flow velocity is 0.4 to 0.6 m/s, with extreme values of 1 to 1.5 m/s between canals S73 1 and S73-3 and downstream of canal S73-4.

The Rupert dam (dam C-1) will be equipped with a concrete control structure, one of whose main functions is to release ecological instream flows corresponding to approximately 29% of the river's mean annual flow. This control structure consists of two surface gates, 12.2 m wide, and a gated bottom opening, 5 m wide by 7.1 m high. Power for this release structure is supplied by a connection to the 25-kV line from the Albanel substation. Inflow from the Rupert River, upstream of the dam, will be determined using data obtained from a gauging station on Mesgouez Lake and forecasting models that predict flood timing and size. A high-precision flow measuring system will be installed in the central opening of the control structure and the river flow downstream of the dam will be measured by a gauging station. The control structure is designed to discharge a flow of 3,470 m^3/s, i.e., the probable maximum flood. It serves to manage the ecological instream flows of the Rupert River and will discharge from the Rupert forebay any flow exceeding the maximum flow capacity of the transfer tunnel (800 m^3/s).

Water from Kayechischekaw Creek will be retained by dike C-R-7-8 equipped with a structure for releasing

instream flows. This structure will allow a mean annual flow of 0.4 m^3/s. This pipe, which remains open at all times, will be installed in a trench dug under the dike's right abutment and embedded in concrete.

Water from the Lemare River will be retained by dam C-R-21A, a sand and gravel dam 579 m long and 19 m high with a crest 7.5 m wide. It will have a structure to release the instream flow based on the river's natural hydrographs, i.e., a mean annual flow of 16.2 m^3/s, with a maximum of 88 m^3/s in the spring. This concrete release structure, which has three bottom openings, will be built on the right abutment of dike C-R-22, approximately 250 m north of the Lemare dam. The circular central opening, 0.9 m in diameter, is equipped with a slide gate on the downstream side. It will be open at all times and release the winter instream flow of 5 m^3/s, which corresponds to the lowest flow. The two square side openings are equipped with a heated slide gate located on the downstream side of the structure. Power for this release structure will be supplied by a connection to the 25 kV line from the Albanel substation.

Four canals will be built in order to facilitate the free flow of water within the diversion bay. Canal S73-1, 780 m long by 170 m wide, will transport water from the Rupert River watershed to the head of the Kayechischekaw Creek watershed. Canal S73 3, 1.6 km long by 100 m wide, will carry water from the Kayechischekaw Creek watershed to the Lemare River watershed. Finally, canal S73 4, 280 m long by 125 m wide, and canal S73-4A, 180 m long by 120 m wide, will transfer water between certain unnamed lakes in the Lemare River watershed.

Transfer structure

Located between the Rupert forebay and the Rupert tailbay, the structure for transferring water between the diversion bays will include a 2.9-km tunnel dug under Lac de la Sillimanite in order to connect the Lemare River watershed to the Arques Creek watershed, a subwatershed of the Nemiscau River.

The transfer structure will include, upstream of the tunnel, a 600-m intake canal, a 90-m concrete weir with a crest elevation of 303.4 m, and a head pond. The water will travel through a 220-m outlet canal on the downstream side of the tunnel. The weir and the transfer tunnel were designed to discharge a maximum flow of 800 m^3/s.

The access gallery transfer tunnel will be 12.7 m wide by 18.6 m high at the centre of the ceiling arch. Flows will range from 100 to 800 m^3/s, and the mean flow will be 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 specific operational problems resulting in a significant reduction in the transfer tunnel's capacity to discharge water downstream (reduction in its conveyance), the proponent has planned a temporary bypass, to allow tunnel repairs to be carried out. In order to maintain the flow of water between the two diversion bays, part of the inflows from the Rupert River, with a flow of approximately 230 m^3/s, will then be channelled into the Rupert tailbay via Cabot Lake. An opening will be made for this purpose in dike C-P-17A west, located to the north of Cabot Lake, so that water from the Rupert forebay can flow into a valley of the Rupert tailbay, over a distance of approximately 6 km, before rejoining the entrance to canal 15.

To allow this temporary bypass, a special structure will be constructed at the site of dike C-P-17A west located to the north of Cabot Lake. The basement rock under the dike will be reshaped by adding a canal, 100 m wide by approximately 300 m long, dug into the ridge separating the two watersheds, and a horizontal platform connecting Cabot Lake in the Rupert forebay, to an unnamed lake in the Rupert tailbay. This platform will be at elevation 304.15 m and the canal, at the ridge of the watersheds, will be approximately 4 m deep. The invert of the canal will serve as a control weir to prevent a drop in the water levels of Cabot Lake and the Rupert forebay below the desired level.

Should it prove necessary for the proponent to use this bypass to transfer water between the two diversion bays, the earth dike closing the canal will be mechanically removed to allow the water flow and will be rebuilt once the work in the transfer tunnel has been completed.

Rupert tailbay

The Rupert tailbay begins at the exit of the transfer tunnel outlet canal, approximately 1 km south of Arques Lake, and ends at the entrance to the Eastmain-1 reservoir. This diversion bay will flood part of the Nemiscau River watershed, including part of the Arques Creek subwatershed. To create this diversion bay, Hydro-Québec Production plans to build two dams: one on the south arm of the Nemiscau River (Nemiscau-2, dam C-108) and the other on the north arm of the Nemiscau River (Nemiscau-1, dam C-76), as well as 41 dikes, ranging in length from 55 to 2,225 m, and in height from 0.5 to 10.5 m, with crest widths ranging from 6 to 7.5 m. The dams and dikes, including the Arques dike (dike C-104),

will be constructed of earth with riprap or rockfill on the upstream side.

It should be noted that dikes PV-1, PV-2 and PV-3, at the northern end of the Rupert tailbay, are filtering "pervious embankment" type dikes that will allow part of the water from the forebay to percolate in order to reduce water flows to canal C and prevent erosion of certain low points in this flow section. This will also have the effect of concentrating the water toward Caché Creek. Downstream of dikes PV-2 and PV-3, two drainage ditches, F-03, 1,850 m long, and F-04, 360 m long, will be dug to facilitate the channelling of flow to the Eastmain-1 reservoir, via secondary valleys of Caché Creek.

The Rupert tailbay, with an area of 117.5 km^2, will flood 60 km^2 of land area. This diversion bay, with a length of 44 km between Arques Lake, at the exit of the transfer tunnel, and the downstream portion of the diversion bay, at the entrance to the Eastmain-1 reservoir, has a vertical drop of approximately 13.6 m. Since the water surface profile of the diversion bay has a very steep gradient, the diversion bay is divided into four bodies of water: transfer tunnel exit to canal 4 entrance, approximately 9 km; canal 4 to dike C-70, approximately 11 km; dike C-70 to canal C, approximately 14 km; and canal C to the Eastmain-1 reservoir, approximately 10 km. The difference in elevation, under open-water conditions, would be approximately 3 m between the transfer tunnel exit and canal C, and 10.6 m between canal C and the entrance to the Eastmain-1 reservoir.

The diversion bay will have a mean depth of 8.5 m and a maximum depth of 19 m at Arques Lake. The mean summer drawdown is estimated at 80 cm, with a maximum of 3.3 m at Arques Lake and a maximum of 1.5 to 2 m in the canal C section, while the maximum winter drawdown is estimated at approximately 4.3 m at Arques Lake and approximately 2.7 m in the canal C section. In the diversion bay, the mean flow velocity will be approximately 0.65 m/s, except in the six canals, where it will be 1.5 m/s. A difference in flow velocity is also projected in the narrows at KP 45 and KP 48 of the diversion bay, in the Caché Creek stretch (from 5 to 7 m/s) as well as in the drawdown area of the Eastmain-1 reservoir, where it will be 2.5 m/s.

The Nemiscau-1 sand and gravel dam (dam C-76) will be 810 m long and 12.9 m high with a crest width of 7.5 m. It will have a structure for releasing instream flow based on the mean annual flow. This flow release structure will be composed of a concrete canal built into the bedrock on the north shore of the river, on the right abutment of the dam. The release structure includes two square bottom openings, with a slide gate, allowing passage of a mean annual flow of 11.6 m^3/s, with a minimum ecological instream flow of 4.9 m^3/s and a maximum ecological instream flow of 74 m^3/s. The maximum flow velocity in the openings would be approximately 4 m/s. The gates will be operated using an electric-motor-driven screw-hoisting mechanism.

The Nemiscau-2 sand and gravel dam (dam C-108) will be 230 m long by 9.4 m high with a crest width of 7.5 m. It will have a structure to release the natural flows of the river based on the mean annual flow. This flow release structure will be composed of a concrete canal built into the bedrock of the north shore of the river, at the north end of the dam. The release structure includes two circular bottom openings, 0.65 and 1.15 m in diameter, with a slide gate. The small pipe will be open at all times to release the minimum flow of 0.8 m^3/s, while the other pipe will be used as needed, particularly in the spring. The mean annual flow will be 2 m^3/s, with a minimum ecological instream flow of 0.8 m^3/s and a maximal ecological instream flow of 6 m^3/s. The maximum flow velocity in the openings would be approximately 5.4 m/s. The gates will be operated manually, if necessary, using a screw-hoisting mechanism.

The Arques Creek sand and gravel dike (dike C-104) will be approximately 490 m long with a crest width of 7 m. It will have a structure to release the natural flows of the creek, based on the mean annual flow, located in the dike's footprint. This flow release structure will be comprised of two steel pipes, 0.75 m in diameter, laid in a trench cut into the bedrock and then filled with concrete. One of the two pipes will be sized to permit a minimum flow of 1 m^3/s. This pipe will be open at all times. The second pipe will be equipped with a slide gate, to allow passage of the maximum flow during the flood season. The mean annual flow will be 2.3 m^3/s, with a minimum ecological instream flow of 1 m^3/s and a maximal ecological instream flow of 6 m^3/s. The maximum flow velocity in the openings would be approximately 4.4 m/s.

Six canals will be built in order to facilitate the free movement of water within the diversion bay.

Compared to the current flow, this mean annual transfer of 453 m^3/s of water to the Eastmain-1 reservoir will represent an increase of:

- 80% of the flow downstream of the Eastmain-1 development;
- 54% of the flow at the Sarcelle site;

- 47% of the flow at the Sakami Lake outlet;
- 14% of the flow downstream of the Robert-Bourassa development.

Rupert River downstream of the control structure

The mean annual ecological instream flow of the Rupert River downstream of the Rupert control structure will be 184.7 m^3/s, after diversion, which corresponds to approximately 29% of the mean annual flow of the river under natural conditions. With the inflows from the Rupert River tributaries located downstream of the control structure, the mean annual ecological instream flow at the mouth of the river, at Waskaganish, would represent approximately 48% of the mean annual flow under natural conditions.

Between the control structure and the mouth of the river in Rupert Bay, i.e., over a distance of 314 km, the Rupert River has a step-pool profile with a difference in elevation of 288 m, 202.5 m of which lies between KP 110 and Waskaganish. In order to preserve the river's natural character and maintain uses, the proponent has planned to build eight structures. On the Rupert River, the sites selected are located in sections where declivities are observed, namely: KP 290, 2 km downstream of the mouth of the Lemare River; KP 223, 7 km downstream of the mouth of Rivière à la Marte; and KP 170, at the Nemiscau Lake outlet, and several kilometres downstream of the mouth of the Nemiscau River. The following locations were also 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 the Plum Pudding Rapids (Kaowpischewaan); and KP 20.4, several kilometres downstream of the Smokey Hill Rapids (Notimeshanan).

Six of these structures are weirs designed to maintain, after diversion, the river's historical mean natural levels in August and September over approximately 50% of the length of the river downstream of the closure point. In the river stretches located just upstream of the structures, the flow velocity will be approximately 0.1 m/s, i.e., a typical value for lacustrine environments, a drop of 58% to 75% in the velocity observed under natural conditions. However, the water levels will be similar to those observed annually during the summer low-flow period. The other two hydraulic structures include a rock blanket, at KP 20.4 of the river, designed to preserve fish migration, and a rockfill spur dike, at KP 290, whose primary function is to maintain the level of the Lemare River at its mouth, at KP 292 of the Rupert River.

At KP 290, there is a 2-m difference in elevation immediately downstream of two islands that divide the river into three branches. A short distance upstream of these islands, there is a third island close to the north shore of the river, which creates a secondary channel in the north branch of the river. The hydraulic structure, built on the high side of the difference in elevation, will include two riprap rockfill weirs, 59 and 69 m long by 3 m high. These structures will be built in the north branch and the centre branch of the river in order to maintain the natural upstream water level observed in August and September, over a distance of approximately 5 km on the Rupert River and 2 km on the Lemare River. The south branch and the secondary channel in the north branch of the river will be left under natural conditions. The work also includes excavation in the secondary channel of the north branch in order to establish a slope conducive to the free movement of fish.

The weir at KP 223 will be built 7 km downstream from the point where Rivière à la Marte joins the Rupert, at the head of the rapids. These rapids have a difference in elevation of 15 m at KP 218 and have an impact on the river as far as 47 km upstream. At this location, the river is approximately 200 m wide and there is a small island located in the southern part. A concrete weir, 130 m long by 4 m high, will connect the north shore of the river to the small island, while the south branch of the river will be left under natural conditions. This weir will be extended out to the north shore for approximately 130 m by a concrete gravity dam. A channel with a gentle slope, approximately 160 m long by approximately 14 m wide, will be excavated on the north shore to act as a fish pass. According to documents submitted by the proponent on July 31, 2006 (D15.4 and D15.5), the structure at KP 223 has been re-assessed; it is planned to obstruct the flow section of the south branch of the river slightly, using several large rocks or concrete blocks to raise the water level upstream of the weir by 10 cm in order to recreate average summer conditions, thereby reducing bank exposure. This rise in water level will restore the river's natural appearance in summer between KP 223 and KP 253, i.e., over a distance of 30 km.

The main outlet of Nemiscau Lake, located at KP 170, is a natural lake level control point. This outlet is composed of large rapids, with a 7-m drop, flowing around either side of an island. Nemiscau Lake has a second outlet, at KP 180, which flows into the Rupert River at KP 153. There is no flow through that outlet during winter and only 7% of the flow of the main outlet during an average flood. It should be noted that Old Nemaska lies

on the west shore of Nemiscau Lake, near KP 188. The weir built at KP 170 will be used to maintain the natural water levels of Nemiscau Lake as required by the Boumhounan Agreement. The planned structure, located above the rapids, will include a 40-m-long concrete weir between the right bank of the river and the island, and a 200-m-long concrete weir between the island and the left bank of the river. Concrete curbs will extend out from the weirs.

The Oatmeal Rapids (Kamaakwewts), between KP 110 and KP 108 of the Rupert River, have a difference in elevation of 34 m, including a 21-m waterfall at KP 108.9. The natural weir at the head of these rapids controls the river level over nearly 15 km upstream. The purpose of the planned weir is to maintain the water level upstream, as far as the confluence of the Rupert and Jolliet rivers (at KP 129) while preserving the visual appearance of the Oatmeal Rapids insofar as possible. The weir, 183 m long by 6 m high, will be extended on the right bank and the left bank by dikes approximately 140 and 240 m long, respectively. This will be a sheet-pile structure, composed of concrete-filled cells, with riprap rockfill downstream. In addition, a third dike, approximately 730 m long, will be installed on the bank in front of a bay in the left bank of the Rupert River.

The KP 85 site is located immediately upstream of the Fours Rapids (Kanewshtekaw), composed of a succession of four rapids, with a total difference in elevation of 73 m, extending as far as KP 77. Two concrete weirs will be built in order to maintain water levels over a stretch of river nearly 11 km upstream, i.e., as far as the foot of the rapids located at KP 95.6. The right weir, 60 m long by 2 m high, and the left weir, 100 m long by 3 m high, will run from the shores on either side of the Rupert River to an island located at the head of the rapids.

At KP 49, the Rupert River forks into two branches at the head of the Bear Rapids, with a difference in elevation of approximately 10 m. In order to maintain the water levels of the river over a distance of 15 km upstream, i.e., as far as the foot of the Cat Rapids, the planned hydraulic structure will be built in the right branch of the river, while the left branch, approximately 45 m wide, will be left in natural condition. The planned work will include a concrete weir, 175 m long by 6 m high, in the right branch of the river, as well as a temporary bypass canal, approximately 620 m long by 70 m wide by 1.5 m deep, dug into the island. Once the work is completed, the downstream part of the temporary bypass canal will be closed off by an earth dike with riprap or and rockfill. The proponent plans to build a temporary bridge on the left branch of the river, at the end of the access road to the weir, in order to provide access to the island during the work.

At KP 33, at the head of the Plum Pudding Rapids (Kaowpischewaan), the Rupert River, which is approximately 400 m wide at this point, has a difference in elevation of 15 m. It is divided into three branches by islands. The proponent plans to build a concrete weir, 177 m long by 3 m high, between the right bank of the river and one of the islands. It also plans to construct two earth dikes with riprap and rockfill, approximately 200 and 160 m long by approximately 9 m high. These dikes will connect the island to the left bank of the river, passing through a second island. The purpose will be to maintain the water levels normally observed in August and September under natural conditions in the Rupert River over a 15-km stretch upstream including Kapeshi Eputupeyach Bay. The installed weir will not affect the natural migration of fish, since this migration takes place through a secondary branch, located on the right side of the Rupert River, that links KP 33 (downstream of the weir) to KP 37.

At KP 20.4, the proponent plans to install a rock blanket on the right side of the river, which is approximately 320 m wide at this point. The purpose of this structure is to control water levels on a stretch of the river between Gravel Pit (KP 20.4) and the foot of the Smokey Hill Rapids (Notimeshanan) (KP 23.7); to preserve traditional dip net fishing at Smokey Hill; allow boats and fish to pass KP 20.4 freely; protect the local river scenery and reduce the risk of cisco spawning grounds freezing. This rock blanket will measure approximately 200 m long by 200 m wide by 4 m thick (maximum height, in the upstream part). In order to facilitate navigation, it will include a trapezoidal navigation channel that will be 45 m wide in the upstream part and 150 m wide in the downstream part. During the summer, the level of the Rupert River above the rock blanket will be 0.9 m, with a maximum of 1.4 m in the middle of the navigation channel. To construct this structure, the proponent plans to erect in the river, on the same site as the rock blanket is to be built, a large temporary L-shaped jetty whose sections will be approximately 150 and 190 m long. This jetty will be connected to the left bank of the river by a temporary bridge of approximately 160 m.

Eastmain-1-A powerhouse

In order to supply the Eastmain-1-A powerhouse, which will be built at the north end of the reservoir,

approximately 500 m east of the existing Eastmain-1 powerhouse, part of the water from the Rupert River will be diverted to the Eastmain-1 reservoir. The Eastmain-1-A powerhouse development will include the following structures: an above-ground powerhouse, a headrace, an intake, penstocks and a tailrace. During construction of this powerhouse and its components, the excavation work will generate 2,900,000 m^3 of excavated material, including 2,000,000 m^3 of rock.

The Eastmain-1-A powerhouse will include three vertical Francis units, each with a capacity of 256 MW, for a total rated capacity of 768 MW. Each unit has a rated flow of 448 m^3/s, giving the powerhouse a design flow of 1,344 m^3/s. The net head will be 63 m. This powerhouse will be remotely controlled from the Regional Control Centre and data transmitted to the System Control Centre data acquisition and processing system. This powerhouse project will include the construction of a 315-kV switchyard in order to connect the powerhouse to the Hydro-Québec grid.

The Eastmain-1-A and Eastmain-1 powerhouses will be operated as a single facility. Their combined mean annual output will be 5.1 TWh on average, and the combined capacity factor of the two powerhouses will be 0.47. Adding the Eastmain-1-A powerhouse will increase output by an estimated 2.3 TWh.

The headrace will provide a good supply of water to the powerhouse intake. It is 300 m long, and funnels from a width of 400 m at the entrance down to 78.9 m just above the intake. The headrace invert will have a difference in elevation of 14 m. Headrace velocity will be limited to 0.7 m/s in order to ensure that a stable ice cover forms.

The powerhouse intake will include three openings connected by a deck that can support a travelling crane. Its wheel-mounted vertical lift gates will be operated by an electric wire rope hoist. On the upstream side of the gates, there are slots for a trashrack or stoplogs. Three penstocks, approximately 150 m long, will be cut through bedrock in order to connect the intake to the powerhouse.

The tailrace, which has a total length of approximately 1,050 m and a width of approximately 30 m, will connect the powerhouse to the Eastmain River. Most of the tailrace will be cut through bedrock. At its confluence with the Eastmain River, it will be widened to 160 m in order to reduce flow velocity to about same level as the river.

Sarcelle powerhouse

The Sarcelle powerhouse will be built at the north end of the Opinaca reservoir, approximately 100 m east of the Sarcelle control structure. This will be a run-of-the-river plant with a net head of 10.8 m. The Boumhounan Agreement stipulates that total discharges at the outlet of the Opinaca reservoir must not exceed 2,770 m^3/s. The Sarcelle powerhouse will have a mean turbine flow of 1,050 m^3/s, while the current Sarcelle control structure, which will continue to operate, will have a mean spill flow of 235 m^3/s, compared to 1,980 m^3/s at present.

The Sarcelle powerhouse will include three 41.7-MW bulb turbine units, for a total rated capacity of 125 MW. The design flow of the powerhouse will be 1,305 m^3/s. Average annual output will be about 0.9 TWh and its capacity factor will be 0.82. During operation, the powerhouse will be controlled in the same way as the Eastmain-1-A powerhouse. This powerhouse project will include construction of a 315-kV switchyard in order to connect the powerhouse to the Hydro-Québec grid.

Sakami structure

At the outlet of the powerhouse and Sarcelle control structure, the water will follow its current path through Boyd Lake and the Boyd River, then Sakami Lake and the Sakami River, and then into the Robert-Bourassa reservoir. The diversion of water from the Rupert River to Boyd and Sakami lakes will increase the volume of these water bodies. In order to adhere to the water levels currently authorized for Sakami Lake, the proponent has planned to build a canal with a concrete weir at the Sakami Lake outlet.

At the Sakami Lake outlet, an island divides the Sakami River into two branches. To increase the flow downstream of Sakami Lake, the proponent plans to dig a canal, approximately 200 m long by approximately 125 m wide, in this island in order to create a third branch. A concrete weir, with a crest at 185.2 m, will be built across this canal in order to maintain the normal maximum level of Sakami Lake at 186.7 m, which is below the maximum level of 187.04 m stipulated in the JBNQA. During construction of the canal, the excavation work will generate 218,000 m^3 of excavated material.

Transmission lines

The proponent plans to install the following transmission lines: a 315-kV line connecting the Eastmain-1-A powerhouse to the Quebec grid; a 315-kV line connecting the Sarcelle powerhouse to the Quebec grid; a 25-kV line linking the Albanel substation to the Rupert

workcamp, transfer tunnel and Lemare control structure; and a 25-kV line linking the Albanel substation to the Rupert control structure. Although the Sakami Lake, Sarcelle, Jolliet Lake and Kauschiskach Creek temporary workcamps must be served by a 25-kV line, it is possible that some of them may be equipped with generators.

Creating the Rupert tailbay will require the proponent to move or raise the base of several towers of three existing 735-kV transmission lines. A total of 8.3 km of lines and nine towers will be affected by this work: circuit 7059, at KP 39 of the Rupert tailbay; and twin circuits 7069 and 7070, at two locations, KP 51 and KP 54 of the Rupert tailbay.

Connection of the Eastmain-1-A powerhouse to the grid

The Eastmain-1-A powerhouse will connect to the Quebec grid via a 315-kV line approximately 1 km long, i.e., the distance separating the switchyard from the Eastmain-1-A powerhouse and the substation of the existing Eastmain-1 powerhouse.

The Eastmain-1 powerhouse is connected to the grid via a 59 km 315-kV line that links the Eastmain-1 powerhouse substation to the Nemiscau substation. This line was built in 2006 as part of the Eastmain-1 project.

Connection of the Sarcelle powerhouse to the grid

The Sarcelle powerhouse substation will connect to the existing Eastmain-1 powerhouse via a 101 km 315-kV line. The Opinaca reservoir is the major obstacle between the two points to be connected. The corridor selected by the proponent presents few technical problems and there is already an access infrastructure that will facilitate construction of the power line.

From the Sarcelle substation, the line will run west of the Opinaca reservoir, along the access road to the Sarcelle control structure for close to 38 km. After that, it will join up with two other electric power lines (a 25-kV and a 735-kV line) for about 16 km, as far as the access road to dam 0A-11 (close to the Muskeg substation). From there, it will run first along the right-of-way of a 735-kV line and a 69-kV line for 14 km, and then for 33 km along the corridor of the Muskeg-Eastmain-1 road.

Construction of this line will be facilitated by the existing and planned accesses over nearly the entire length of the line. Although this line requires building approximately 110 km of temporary roads, they will be divided into several sections in order to bypass or cross land obstacles. Existing roads will be used whenever possible to cross or bypass 140 streams (most of which are intermittent), six bodies of water (including Boyd Lake and the Opinaca River, Little Opinaca River, Eastmain River and Acotago River). In the right-of-way of the line, culverts or temporary bridges will be used for the stream crossings.

At the request of the tallymen of traplines RE-1 (Eastmain) and VC-34 (Eastmain), the route for this line was moved at two locations in order to avoid a moose-hunting ground.

25-kV line linking the Albanel substation to the Rupert workcamp, transfer tunnel and Lemare control structure

This 25-kV line, approximately 30 km long, will start at the Albanel substation and follow the Circuit 7069 and 7070 maintenance road to the Rupert workcamp (KM 21.8). It will then continue on to the transfer tunnel (KM 30.3), running along the access roads to the Rupert forebay and transfer tunnel. This line will be used to supply power to the Rupert workcamp and the tunnel jobsite during construction.

During the operation phase, the line will be extended for approximately 3 km to provide a power supply for the ecological instream flow release structure of the Lemare River.

25-kV line linking the Albanel substation to the Rupert control structure

During the construction phase, this line, approximately 30 km long, will be used to provide power to the worksite of the Rupert River control structure spillway. Once the work is completed, it will provide power for the hoisting mechanism and heating systems for the Rupert control structure spillway.

2.2.2 Related structures and work

The project will entail various related structures and work, including:

- relocation of certain segments of three 735-kV transmission lines;
- relocation of a stretch of the maintenance road for two twin 735-kV power lines (Circuits 7069-7070);
- stabilization of the banks along the La Grande Rivière using granular blankets;
- stabilization of the banks at Waskaganish;
- work related to the Waskaganish drinking water treatment plant and intake pipe;
- quarries and sand pits;
- excavation work and disposal of the excavated material;

- clearing of roads, workcamps, structure sites and other sites;
- clearing in the diversion bays;
- worksite facilities in all the major work sectors;
- waste and hazardous waste management;
- restoration of the areas disturbed by the work;
- building of a dike in Jolly Bay;
- construction or upgrading of access routes to Cree traplines.

Relocation of segments of three 735-kV transmission lines

The route of two transmission line corridors from the La Grande-3 section will be partially flooded during creation of the Rupert tailbay. These two corridors are:

- the 735-kV line (Circuit 7059) linking the Chisasibi substation to the Albanel substation;
- the two twin 735-kV lines (Circuits 7069 and 7070) linking the Lemoyne substation to the Albanel substation.

Several towers, along three existing 735-kV transmission lines, will have to be relocated or raised. Circuit 7059 will cross the future diversion bay at KP 39 and a section approximately 2.5 km long will have to be relocated to the southeast, which will require dismantling five towers and installing another four. Workers will use a winter road, approximately 4 km long, built from where the line intersects the access road to the Rupert tailbay and which will then run inside the line corridor. An ice bridge is planned for the Nemiscau River crossing.

The corridor for Circuits 7069 and 7070 will cross the tailbay at two locations: KP 51 and KP 54. At KP 51, the route of the two lines will not be modified; the work will include installing riprap armouring around one of the towers of Circuit 7069 and relocating two towers of Circuit 7070 onto land, with no change to the alignment. At KP 54, the corridor of Circuits 7069 and 7070 will cross a bay formed by the diversion bay. At this location, the axis of line 7069 will remain as is; only two towers will be moved slightly, one onto land and the other onto an island, with riprap armouring, while a third tower will be protected with riprap. The axis of line 7070 will be only slightly modified; two towers will be removed and replaced by three others, while three neighbouring towers will be protected with riprap. The two jobsites will be accessed via the existing maintenance road for these lines, which will be maintained until flooding of the Rupert tailbay.

Relocation of a stretch of road for two twin 735 kV transmission lines

At two locations (KP 51 and KP 54 of the diversion bay), the flooding of the Rupert tailbay will cut off two sections of approximately 1 km each of the maintenance road for two twin 735 kV transmission lines (Circuits 7069 and 7070). In the KP 54 section, construction of the access road to the Rupert tailbay, which runs very close to the corridor of the two lines, will re-establish the first link with the maintenance road. However, to re-establish the second link, the proponent will build a 4.6-km spur road to the Circuit 7069 and 7070 road, beginning at the access road to the Rupert tailbay, several kilometres north of the Nemiscau-2 dam. This spur road, which will cross the Rupert tailbay at KP 47.5, will include a permanent single-lane bridge with a span of 140 m resting on four pillars in the water.

For the two sections of maintenance road that will be flooded by the Rupert tailbay, the proponent plans to carry out restoration work only at KP 51, i.e., at the existing Nemiscau River crossing point. At this location, a 135 m section of the road was built on fill, which obstructs more than 95% of the river. In the course of excavating the fill, a spawning ground will be created on the left bank of the diversion bay and the excess material will be used to create an island near the shore of the future diversion bay.

Stabilization of the banks along the La Grande Rivière

A 26.8-km section of the La Grande Rivière between KP 9.7 and La Grande-1 dam (KP 37) is subject to bank erosion. Hydro-Québec monitoring records dating back to 1973 indicates continuing erosion at this site since 1991. The records also show that 69% of the left bank and 15% of the right bank are currently affected. According to the proponent, it is difficult to accurately predict the effect that the 14% increase in flow and the 0.1 m/s increase in flow velocity of the La Grande Rivière will have on the stability of these riverbank slopes. However, the proponent anticipates that these changes will be minor. Given the erosion observed in this section of the river, the proponent will carry out bank stabilization work. In addition, this work will slightly reduce the sediment load in the river, thereby improving water conditions at the Chisasibi drinking water intake, located at KP 16.

In the Environmental Impact Statement, the proponent outlined plans to carry out work at ten locations, nine located on the left bank of the river and the tenth on the right bank, quite close to the La Grande-1 dam. However, in Volume 4 of the Supplement to the

Environmental Impact Statement (RP-13, pp.160 to 171), the proponent indicates that it has decided to carry out stabilization work at the site on the right bank regardless of whether this project proceeds.

Approximately 9 km of banks in total will receive protection. The proposed stabilization method involves reconstructing the banks so that their composition and configuration are similar to those of the estuarine stretch of the La Grande Rivière which are naturally stable despite heavy action by waves and currents. The proponent plans to remove the fine materials from the banks located at the foot of slopes at risk and replace them with granular blankets composed of a mixture of sandy gravel, pebbles and small boulders.

Since the riverbank slopes located to the east of Chisasibi, between KP 16 and KP 22, are more than 10 m high, the stabilization work in this area will be carried out in the winter, when the slopes are frozen, in order to avoid the risk of landslides. A total of 5.4 km of banks will be stabilized. However, in the community of Chisasibi section, between the pumping station (at KP 16) and the airport (at KP 10), the work will be carried out in the summer, over 3.6 km, since the height of the slopes is less than 10 m.

The proponent will use six access roads to reach the various worksites. The three existing roads will require only minor repairs. Three temporary access roads will be built: one 600 m all-season road in the Chisasibi airport area and two winter roads. The first winter road, approximately 1.4 km long, will follow the firebreak strip located at the east end of Chisasibi over most of its length and will provide access to the western part of the blanket at KP 18. The second winter road, approximately 1 km long, to which short sections built on the banks of the river will be added, will provide access to the three blankets at KP 20, to the blanket at KP 22 and to the eastern part of the blanket at KP 18. According to the proponent, in most instances, 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, i.e. during two summers and three winters. An estimated 150,000 m^3 of materials will be required to build the 9 km of granular blanket. The proponent has identified 17 potential sand pits, 13 of which are located in trapline CH33. However, the final selection has not yet been made.

Finally, we note that part of the work will be carried out on Chisasibi category I land. This is the case, for instance, for the granular blankets opposite the community, the access roads to the worksites and certain sand pits located along the access road to the community. For all work carried out on category I land, the proponent will have to obtain authorizations from the local environment administrator where necessary.

Stabilization of the banks and drinking water supply at Waskaganish

Under the Boumhounan Agreement, the proponent must ensure that the left bank of the Rupert is stable near the village of Waskaganish and close to the raw water pipe leading to the existing drinking water plant.

When the water intake was built in 1996, armouring was laid down to stabilize riverside slopes. This armouring, consisting mainly of gabions placed on the slope, has apparently become unstable. The existing armouring will be strengthened with rockfill and extended to about 200 m downstream and 100 m upstream of the raw water pipe.

The proponent has also undertaken to build a new drinking water treatment plant prior to diversion of the Rupert River.

Quarries and sand pits

The work planned during the project will require large quantities of till, granular material, rock and concrete aggregates.

A minimum volume of approximately 10,000,000 m^3 of granular material and rock will be needed to complete the project. To meet these needs, the proponent has identified 29 potential quarries and 291 potential sand pits. In the section of the two diversion bays, where requirements are estimated to be at least 8,000,000 m^3, the potential sand pits will yield an assured supply of 3,300,000 m^3 of granular material and 5,300,000 m^3 of till, in addition to an indeterminate volume of quarry rock and a minimum volume of 9,200,000 m^3 of materials from the excavation work.

For the project as a whole, the sand pits and quarries are broken down as follows.

Excavation and disposal of excavated material

Excavation work is planned at the locations of dams and dikes, control structures, transfer structure, canals, powerhouses, hydraulic structures, road rights-of-way, bridges to be built, and at workcamps and temporary work areas.

Based on the information provided by the proponent, the volume of materials from the excavation is estimated as follows:

Table 2-5 Volume of materials required

Location	Volume
Rupert dam	656,000 m^3
Lemare dam	263,000 m^3
Nemiscau-1 dam	99,400 m^3
Nemiscau-2 dam	95,100 m^3
Rupert forebay dikes (31)	2,447,000 m^3
Rupert tailbay dikes (41)	2,040,500 m^3
Diversion bay access roads	2,448,000 m^3
Hydraulic structures on the Rupert River (8)	552,000 m^3
Access roads to the 8 hydraulic structures	1,289,300 m^3
Granular blankets on the banks of the La Grande Rivière (9)	150,000 m^3

Source: Proponent's documents

Table 2-6 Location of the quarries and sand pits

	Sand pits	Quarries
Rupert dam section	18	1
Rupert workcamp access road section	14	1
Rupert forebay section	81	4
Rupert tailbay section	71	6
8 weirs on the Rupert River	69	14
Sakami weir section (road, workcamp and weir)	*	*
9 granular blankets, along the La Grande Rivière, at Chisasibi	17	0
Muskeg–Eastmain road and 315-kV Muskeg–Eastmain-1 line	18	0
Sarcelle section (road, workcamp, powerhouse, 315-kV line)	3	3
Eastmain-1-A powerhouse section	*	*

* Use of quarries and sand pits has already been authorized

Source: Proponent's documents

Table 2-7 **Volume of excavated material**

Location	Volume
Rupert dam	110,000 m^3
Rupert control structure (spillway)	740,000 m^3
Lemare dam	67,000 m^3
Nemiscau-1 dam	35,000 m^3
Nemiscau-2 dam	60,000 m^3
Lemare (1) and Nemiscau (3) control structures	129,100 m^3
Rupert forebay dikes (31)	750,000 m^3
Rupert tailbay dikes (41)	820,000 m^3
Transfer structure (transfer tunnel, etc.)	2,530,000 m^3
Canals in the Rupert forebay (4)	1,490,000 m^3
Canals in the Rupert tailbay (6)	2,500,000 m^3
Weir at Sakami Lake outlet	218,000 m^3
Eastmain-1-A powerhouse	2,907,000 m^3
Sarcelle powerhouse	1,209,000 m^3
Hydraulic structures on the Rupert River (8)	556,000 m^3

Source: Proponent's documents

According to these data, the excavation work will generate a minimum volume of approximately 14,100,000 m^3 of materials composed of overburden and rock, including a minimum volume of 9,200,000 m^3 in the section of the two diversion bays. Depending on the quality of these materials, they could be used as construction materials on site or at surrounding worksites, for restoration of the areas affected and for wildlife enhancement projects. However, according to the proponent's projections, only 12% of the excavation materials will be reusable, while 88% will be surplus. Some 12,500,000 m^3 of surplus excavated material will have to be disposed of in designated areas.

Final selection of the location of these disposal areas will be made during the project construction phase. In general, they will be located near the extraction sites and, insofar as possible, within the planned diversion bays if relief and drainage conditions are suitable. However, large excess quantities cannot be moved to the future diversion bays. This will be the case, for instance, of materials from the Eastmain-1-A powerhouse (2,500,000 m^3), the Sarcelle powerhouse (1,100,000 m^3), the Sakami canal (218,000 m^3) and the hydraulic structures on the Rupert River (510,000 m^3).

The strategy proposed by the proponent for integrating the disposal areas into the natural environment is as follows:

- For the disposal areas located within the diversion bays, no measures are planned. However, the proponent will ensure that the tips of the piles are at least 1.5 m below the minimum operating level of the diversion bays or, rather, at least 1.5 m above maximum operating level of the diversion bays. In addition, the disposal areas will be at least 75 m from the shores of natural water bodies.

- For the disposal areas that are "not visible" from the main structures or the main access road, the piles composed primarily of coarse or compacted materials will be graded so as to give them regular and stable slopes, followed by spreading of unconsolidated material and earth, and then reforestation. The piles composed largely of fine or sedimentary materials will be graded and small ponds suitable for goose hunting will be developed in certain locations. These ponds will be seeded with grasses and legumes over a periphery 50 m wide, and the rest of the disposal area will be reforested;
- For the disposal areas that will be "visible" either in whole or in part from the main structures or the main access road, the same strategy as for the disposal areas that are "not visible" will be used, but with an expansion of the seeded surfaces and an increase in the density of reforestation.

Clearing of roads, workcamps, sites of structures and other sites

The forest vegetation of the project study area is located at the geographic limit of two climax domains, namely the black spruce-moss forest, in the diversion bays and Rupert River sections, and the black spruce-lichen forest, in the increased flow section. Black spruce is found over the entire territory, while balsam fir and jack pine are at the northern limit of their range. Black spruce-moss forests are fairly dense, while spruce-lichen forests are open and relatively unproductive. These climax domains also include the jack pine forest, in the sections disturbed by forest fires; the white spruce forest, along the James Bay coast; mixed stands composed of black spruce with companion species such as white birch or trembling aspen; as well as hardwood stands, represented by the white birch forest and the poplar forest, which are relatively rare and cover very small areas.

An examination of the satellite images provided by the proponent in the background report (ES 13) reveals large areas disturbed by forest fires over the past 25 years. Within the 8,873 km^2 of the study area selected for description of the vegetation, approximately 40% of the land area appears to have been disturbed by forest fires. The appearance of the affected areas is characteristic of recent burns, regenerating burns or poorly regenerated burns.

The inventory of the areas that will, or could be, cleared outside the areas flooded by the diversion bays was carried out using the vegetation mapping based on satellite imaging used in the Environmental Impact Statement. However, for the hydraulic structures, photo interpretation was carried out using aerial images geo-referenced to a scale of 1/5,000.

The clearing work affects a total area of approximately 5,275 ha.

The proponent's plans call for a 34-m wide clearing for construction of the permanent and temporary roads. The permanent roads include:

- The access roads to the two diversion bays, to the Rupert dam and the spur road to the Circuit 7069-7070 road (for a total area of 402 ha, 265 ha of which is to be cleared and grubbed and 137 ha of which is to be close cut to the ground);
- The Muskeg–Eastmain-1 road (76 ha);
- The secondary access roads to the diversion bay retaining structures (9 ha).

The temporary access roads include the access roads to the hydraulic structures (184 ha), jobsites, quarries and sand pits, and the corridor of the 315-kV Sarcelle–Eastmain-1 line. The proponent has not provided any information about the clearing of the access and bypass roads required for construction of the 315-kV Sarcelle–Eastmain-1 line, since its construction strategy had not yet been determined.

The banks of the Rupert River flooded following the rise in the water level of the section of the river upstream of the hydraulic structures cover a total area of 22.9 ha, 17.1 ha of which consist of terrestrial environment and peatlands (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), while 5.8 ha are located in riparian environments (4.8 ha of swamps and 1 ha of aquatic grass beds). These data do not include the area affected by the changes made to the weir at KP 223 (D15.4 and D15.5), upstream of which there will be a 10-cm increase in the water level. According to the available data, no rise in water level is anticipated upstream of the rock blanket at KP 20.4, of the weirs at KP 49 and KP 223, and of the rockfill spur dike at KP 290.

No clearing is planned for the Eastmain workcamp, since the accommodation capacity of this existing workcamp will be reduced, unlike the Nemiscau workcamp and the workcamp at the service area at KM 257, which will be expanded by approximately 10 ha. For the Rupert workcamp, the total area to be cleared and stripped is 61.1 ha and the total area of earthwork is approximately 50 ha. During construction of the workcamps, the

Table 2-8 Types of areas to be cleared

	Forest land	Burns	Wetlands	Dry barrens	Total
Permanent roads	194.8	228.8	51.5	12.0	487.1 ha
Temporary access roads	95.1	160.1	73.9	13.1	342.2 ha
Access road to Sakami weir	n/a*	n/a	n/a	n/a	~6 ha
Access roads to granular blankets	n/a	n/a	n/a	n/a	~3 ha
Retaining structures in the diversion bays	n/a	n/a	n/a	n/a	128.8 ha
Hydraulic structures on the Rupert	10.6	0.8	2.1	0.2	13.7 ha
Banks flooded on the Rupert	11.1	3.7	2.2	0.1	17.1 ha
315-kV Sarcelle–Eastmain-1 line	187.5	269.5	118.3	27.6	602.9 ha
25-kV Albanel–Lemare dam line	n/a	n/a	n/a	n/a	~65 ha
25-kV Albanel–Rupert dam line	n/a	n/a	n/a	n/a	~60 ha
Quarries and sand pits	1,284.1	1,647.7	263.4	204.5	3,399.7 ha
Eastmain workcamp	0.0	0.0	0.0	0.0	0.0 ha
Nemiscau workcamp	0.0	9.0	0.0	1.0	10.0 ha
KM 257 workcamp	7.9	0.2	0.4	1.5	10.0 ha
Rupert workcamp	8.9	51.5	0.7	0.0	61.1 ha
Sarcelle workcamp	0.0	33.5	0.1	4.5	38.1 ha
Kauschiskach workcamp	5.4	4.1	0.4	0.1	10.0 ha
Jolliet Lake workcamp	11.1	2.7	1,3	0.0	15.1 ha
Sakami Lake workcamp	3.8	0.8	0.4	0.0	5.0 ha

*n/a: information not available

Source: Proponent's documents

proponent will take the necessary precautions to avoid disturbing the neighbouring peatlands, especially at the Jolliet Lake workcamp.

No wetlands will be cleared within the limits of the quarries and sand pits. The wetlands in the sand pits include 177.7 ha of treed ombrotrophic peatlands (or treed bogs) and 24.5 ha of treed minerotrophic peatlands (or treed fens), while there are 61.2 ha of treed wetlands in the quarries.

According to the available data, the cutting of trees and shrubs is broken down as follows: approximately 40% in forest stands, approximately 54% in burned areas including recent burns, poorly regenerated or regenerating burns, and approximately 6% in wetlands, taking into account the fact that wetlands will be protected during development of the quarries and sand pits. No exceptional plant communities were inventoried in the locations where trees and shrubs are to be cut.

The proponent estimated the volume of wood to be cut by using aerial photographs on a scale of 1/15,000, 1/20,000 and 1/40,000. These estimates were validated in the field in order to take recent forest fires into account.

Of the total volume of 106,302 m^3 of wood, it appears that less than half, i.e. approximately 46,456 m^3, is of sufficient value to partially meet the conditions set out in the Boumhounan Agreement for the recovery of merchantable timber and its delivery to the Nabakatuk Forest Products sawmill in Waswanipi at the proponent's expense.

The clearing work will be spread over three years. According to the quality criteria for felling, piling and burning work, the work must be carried out on snow-free ground, i.e. from May to October. However, on the lower Rupert River, the clearing work will be carried out insofar as possible in the fall or winter in order to mitigate the impacts on forest birds.

Table 2-9 **Volume of wood resulting from cutting for these related structures**

	Volume
Permanent roads	8,946 m^3
Temporary roads	9,275 m^3
Workcamps	2,784 m^3
315-kV Sarcelle–Eastmain-1 line	12,850 m^3
Quarries and sand pits	69,972 m^3
Hydraulic structures on the Rupert	2,475 m^3
Total	106,302 m^3

Source: Proponent's documents

Clearing in the diversion bays

The proponent has conducted a forest inventory of the terrestrial environment and wetlands that will be flooded by the two diversion bays. Of a total area of 346.2 km^2, the two diversion bays will flood 159 km^2 in the terrestrial environment, 29.1 km^2 of wetlands and 158.1 km^2 of existing watercourses and water bodies. According to forest inventory data, fires in the fairly recent past have affected approximately 44% of the terrestrial environment that will be flooded and approximately 56% of the forest environment covering an area of 124.8 km^2. The burned forested areas cover large tracts in the southern part of the Rupert forebay (between Mesgouez Lake and Goulde Lake), in the Rupert workcamp section and in the northern part of the Rupert tailbay (between KP 53 and the Eastmain-1 reservoir).

In the Boumhounan Agreement, the proponent and the Crees agreed to use "the clearing objectives and specifications" identified for the La Grande Complex (1975) in Section 8, Schedule 2, of the JBNQA to determine the sections to be cleared in the diversion bays. In cooperation with the Cree communities, the proponent has identified 35 sites to be cleared within the diversion bays, for a total area of 5,089 ha (50.9 km^2), including 4,040 ha in the forest environment, which represents approximately 25% of the forest environment to be flooded by the future diversion bays. However, 40% of the forest environment that meets the minimum harvesting criteria will be harvested before the impounding of the diversion bays.

The planned clearing includes approximately 37 km^2 of shoreline in the Rupert forebay and approximately 12 km^2 of shoreline in the Rupert tailbay. The main targeted sections include the entire flooded section of the Rupert River upstream of the dam; a significant proportion of the flooded banks of the Misticawissich River; the section between the entrance of canal S73-1 and dike C-R-13; the Des Champs and Arques lakes section, and the section between the Nemiscau-1 dam and the entrance of the Eastmain-1 reservoir. The upstream side of all the dams and dikes in both diversion bays will be cleared. Clearing within the diversion bays will also help reduce the visual impact on the areas where the access roads provide a view onto these water bodies.

The purpose of the multipurpose areas is to facilitate access to the future diversion bays for navigation and fishing, improve the quality of the landscape and ensure the safety of the structures. The navigation corridors, ranging in width from 100 to 1,000 m with a minimum depth of 1.5 m under open-water conditions, will be used to facilitate navigation between the large water bodies of the diversion bays and their main tributaries. The two sites to be cleared for hydraulic purposes have been designed to improve flow conditions, prevent trees in the Caché Creek valley from being uprooted and carried by the current to the Eastmain-1 reservoir, reduce loss of head and lower the water levels in canal S73-1 and canal S73-3 section.

The 12 navigation corridors to be cleared in the diversion bays will be located as follows:

- Rupert River: along the river, between KP 332 (Mesgouez Lake outlet) and KP 324 (KP 110 of the Rupert forebay);

Table 2-10 **Breakdown of the sites to be cleared in the diversion bays**

Sites to be cleared	Surface area	Volume of wood
21 multipurpose areas	3,436 ha	58,690 m^3
12 navigation corridors	1,307 ha	32,238 m^3
2 sites to be cleared for hydraulic purposes	346 ha	2,141 m^3

Source: Proponent's documents

- Misticawissich River: along the river, between its KP 5 (KP 105 of the Rupert forebay) and the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Sanctuary;
- Lemare River: along the river, between KP 78 of the Rupert forebay and the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Sanctuary; along the unnamed watercourse that links Cabot Lake to the Lemare River; along the navigation route used to link Hore Lake to the Lemare River;
- The mouth of an unnamed watercourse emptying into KP 63 of the Rupert tailbay;
- Along an unnamed watercourse linking Bourier Lake to Arques Lake (at KP 61 of the Rupert tailbay);
- Along an unnamed watercourse linking Du Glas Lake to Arques Lake (at KP 58 of the Rupert tailbay);
- Nemiscau River: along the stretch of the river located north of Du Glas Lake, between KP 160 and KP 171 of the Nemiscau River;
- An approximately 7 km section along an unnamed watercourse flowing into the Nemiscau River (at KP 162 of the Nemiscau River), including a west branch linking Lamothe Lake to this unnamed watercourse;
- Between KP 45 and KP 44 of the Rupert tailbay and along an east branch of the diversion bay between KP 43 and KP 41;
- Along an unnamed watercourse linking Kauakiekamatsh Lake to the Nemiscau River (at KP 39 of the Rupert tailbay).

Since Cabot Lake could be used to divert water to the Rupert tailbay in the event of operational problems with the transfer tunnel, the tallymen of traplines M18, M25 and M33 requested, during consultations held on this issue on September 22, 2005, that the clearing plan for the navigation corridor along the unnamed watercourse connecting Cabot Lake to the Lemare River be revised in order to take the potential increased flow into consideration. The proponent undertook to consult the tallymen when drawing up the specifications for clearing the navigation corridor of this watercourse. The two sites to be cleared for hydraulic purposes are located as follows:

- Between KP 98 and KP 93 of the Rupert forebay (at the entrance of canal S73-3);
- In the Caché Creek valley, between canal Z and the Eastmain-1 reservoir.

Concerning the 5,089 ha to be cleared in the diversion bays, the proponent has estimated the volume of wood to be harvested at 93,069 m^3, for an average yield of 18.3 m^3/ha, including approximately 28,000 m^3 of merchantable timber. This very low volume of wood to be harvested is primarily due to the fact that 55% of the cutting areas are located in burned areas and 20% are located in wetlands.

The clearing work involves disposing of all living or dead wood, both standing and fallen. With the exception of the timber to be recovered, the wood will be piled up and burned. Under the Boumhounan Agreement, merchantable timber is to be delivered to the Nabakatuk Forest Products sawmill in Waswanipi at the proponent's expense. In addition, if the tallymen so request, the proponent will facilitate the recovery of wood from highly valued species, such as birch and larch, for their own use.

The clearing work in the diversion bays will be spread over a three-year period. Field work will be carried out from May to October. The clearing contracts will be awarded to Cree companies, as well as to interested tallymen.

The wooded surfaces left undisturbed in the diversion bays, both in the forest environment and the wetlands, cover approximately 13,000 ha. At winter freeze-up, the partially submerged tree trunks will merge with the newly formed ice sheet in the diversion bays. Then, when the water level drops, the weight of the ice in combination with the rapid drop in the water level

will exert enough force to collapse the tree trunks. Approximately 70% of the trees left standing will thus be broken by the effect of the ice, given the shallow depth in the diversion bays.

According to the proponent, the areas where this natural clearing action exerted by the ice can be observed are broken down as follows:

- Approximately 9,500 ha: more than 75% of the stems will be collapsed by the ice;
- Approximately 1,700 ha: 50 to 75% of the stems will be collapsed by ice;
- Approximately 700 ha: 25 to 50% of the stems will be collapsed by ice;
- Approximately 1,100 ha: less than 25% of the stems will collapse.

This ice-generated clearing will be particularly significant during the first two years of operation of the diversion bays. In the event that large quantities of wood debris pose a safety problem in the navigation corridors and around launching ramps or for the Hydro-Québec facilities, the proponent will then clear these sites.

Jobsite facilities

The proponent plans to allot space for contractors near each work area for offices and equipment. Service and storage areas are also planned near the main work sites. The jobsite facilities will be dismantled once the construction work is complete. All the sites will be restored, except for specific areas for storing materials and other products needed for long-term maintenance of the structures.

Management of domestic waste and hazardous waste

Domestic waste from the workcamps will be shipped to trench landfill sites, in accordance with the Quebec *Regulation respecting the landfilling and incineration of residual materials* (Q-2, r. 6.02). The proponent's plans call for daily dump truck collection of closed storage containers which are distributed throughout each workcamp.

For the workcamps, the proponent is considering the following options:

- The Eastmain and Nemiscau workcamps: extending the duration of operation of the existing trench landfill site for these workcamps;
- The Kauschiskach, Jolliet Lake, KM 257 and Sakami Lake workcamps: using existing sites operated by third parties, subject to obtaining their approval;
- The Rupert and Sarcelle workcamps: opening of a new solid waste disposal site.

The methods for storing and disposing of construction waste have not yet been specified. However, the proponent's plans emphasize using existing approved sites and requesting an extension of approval for the sites approved during the Eastmain-1 project. Hazardous waste will have to be stored in accordance with applicable regulations and recovered before completion of the work.

The recovery of used tires will be the responsibility of each contractor. These tires will be temporarily stored on a site approved by *SEBJ* and subsequently transported out of the James Bay territory by the contractor to a recovery or recycling centre. The same procedure applies for scrap metal.

Hydro-Québec plans to develop a septic tank sludge management program that will comply with both the applicable regulations and the goals of the new Quebec Residual Materials Management Policy, 1998-2008 (R17). For the Eastmain-1-A and Rupert diversion project, the proponent is currently analysing three options: using existing approved disposal sites (in Chibougamau, Matagami and Radisson), opening "new-generation" disposal sites and using mobile dewatering units.

Concerning the treatment of contaminated soil, during implementation of the Eastmain-1 project industrial activities generated approximately 100 m^3 of contaminated soil from some 20 minor spills attributable to different contractors. Given the small quantities of contaminated soil involved, the proponent has decided that each contractor concerned will be responsible for transporting the contaminated soil to authorized transfer centres located outside the James Bay territory or for treating the contaminated soil on site, at its own expense. For the fuel storage facilities owned by *SEBJ*, in situ treatment will be the preferred method.

Restoration of areas disturbed by the work

SEBJ will produce a master plan for the rehabilitation and restoration work in areas disturbed by construction activities, including quarries and sand pits. Before the end of the project construction work, specific criteria will be presented for restoration of the plant cover and, generally, the various types of planned rehabilitation and restoration work.

Building of a dike at Jolly Bay

The N25 tallyman expressed concerns about the possibility of losing a goose-hunting ground in a bay on the left bank of the Rupert River, approximately 3 km downstream of the Rupert dam. The section of this bay, called

Jolly Bay, is a waterfowl concentration area and an important goose-hunting ground (Canada goose). Five permanent Cree camps and four hunting "blinds" have been set up along the edge of this bay. The tallyman hunts geese there in the spring, in the last week of April and early May, when the shoals of the bay are still exposed because of the winter low-flow period. In addition, in summer, the tallyman net fishes at three locations in the bay. The main species caught are brook trout, walleye, northern pike, longnose sucker, lake whitefish and lake sturgeon.

This bay drains a watershed of 44 km^2 whose main inflow comes from a tributary located south of the bay. In late winter, the water level in the bay is at elevation 282.1 m. In late April, the bay is still almost completely exposed (at 282.5 m). It fills around late May (284.9 m) with the Rupert River flood. In summer, the water body covers an area of 43.2 ha (283.8 m).

After the partial diversion of water from the Rupert, the bay will no longer receive the Rupert River flood in May. As a consequence, the maximum water level in the bay would be 282.5 m at best, reducing the surface area of the water body to 13 ha. In summer and winter, the bay would be almost completely dried up. Unless other action is taken, the summer fish feeding habitats will disappear and the pike and brook trout spawning grounds located in the tributary will no longer be accessible. Eventually, the exposed sectors will be invaded by terrestrial vegetation and goose hunting could be compromised.

In October 2005, the proponent met with the N25 tallyman in order to discuss with him the concept of building a dike in Jolly Bay that would preserve the riparian habitats and goose-hunting grounds. The planned structure is designed to maintain a water level in the bay at the end of winter conducive to goose hunting and a mean water level in summer similar to natural conditions.

The dike will be composed of granular fill with rockfill armouring. It will be designed to allow flow reversals between Jolly Bay and the Rupert River and to support a possible submersion in the event of a heavy flood. Approximately 190 m long by approximately 3.5 m high, the dike will be impermeable at its base up to a height of approximately 2.5 m (i.e. at elevation 283.8 m), and permeable over the last metre of the top, in order to recreate the natural conditions of the bay in summer. A round culvert, 0.6 m in diameter, will be installed in the dike, at elevation 282.5 m, to ensure that the natural conditions of the bay are maintained in the spring, during goose-hunting season. Finally, the crest of the dike, approximately 3.5 m wide, will be designed to allow the passage of all-terrain vehicles.

Building a dike in Jolly Bay and maintaining water levels similar to the existing spring and summer levels will help conserve the riparian habitats (marshes, swamps), maintain goose hunting, as well as preserve fish habitat and adequate depth for navigation. In addition, the seven sand pits to be operated around the bay, approximately 100 to 150 m from the bay, will be developed for goose hunting.

Construction or upgrading of access routes to Cree traplines

At the tallymen's request, the proponent plans to build or upgrade more than 100 km of access routes consisting of all-terrain vehicle (ATV) trails, snowmobile trails and passable roads in order to facilitate access to Cree camps and traplines. Some of these access routes will be no more than a few dozen metres long, while others will be longer than 10 km, including two more than 20 km in length.

The proponent also made other commitments:

- Trapline M18 (Mistissini): In order to facilitate access to certain camps, the proponent will study the possibility of developing three ATV trails. The first trail would begin at the east end of the access road to Cabot Lake and lead to an unnamed lake located approximately 20 km southeast of the lake and would require a crossing at the Lemare River. The second trail, approximately 22 km long, would begin at the Circuit 7069 and 7070 maintenance road, at a point located approximately 12 km northeast of the bridge to be built on the Rupert tailbay, and lead to the western shore of Kattishabocau Lake. The third trail, approximately 3 km long, would link the access road to the Rupert tailbay, near dike C-69, to a camp located north of Cramoisy Lake, passing over an esker. If a decision is made to excavate this esker for fill (sand pit DG-310), this ATV trail would be converted to a passable road.
- Trapline N1 (Waskaganish): The proponent will study the possibility of building an ATV trail, approximately 2 km long, starting from the access road to the community of Waskaganish and leading to an unnamed lake that could be developed for goose hunting, as well as a second road, approximately 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, connecting Waskaganish to certain camps located along Rupert Bay.
- Trapline N24A (Nemaska): The proponent will study the possibility of upgrading a former winter road located to the south of trapline N25 in order to facilitate access to Rivière à la Marte from the Circuit 7078 and 7080 road, subject to the agreement of the 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 run several kilometres west of Circuits 7078 and 7080. Although the location of this road is very approximate, we have estimated its length at approximately 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, in order to access temporary Cree camps located in the vicinity of KP 10 of the Nemiscau River.
- Trapline R19 (Nemaska): The proponent will study the possibility of building an access approximately 10 km long connecting a tallyman camp located on the west shore of Utish Lake to the Nemiscau-Eastmain-1 road.
- Trapline R21 (Nemaska): In 2004, the tallymen of N24, N24A and R21 requested that the access road to the rockfill spur dike at KP 290 be extended to KP 280 of the Rupert River in order to compensate for the possible degradation of navigation conditions in the section of the river between KP 290 and KP 281. Since extension of the road could result in more vehicles travelling through the R21 trapline, it was agreed with the R21 tallyman, in October 2005, to wait until completion of work at the spur dike at KP 290 in order to determine 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. Should a decision be made to extend the road, the proponent plans to study the potential consequences of overfishing in the section of KP 280 before undertaking work to build the road.
- Trapline VC20 (Wemindji): From the Transtaïga Highway, development of an access, approximately 2 km long, to reach a network of lakes leading to a camp located near the Ukau Amikap pass (near Kachinukamach Lake). In addition, the proponent will redevelop an existing access, approximately 1 km long, connecting the Transtaïga Highway to the northeastern end of Bonfait Lake.

2.2.3 Workcamps

The construction phase will last five years. The peak workforce required for all construction work is estimated at 5,500 workers, who will be accommodated in eight workcamps. The criteria used by the proponent to select the location of these workcamps have already been described.

The proponent plans to allot space for contractors near each work area for buildings, offices and equipment. Service and storage areas are also planned near the main work sites. These sites will be restored once the construction work is complete, except for specific areas for storing materials and other products needed for long-term maintenance of the structures.

The eight workcamps planned for the project to accommodate workers include three existing workcamps and five temporary workcamps:

Existing workcamps

- The Eastmain workcamp: This workcamp was used during execution of the Eastmain-1 hydroelectric project and is currently used by the workers assigned to the final stages of the Eastmain-1 powerhouse. The number of workers it can accommodate will be reduced to 1,200 and it will be used for five years, during construction of the Eastmain-1-A powerhouse, the 735-kV Sarcelle–Eastmain-1 line and the Muskeg–Eastmain-1 road. At the end of the work, it will be either modified or dismantled, depending on the needs of Hydro-Québec and *SEBJ*.
- The Nemiscau workcamp: This workcamp will be used as overflow for the Rupert workcamp. It will be used during construction of the access roads to the diversion bays, the Rupert workcamp, the transfer tunnel, the Rupert control structure and spillway, as well as construction of the two 25-kV lines linking the Albanel substation to the Rupert workcamp, the transfer tunnel and the two control structures. The workcamp will be expanded to accommodate 1,200 workers for five years. On termination of the work, it will be either modified or dismantled, depending on the needs of Hydro-Québec and *SEBJ*.
- The KM 257 workcamp: Located at KM 257 of the Route de la Baie-James, this is a former workcamp that was converted to a rest stop. It will be expanded and modernized in order to accommodate the workers who will be building the weirs at KP 85 and KP 110.3. The proponent plans to accommodate 250 workers at this camp for two years. In the event

that the Kauschiskach workcamp is not built, the KM 257 workcamp will then be used to accommodate 400 workers for two years. On completion of the work, it will be redeveloped in accordance with the conditions of the agreement between the rest stop owners and *SEBJ*.

New workcamps

- The Sakami Lake workcamp: This temporary workcamp, which will accommodate 50 workers for 10 months, will be used during construction of the Sakami weir. Although its location has not been finalized, the proponent has identified a site near the Sakami Lake outlet very close to the work area. This workcamp will be dismantled on completion of the work.
- The Sarcelle workcamp: This temporary workcamp will be used during construction of the Sarcelle powerhouse and the 735-kV Sarcelle–Eastmain-1 line. Although its location has not been finalized, the proponent has identified a potential site located near the line to be built and approximately 10 km from the Sarcelle powerhouse. Plans call for housing 800 workers at this workcamp for five years. On completion of the work, this workcamp will be either modified or dismantled, depending on the needs of Hydro-Québec and *SEBJ*. Plans also call for redeveloping the site for goose hunting.
- The Rupert workcamp: This temporary workcamp will be used during construction of the access roads to the two diversion bays, control structures and dikes, as well as during development of the Rupert forebay and Rupert tailbay. Plans call for housing 1,800 workers at this workcamp for 30 months. This workcamp, with an area of about 60 ha, will also include a service station with gasoline and diesel tanks and a fuel storage area. On completion of the work, it will be either modified or dismantled, depending on the needs of Hydro-Québec and *SEBJ*.
- The Jolliet Lake workcamp: This temporary workcamp will be used during construction of the weirs at KP 170 and KP 223. Although its location has not been finalized, the site currently selected is located near the weir at KP 170 and the landing site for the barge used to cross the Nemiscau River during construction work on the weir at KP 223. Plans call for housing 250 workers at this workcamp for two years. It will be dismantled upon completion of the work.
- The Kauschiskach workcamp: Although its location has not been finalized (it is even possible that the workers will be accommodated instead at the workcamp at KM 257 of the Route de la Baie-James), the proposed site is located approximately 40 km east of Waskaganish, along the access road to this community. This workcamp will be used during construction of the weirs at KP 20.4, KP 33 and KP 49. Plans call for housing 150 workers at this workcamp for two years. It will be dismantled upon completion of the work;
- For the work planned in the Waskaganish and Chisasibi sections, the proponent has not indicated its strategy for accommodating workers.

The workcamps will be divided into two areas. The residential area will include the dormitories, cafeteria, community buildings and administrative offices, while the industrial area will include the warehouses and workshops.

The drinking water supply for the workcamps will generally come from wells drilled into the bedrock. Wastewater will be treated in accordance with the of the *Ministère du Développement durable, de l'Environnement et des Parcs*. In the case of the Rupert workcamp, several wells will supply drinking water. The Rupert workcamp sewer system will receive wastewater, which will be treated and the effluent discharged into a neighbouring peatland.

On completion of the construction work for the Eastmain-1-A and Rupert diversion project, the personnel assigned to operate the structures will be housed in Hydro-Québec staff residences in Nemiscau.

2.2.4 Roads

To implement this project, the proponent will have to build approximately 255 km of roads and upgrade approximately another 105 km. In addition to this road network, various secondary roads, whose location has not yet been determined, will also have to be built. These secondary roads include spur roads to borrow pits and quarries, dikes and control structures, canals, to the north end of the transfer tunnel and to the tunnel's outlet canal. They also include access roads to clearing sites in the diversion bays.

In addition, construction of the 315-kV Sarcelle–Eastmain-1 transmission line will require construction of approximately 110 km of secondary roads running parallel to and a very short distance away from the permanent Sarcelle–Eastmain-1 road. Removing the culverts and temporary bridges in the right-of-way of this line on completion of the work will sever these secondary roads into several sections, making them much less useable.

Table 2-11 Summary of roads

	Roads	
	To be built	**To be upgraded**
Permanent Sarcelle–Eastmain-1 road		
Permanent Muskeg–Sarcelle powerhouse road		35 km
Repairing the Opinaca River bridge		(–)
Permanent Muskeg–Eastmain-1 road	40 km	
Access roads to the Rupert diversion bays		
Access roads to the Rupert diversion bays	81 km	17 km
Access road to the transfer tunnel and Cabot Lake	14 km	
Access road to the Rupert control structure	4 km	
Spur roads to the control structures, dikes and canals	~35 km	
Roads for the modification of lines		
Spur road to the Circuits 7069 and 7070 road	5 km	
Winter road and ice bridge to modify Circuit 7059	~4 km	
Access road to the Sakami weir	2 km	1 km
Access roads to the eight hydraulic structures		
Access roads to the hydraulic structures	~65 km	~31 km
Access road to the Jolliet Lake workcamp		~21 km
Barge (and ice bridge) on the Nemiscau River	(–)	
Access roads to the nine granular blankets		
All-season road	1 km	
Winter roads	4 km	
Total	255 km	105 km

Source: Proponent's documents

Access to the Sarcelle workcamp and Sarcelle powerhouse jobsite will be controlled by a booth installed at the Sarcelle workcamp, while access to the Rupert workcamp and to the Rupert diversion bays jobsites will be controlled by a booth installed quite close to the Albanel substation.

According to the design criteria used by the proponent, described in the previous section, these roads are broken down as follows:

- 110 km of Type I roads, including the 31-km road linking the Albanel substation to the transfer tunnel's intake canal, which passes through the Rupert River workcamp; the 4-km road connecting the Route du Nord to the Rupert control structure; upgrading of the existing 35-km road leading to the Sarcelle powerhouse; the 40-km permanent Muskeg–Eastmain-1 road.
- 89 km of Type II roads, including the 35-km access road to the Rupert forebay; the 35-km access road to the Rupert tailbay; the 11-km road linking the transfer tunnel to Cabot Lake; the 5-km spur road to the Circuit 7069 and 7070 road, including a bridge with a span of 140 m to cross the Rupert tailbay; and the 3-km access road to the Sakami weir.
- about 35 km of access roads to the dikes and control structures. During the operation phase, these access roads will be maintained for the purpose of inspecting and maintaining the structures and equipment installed.

- 65 km of "temporary" roads to access the sites of the eight hydraulic structures. They will be used during construction work on the hydraulic structures, and the environment will subsequently be restored, unless there is a specific agreement with the tallymen. Maintenance of the 52 km of existing roads that will be upgraded will remain the responsibility of the current users.
- less than 10 km of winter roads and ice bridges, which will be used during modifications to the 735-kV line (Circuit 7059) and for the stabilization work on the slope along the La Grande Rivière, near Chisasibi. In addition, if certain work relating to the weir at KP 223 were to be carried out in winter, the proponent will install an ice bridge on the Nemiscau River.

As part of the mitigation measures for the tallymen, the proponent plans to build or upgrade a number of secondary roads in order to facilitate access to traplines or camps. These will be roads for motor vehicles, ATV trails and snowmobile trails. The locations of most of the roads to be built, ranging in length from several hundred metres to approximately 20 km, have not yet been determined.

During the project construction phase, *SEBJ* will be responsible for the safety and maintenance of the permanent and temporary roads and access roads. During the project operation phase, the proponent will assume responsibility for the permanent roads based on needs relating to the operation and maintenance of the structures and equipment installed. The access roads to the Sarcelle, Eastmain-1 and Eastmain-1-A powerhouses will be maintained and cleared of snow in winter. The permanent access roads to the diversion bays and structures will be maintained, but will not be cleared of snow in winter.

Permanent access roads to the diversion bays

Access to the structures of the Rupert diversion bays will require building or upgrading 116 km of roads, including 35 km of type I roads and 81 km of type II roads. Construction of all the permanent roads in the diversion bays section will require the installation of nearly 200 culverts (most with a diameter of 0.9 m), as well as the construction of three bridges (including one temporary bridge) and three prefabricated arches.

Permanent bridges will be built to cross the Lemare River, opposite the control structure and the Rupert tailbay (bridge 160 m long), while a temporary bridge will be built on the Nemiscau River, opposite the Nemiscau-1 control structure. Prefabricated concrete arches will be installed to cross Lac de la Chlorite, Arques Creek and the Nemiscau-2 River. In addition, other prefabricated arches are planned for small watercourse crossings, when conditions are unsuitable for installation of a culvert.

Permanent access road to the Rupert control structure

This type I road, a total of 4 km in length, crosses three permanent streams and three intermittent streams. A bridge will be built at its eastern end, above the Rupert spillway, in order to facilitate crossing of the Rupert River.

Permanent Muskeg–Eastmain-1 road

This road is provided for in the Boumhounan Agreement, at the request of the Crees, in order to facilitate access to this section of the territory. At 40 km long, it will require construction of a bridge with a 22-m span over the Acotago River and the installation of 94 culverts (most with a diameter of 0.9 m).

This road will connect the Route de la Baie-James (near KM 392) to the Eastmain workcamp near the Eastmain 1-A powerhouse, facilitating access to the construction sites for a number of workers from the Cree communities located along the shores of James Bay. This new road will also add an important loop to the James Bay territory road network. This loop will comprise the junction of the James Bay-Muskeg highway (existing), the Muskeg–Eastmain-1 road (to be built) and the Nemiscau-Eastmain-1 road (existing) and will facilitate travel in the territory, in the Chibougamau-Radisson belt.

Permanent Muskeg–Sarcelle powerhouse road

This permanent access road, approximately 60 km long, is in good condition and is regularly used by the Crees and sport fishermen.

From the Muskeg substation, the road follows, for approximately 25 km, a section of the main permanent gravel road linking the Route de la Baie-James to the Muskeg substation. It then branches off to the north, following a permanent secondary gravel road of approximately 35 km, leading to the Sarcelle control structure and the future location of the Sarcelle powerhouse. This 35-km secondary road will have to be upgraded in order to convert it to a type I main permanent road. This work will include upgrading the road surface and repairing the bridge on the Opinaca River.

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

2.2.5 Issues identified by the proponent

Based on the lessons learned from hydroelectric developments in Quebec, particularly in the James Bay territory, and consultations with Cree and Jamesian communities, the proponent has identified four main issues linked with the project:

- Conservation of fish and fish habitat in the Rupert River;
- Continuation of Cree hunting, fishing and trapping;
- Recreational and scenic value of the Rupert River;
- Economic spinoffs for Cree and Jamesian communities.

Maintaining fish resources, i.e. maintaining productive capacity and habitat functions in the reduced-flow section of the Rupert River, downstream of KP 314, is a major concern. Special attention must be paid to traditional anadromous lake cisco fishing activities at the Smokey Hill site, near Waskaganish, as well as traditional fishing activities involving lake sturgeon, walleye, northern pike and lake whitefish.

The project will affect some 30 traplines associated with six Cree communities. Territory users from the community of Mistissini will be mainly affected by the creation of the two diversion bays, while users from the communities of Nemaska and Waskaganish will be affected by reduced flows of the Rupert River. Users from the communities of Eastmain and Wemindji will be affected by the increased flows in the Opinaca reservoir, Boyd Lake and Sakami Lake, while users from the community of Chisasibi will have to adjust to the increased flows of the La Grande Rivière.

The Crees of Waskaganish, Nemaska and Mistissini make extensive use of the Rupert River while travelling by boat or snowmobile and the river is also used for handing down Cree traditions, such as canoe brigades. A number of permanent and temporary Cree camps have been built along this river. Some, such as the camps on the left bank east of Nemiscau Lake as well as the Old Nemaska and Gravel Pit camps, include a number of homes. The Rupert River is also used for recreational canoeing and kayaking expeditions. Users have expressed serious concerns about continued navigability, the recreational and scenic value of the river and development of its tourism potential.

The Cree and Jamesian populations have indicated that they want the proponent to promote economic spinoffs in their community by awarding contracts, apportioning the work and purchasing goods and services in order to allow regional businesses to share in the calls for tender, job creation and workforce training.

2.3 The study area

2.3.1 Areas selected by the proponent

2.3.1.1 Biophysical environment—ecosystem approach

The proponent divided the study area into various sectors, whose boundaries encompass the entire region in which impacts are likely to occur. As required by the directives, the various biophysical components of the environment have been described and analysed using an ecosystem approach. This approach was necessary in order to facilitate understanding of the effects on the extensive study area. The environment was subdivided into six sectors with differing ecological characteristics particularly with respect to aquatic habitats. These sectors, illustrated in figure 2-3, are described here briefly:

- the Rupert bay diversion section comprises the flooded area upstream of the closure points of the Rupert, Lemare and Nemiscau rivers;
- the Rupert, Lemare and Nemiscau rivers section corresponds to the watersheds of these rivers downstream of their respective closure points;
- the Rupert Bay and Rupert River estuary section includes Rupert Bay, Boatswain Bay and the estuaries of the Nottaway, Broadback, Rupert and Pontax rivers;
- the increased flow section begins upstream from the Eastmain-1 reservoir, continues through the Opinaca reservoir, the Boyd-Sakami, and the Robert-Bourassa and La Grande-1 reservoirs;
- the La Grande Rivière estuary and James Bay coast section encompasses the estuarine section and the coastal waters of James Bay included within the freshwater plume of the La Grande Rivière. According to the proponent, the study area boundaries in the marine environment are dictated by the fact that the impacts of the project will not extend beyond the winter limits of the plume from the La Grande Complex. The areal extent of the winter plume, under current conditions, has been determined with reference to the 20‰ isohaline and ranges from 2,100 to 3,500 km^2. The outflows from the La Grande Rivière will be approximately 4,400 m^3/s to 4,600 m^3/s;
- all sectors affected by the structures and related activities, such as access roads, existing power transmission lines, camps and construction site facilities and borrow pits.

2.3.1.2 Human environment—by land-use area

As required by the directives, two geographic scales have been used to analyse the impacts on the human environment. The extended study area, based on the James Bay Territory as defined in Chapter 22 of the JBNQA, is the reference area for the study of impacts on the social and economic situation of the Cree and Jamesian communities. The "extended" study area encompasses the *Municipalité de Baie-James* (*MBJ*) and the nine Cree villages, including Whapmagoostui. Note that the proponent's analysis with regard to the anticipated economic effects reaches beyond these boundaries.

The "limited" study area covers the 36 traplines affected by the project, which are used by trappers from six communities: Mistissini (4), Nemaska (10), Waskaganish (8), Eastmain (4), Wemindji (4) and Chisasibi (6). Rupert Bay and Boatswain Bay, along with the mouth of the La Grande Rivière and its immediate surroundings on the east coast of James Bay, are included in the limited study area. This limited area is used to identify the specific impacts of the project components and their direct repercussions on the use of the territory by the Cree.

At the request of the review bodies, the study area boundaries in this section have been called into question with the aim of getting the proponent to explain the rationale more fully, taking into account the existing literature on major biophysical phenomena such as marine current and sea ice dynamics and the biological productivity in James Bay and Hudson Bay.

2.4 Significant modifications to the physical environment

2.4.1 The Rupert diversion bay section

2.4.1.1 Increase in the area of lakes

When the impoundment begins as planned in December 2009, there will be a difference between the north and south sections of the forebay. In the northern part, the waters of the Lemare River will already have begun accumulating in the forebay, while the entire flow from the Rupert River will still go through the diversion structure built at KP 314. To avoid problems of water backing up from one basin to another and to limit erosion, the impoundment will be carried out in two stages. First, the water levels in the two sections of the forebay will be made equal by releasing 127 m^3/s into the Rupert River, while the structures ensuring instream flow in the Lemare and Nemiscau rivers and in Kaychischekaw Creek will be opened up. Second, when the water level is the same in both forebay sections, the proponent will remove the temporary plug from the S73 canals area. At that time, the water levels will reach the crest elevation of the forebay weir, and the inflows will be transferred through the tunnel to the tailbay, where the water level will rise gradually, and reach the Eastmain-1 reservoir.

Once the impoundment is completed, the area of the diversion bays will reach the values shown in Table 2-12. There will thus be a gradual transition from a mosaic consisting of 158 km^2 of natural water bodies, including lakes, rivers and creeks, to two diversion bays with a total area of 346.2 km^2.

In accordance with the Boumhounan Agreement, the operating level in the forebay must not affect the water level in Mesgouez Lake, which is set at 308 m. To achieve this goal, the forebay level must be 306 m, allowing a maximum diversion flow of 800 m^3/s. Under these circumstances, the maximum level at the upstream end of the forebay will be 306.4 m, while the drawdown of the water body is estimated at 2 m. With respect to the tailbay, the drawdown will be 4.2 m in winter and 3.3 m in summer at the upstream end, compared with 2.7 m in winter and 2 m in summer at the downstream end.

The hydraulic regime differs appreciably between the two diversion bays. The forebay is more lacustrine and characterized by a small difference in elevation and low flow velocities not exceeding 0.65 m/s, except in a short

Table 2-12 Flooded area

Areal extent (km^2)	Forebay	Tailbay	Total
Flooded land	128.1	60	188.1
Aquatic	100.6	57.5	158.1
Total	228.7	117.5	346.2

Source: Proponent's documents

stretch downstream from canal S73-4, south of Lake Goulde, where flow velocities can reach 1.5 m/s. The maximum depth, which will be at Des Champs Lake, will be increased to 24 m, whereas the average depth will be a dozen metres or so.

In the tailbay, flow velocity may reach 5 to 7 m/s in Caché Creek because of the steeper slope between the tunnel exit and the entrance to the Eastmain-1 reservoir. Further upstream, the flow velocity will be approximately 1 to 2 m/s. The maximum depth, that is, about 19 m, will be at Lake Arques, while the average depth will be 8.5 m. The depth of the principal lakes located in the forebay will increase by about eight metres. By contrast, in the tailbay, the level of Lake Arques will increase by approximately four metres.

As a result of the creation of the two diversion bays, some stretches of river, currently described as being lotic, will be flooded and will have a more lacustrine regime. This type of habitat consisting of fast-flowing water will be present in the last 36 kilometres of the Misticawissich River and along the Rupert River, between KP 334 and KP 314. In this stretch of river, seven rapids will be flooded. Similarly, part of the Nemiscau (38 km) and Lemare (32 km) rivers, as well as part of Kayechischekaw Creek (1.5 km), will disappear under the water. Figures 2-4 and 2-5 illustrate the areas to be flooded in the forebay and tailbay respectively.

2.4.1.2 Modification of the thermal regime and ice cover

Thermal stratification of former lakes

Under natural conditions, the thermal regime downstream from Lake Mesgouez is comparable to that of other large rivers in the region; it is not influenced by Lake Mistassini. The rivers there all show the same behaviour, that is, rapid warming in spring from mid-May onwards. The temperature remains between 18 and 20°C from mid-June to August, drops in fall and then levels out close to the freezing point.

Lakes deeper than 10 metres exhibit marked thermal stratification in summer. The thermocline is situated at a depth of about five metres in early August and moves gradually deeper as the water cools in fall. The water temperature above the thermocline is comparable to that in nearby rivers. The temperature below the thermocline is lower in summer and higher in winter than that in nearby rivers.

In the course of the year following diversion bay impoundment, a new thermal regime will become established as a function of water depth and turnover time. Although water turnover time varies spatially and temporally with the volume of inflows supplying the diversion bays and the location concerned, the average turnover time for the forebay as a whole will be 25 days. However, in the south basin of the forebay, which is essentially a transit for the instream flow from the Rupert, the residence time will be much shorter, varying from 8 days during the spring freshet to 20 days in winter. Immediately upstream from KP 314 on the Rupert River, thermal stratification episodes will cause the temperature of the instream flow to sometimes be colder than under present conditions, because the spillway water intake is located at a depth of about 20 m and the instream flow release structure lets out water coming mainly from the deep part of the basin. In spring, between late May and late June, water temperatures may differ as much as 4 to 6°C between the surface layer and the bottom. This temperature difference will lessen as more and more of the deep water is evacuated to the Rupert River and replaced by warmer water coming from upstream.

In summer, this stratification of the southern basin should gradually disappear and the water temperature should be closer to that seen in Lake Mesgouez. Former lakes such as RP062 and Des Champs could still be thermally stratified in summer; however, the thermocline would occur at a greater depth because the water level will be 17 m higher, on average. The presence of this thermocline, and its depth, will be important factors, since the proponent plans to re-create lake trout spawning areas in certain lakes where they occur naturally, taking into account the species' reproduction and feeding requirements. This issue is dealt with in a subsequent section of the report. In general, the lakes located along the main course of the diversion system might lose their thermocline, whereas for those located some distance away, such as lakes Cabot and Hore, there will be no change in thermal stratification, or only a slight accentuation owing to the slight increase in water level.

In the tailbay, the water will have a turnaround time of 8 days, with slight thermal stratification, as in the forebay. However, the water will be colder by 2°C in spring, by 0.3°C in summer and by about 1°C in fall. There may still be thermal stratification in Lake Arques, which is located along the main course of the diversion, immediately downstream of the tunnel. Its depth will increase from 20 to 24 m.

Date of freeze-up and break-up

At present, freeze-up on the Rupert River, upstream of the closure point, begins in early December and the ice cover forms quickly in sectors with slow-flowing water. Fast-flowing sectors often remain ice-free throughout the winter. During the diversion bay impoundment, planned for December, the water temperature is expected to be below 0°C, which means that the forming water bodies will freeze over quickly. Once impoundment is completed, freeze-up in the diversion bays will be governed by the flow velocity of the water. In the sections with slow-flowing water, the ice cover will thicken rapidly as the area is progressively flooded.

During the operating phase, freeze-up will occur at the same time as on nearby lakes, because of the slow current in the forebay. In winter, there will be some patches of open water, giving rise to frazil ice. For example, this will happen in the canal S73 area of the forebay, near canals 4 and 5 and between KP 20 and KP 25 of the diversion in the tailbay. The open patches in the tailbay will engender the production of large quantities of frazil ice, causing a rise of 1.6 to 2 m in the level of this water body, depending on the sector, compared with the maximum level under open-water conditions. Frazil production will be significant all along the main flow zone.

Ice break-up will occur later in the diversion bays than in the Rupert River. This is because of the large water mass being warmed by the flows from the Rupert and the thickness of the ice cover that forms on a water body that is closer to a lake than a river, notably for the forebay. In slow-flowing zones, the ice cover may persist until mid-June.

2.4.1.3 Sediment dynamics in the diversion bays

In the forebay, erosion will be greatly reduced, since the nature of the existing materials limits their resuspension. However, once the Rupert diversion has been completed, because of the flow velocities in the tailbay and the nature of the local materials, erosion will be observed in the area from canal 4 to the point where the diverted water enters the Eastmain-1 reservoir. The proponent has estimated the volume of material at about 11,100,000 m^3. Of this total, about 3,800,000 m^3 will settle further down the diversion bay, and 7,300,000 m^3 will be transported into the reservoir. This massive displacement of material, when the diversion is brought on line, will have the effect of reducing water level throughout the tailbay by no more than 1 m. The decrease in level upstream of the three instream flow release structures is estimated to be 0.4 m at the Nemiscau-1 dam, 0.8 m at the Nemiscau-2 dam and 0.7 m at the Arques Creek dike.

According to the proponent, this phenomenon of erosion of flow zones was not taken into consideration in establishing the future water levels presented in the impact study, where it is indicated that the maximum rise in level at 800 m^3/s, will vary between 4.2 and 0.1 m at various points in the tailbay. The retaining structures have been designed without considering this phenomenon, which makes them safer. Nonetheless, the drop in level was considered in designing the instream flow release structures at the closure point of the Nemiscau River, in order to ensure adequate and constant flow toward the downstream portion of the river.

2.4.1.4 Changes to the quality of water

Once the Rupert diversion is operational, water quality in the diversion bays will depend on the mixing of two types of water, i.e. that from Lake Mistassini and the Rupert River (type A) and that from Rupert River tributaries (type B). The water in the Rupert River has little colour and is very transparent, with low turbidity, a neutral pH and low conductivity and little phosphorus and organic matter. The water in tributaries such as the Lemare and Nemiscau rivers is more coloured and has similarly low nutrient levels and low turbidity but the pH is somewhat acidic.

Once the impoundment of the diversion bays is completed and the diversion is operational, water quality could change as a result of four phenomena: mixing of waters of differing quality, leaching of flooded soil, decomposition of submerged organic matter and increase in phytoplankton biomass. Mixing of types A and B will be, over the long term and permanently, the main water quality change mechanism, since 90% of the water in the diversion bays will be type A water and about 10% type B. The other three mechanisms will have a minor impact on water quality in the short term and will be quickly mitigated once the physical effects of impoundment, such as erosion, and the chemical effects, such as nutrients being released from decomposed vegetation, have stabilized.

According to the proponent, following diversion, the colour of the water will be similar to that in the Rupert River, and all the organic matter parameters will decrease. In the bays some distance from the main flow, near where water from the Lemare, Nemiscau and Misticawissich rivers empties into the diversion bays, the water will remain type B. Despite the fact that a certain

amount of organic matter will be flooded, the dissolved oxygen contents will decrease very little and will always be sufficient to maintain aquatic life. There will be an increase in total phosphorus, with values reaching 17 µg/l in the tail-bay during the first year, falling back to 4 µg/l after 7 years. This temporary increase will translate into an increase in biological productivity, which will recover to a level comparable to the biophysical environment in five to eight years post-impoundment. According to the proponent, these changes in the physico-chemical characteristics fall within critical thresholds for the various uses of water.

2.4.1.5 Main changes to traplines

Four Mistissini and three Nemaska traplines will be affected in the diversion bay section. The flooding of part of the two communities' hunting, fishing and trapping areas resulting from the diversion bay impoundment will be the main biophysical impact. 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 roads leading to and from the infrastructure will cut across the area.

The section's hydrological regime will change with the creation of the Rupert diversion bays owing to the impoundment of water bodies of various sizes, rivers and streams and the increase in the Caché Creek flow. The spawning areas of the various fish species will become unusable because of changes in spawning area conditions and characteristics. The flooding of large areas of land will also increase the dissolution of the methylmercury found in the soil and, consequently, increase absorption by, and bioaccumulation of, mercury in fish. Waterfowl and small and large animals will have to adapt to the new habitat.

These new bodies of water will change the way the Cree use the territory. Some hunting and fishing grounds will disappear, and users will have to adjust their practices to the new conditions. Users will need to modify their travel routes and adjust to new navigation and ice conditions. Permanent and temporary campsites will be flooded. The new roads will increase access to the region, which currently has very few, if any, access roads.

Of the four traplines in the diversion bay section, Mistissini trapline M25 will be the most affected: More

Table 2-13 **Area of Mistissini and Nemaska traplines flooded by Rupert diversion bays**

Trapline	Total Area (km^2)	Area Flooded (km^2)			Percentage of Flooded Land (%)		
		Land	Body of Water	Total	Land	Body of Water	Total
Mistissini							
M33	2,286	22.13	12.69	34.82	0.97	0.55	1.52
M26	688	8.37	7.40	15.77	1.27	1.08	2.29
M25	1,390	103.49	111.40	214.89	7.45	8.01	15.46
M18	1,150	37.92	18.52	56.44	3.30	1.61	4.91
Total	5,514	171.91	150.01	321.92	3.12	2.72	5.84
Nemaska							
N25	1,156	1.16	0.36	1.52	0.10	0.03	0.13
R21	688	8.74	2.79	11.53	1.27	0.41	1.68
R19	1,238	3.26	1.60	4.86	0.26	0.13	0.39
Total	3,082	13.16	4.75	17.91	0.43	0.15	0.58
Total	**8,596**	**185.07**	**154.76**	**339.83**	**2.15**	**1.80**	**3.95**

Source: Proponent's documents

than 15% of its area will be flooded and numerous infrastructure components and roads will permanently change the virtually virgin land. A dozen birthplaces and burial sites, as well as 38 permanent and temporary camps, will be flooded.

As shown in Table 2-13, nearly 5% of trapline M18 will be flooded, and roads, dikes and control structures will change the landscape. Although 2.3% of trapline M26 and 1.5% of trapline M33 will be flooded, the proponent does not intend to build any infrastructure or roads on this territory.

Part of Nemaska traplines R21, R19 and N25 will also be flooded by the diversion bays (1.7%, 0.4% and 0.1% of their respective areas).

2.4.2 Reduced-flow stretch of the Rupert River and structures maintaining steady water levels

2.4.2.1 Changes in hydraulic conditions

This section covers the instream flow regime proposed by the proponent. The analysis of the methods used and instream flows will be discussed in a subsequent section.

The proposed regime was established in accordance with the *Politique de débits réservés écologiques pour la protection du poisson et de ses habitats* (R9). The policy defines ecological instream flow as follows:

Minimum flow required to maintain the quantity and quality of fish habitat at a level deemed acceptable, so as to ensure the normal course of biological activities of fish species that complete their life cycle, in whole or in part, in the affected segment(s). The free movement of fish must be ensured through the appropriate ramping of ecological instream flow or specific changes to impassable sites.

The Boumhounan Agreement sets a minimum flow threshold of at least 20% of the mean annual flow at the closure point (i.e. 127 m^3/s) for all ecological instream flows. Under the Agreement, the proponent may not, in any circumstances, reduce the Rupert River's flow below this threshold.

Rupert River instream flow regime

The proposed instream flow regime is synchronized with three periods corresponding to the biological activities of the main fish species found in the Rupert River: the spring and fall spawning periods, the summer feeding season and the winter incubation period.

Generally, fish species, especially those valued by the Cree, spawn in the spring and fall. Spawning activity was deemed critical and was the subject of two-dimensional microhabitat modelling with a view to better defining instream flow. Walleye, longnose sucker, white sucker and lake sturgeon served as a reference for springtime activities, while lake whitefish served as a reference for the fall spawning season. These species breed in lotic areas and are especially sensitive to flow reduction.

The proponent did not adopt a modelling approach for the summer feeding season (from June to October). The presence of structures that raise water levels while maintaining lentic habitats and instream flows set by the Boumhounan Agreement were deemed adequate by the proponent. Summer flow was validated using the wetted-perimeter method, which analyses aquatic habitat area.

Similarly, a microhabitat modelling approach was not adopted for the winter incubation flow. The flow set by the Boumhounan Agreement was retained. Hydraulic conditions were subsequently verified to see whether the incubation of lake whitefish eggs was progressing normally.

The ecological instream flow regime at KP 314, which is the site of the Rupert control structure, will have the following characteristics (Table 2-14):

- The flow will be a steady 416 m^3/s during the 45-day spring spawning period.
- A minimum flow of 127 m^3/s will be maintained during the summer period, as per the Boumhounan Agreement.
- The flow will be a steady 267 m^3/s during the 31-day fall spawning period.
- A minimum flow of 127 m^3/s will be maintained for 178 days in winter, as per the Boumhounan Agreement.

At the closure point, water released at various regime instream flows correspond to 28.7% of the Rupert River's mean annual flow under natural conditions.

Although the instream flow regime was established on the basis of only a few fish species, the proponent claims that all of the other fish species found in the Rupert River will indirectly benefit from it and that none of them will be significantly affected. The regime will consist of minimum instream flows, as the proponent intends to use the structure controlling flows discharged into the Rupert River when the diversion bays are at their maximum levels and when the tunnel is used at maximum capacity (800 m^3/s).

Except in spring, instream flow periods could vary by a few days owing to the timing of ramping periods. The ramping periods for the proposed regime flows were

determined so as to replicate natural conditions, thereby avoiding sharp fluctuations in levels:

- Spring instream flow will be timed to start when flooding begins at Mesgouez Lake, that is, when inflows to the lake exceed 450 m^3/s, but will never occur before May 8 so as not to disrupt the start of the spawning period. Flow will be up-ramped over five days through six gate manoeuvres at the Rupert River's control structure.
- Following a 45-day spring flow, the flow will be down-ramped over nine days to the summer instream flow.
- The summer instream flow will end on October 5, and flow will be up-ramped by 140 m^3/s over three days to the fall instream flow.
- The fall spawning period ends with the arrival of the freezing season, when the mean daily air temperature falls below 0°C. Freeze-up begins an average of 18 days later. Flow will be down-ramped over a three-day period 15 days after the freezing season begins, no earlier than October 31 and no later than November 10. The purpose of these timeframes is to ensure the normal course of spawning. Winter instream flow begins before freeze-up to avoid a drop in water levels while ice cover is being formed, which could affect the safety of river users.

The Boumhounan Agreement provides for 10 hydraulic structures on the Rupert River to return water levels to those observed under natural conditions. Eight structure sites were selected by the proponent in agreement with Cree users. The structure sites are located near declivities (rapids, cascades or waterfalls) at KP 20.4, 33, 49, 85, 110.3, 170, 223 and 290 (Table 2-16). The purpose of hydraulic structures at these sites is to maintain the river's water levels. The structures are designed to favour or maintain navigability and sustained use for hunting, fishing and trapping. Structures at KP 20.4 and KP 170 were designed in a way to ensure that the Gravel Pit site (KP 21.35), located downstream from the Smokey Hill Rapids, and the Old Nemaska site (KP 187) are not flooded in the event of a 100-year flood.

Table 2-14 **Rupert instream flow regimes proposed by the proponent**

Season	Spring	Summer	Fall	Winter
Biological activity	Spawning	Feeding	Spawning	Incubation
Target species	Lake sturgeon, walleye, longnose sucker, white sucker	All species	Lake whitefish	Lake whitefish
Agreement or method	Microhabitat modelling	- Boumhounan Agreement - wetted-perimeter	Microhabitat modelling	- Boumhounan Agreement - hydraulics
Minimum flow at the closure point (m^3/s)	416	127	267	127
Length (days)	45	91	31	178
Timing	Flooding of Lake Mesgouez > 450 m^3/s	End of the 45-day spring instream flow	October 5	15 days after freeze-up begins
Ramping (days)	5	9	3	3
Constraints	No earlier than May 8			No earlier than October 31, no later than November 10

Source: Proponent's documents

Table 2-15 **Description of planned hydraulic structures and their areas of influence**

KP	Type of Structure	Approximate Area of Influence (km)	Fish Movement
20.4	Rock blanket	3.3	Free movement
33	Weir	15	Free movement on one branch of the river
49	Weir	15.1	Impassable natural object
85	Weir	10.8	Impassable natural object
110.3	Weir	14.7	Impassable natural object
170	Weir	44.9 (Rupert) 24 (Nemiscau)	Impassable natural object
223	Weir	47.3	Free movement through a weir notch
290	Spur	3 (Rupert) 2 (Lemare)	Free movement

Source: Proponent's documents

According to the proponent, the maintenance of Rupert water levels serves a number of environmental objectives. The rock blanket at KP 20.4 is intended to preserve the migration of fish and the spawning of lake cisco at the Smokey Hill spawning grounds. Six weirs will control the water levels of water bodies of 15 km to 47 km in length, for a total of approximately 150 km. A spur dike will close off part of the river at KP 290 to maintain flow farther upstream. The purpose of these hydraulic structures is to maintain a variety of aquatic habitats where fish can complete their life cycle. The structures will make it possible for some waterfowl species to use the bodies of water during migration or breeding. The weir at KP 170 will maintain the level of Lake Nemiscau, which is very popular with dabbling and diving ducks during breeding, as well as for the forage fish group.

The construction of the structures will begin before diversion bay impoundment and continue after the diversion is in operation. During diversion bay impoundment, temporary structures will be installed to maintain levels close to those expected during operation; weirs at KP 49, 85, and 110.3 will be built the following spring. The structure at KP 290 will be completed in late fall after diversion bay impoundment.

The exposure of banks or the riverbed will change the environment and, consequently, will be a major issue. Many of these areas are located upstream of Lake Nemiscau. The areas most affected are located between KP 220 and KP 223 and between KP 270 and KP 280. They are even sometimes found within hydraulic structures' areas of influence. This area corresponds to the section upstream of the weir at KP 223 and is exposed between KP 240 and KP 262. The downstream section is exposed, especially on the right bank, between KP 3 and KP 15 and between KP 26.5 and KP 29.5, and upstream of KP 125.

Figure 2-6 shows hydrographs under future conditions at the closure points, together with the gauging stations. Figures 2-7 and 2-8 respectively show the longitudinal profile and hydraulic structures on the Rupert River.

A total of 20 km^2 of aquatic habitat will be lost following the partial diversion. The size of sections that are not part of the areas of influence of the hydraulic structures will shrink by 12.5 km^2 and their mirror width (width at the surface) will decrease by up to 20%. The remaining area that will be lost lies within the structures' areas of influence (see Table 2-11). Maximum area exposure will occur in summer; although flow will be the same in winter (127 m^3/s), Rupert River water levels will rise as a result of the friction caused by ice cover.

The area alone does not allow for a complete understanding of all the habitat loss caused by bank exposure or changes in habitat. As a result, the proponent divided the river by habitat type representing flow facies corresponding to the river's physical characteristics (weirs, channels, lakes, basins, rapids, cascades and waterfalls). A natural weir is defined as a shoal or declivity with rapid flow, while a channel has a constant depth of more than one metre. These facies can essentially be subdivided by flow velocity (e.g. channel 1, 2 or 3). The lowest number (e.g. channel 1) corresponds to the highest flow velocity, which is usually associated with coarser substrate (EI1.6).

Table 2-16 shows the losses and gains in habitat type area for certain parts of the Rupert River defined by impassable obstacles, as calculated by the Department of Fisheries and Oceans (M32). These areas are basically quantitative estimates of environmental impacts, especially with regard to habitat available for the main species found in the river based on their preference. The different types of channels represent the vast majority of habitat available along the Rupert River. Except for Area 7, which corresponds to Lake Nemiscau, whose physical integrity will be preserved, according to the proponent, all of the other areas will shrink in size.

With the exception of Zone 8, the area of type 3 channels will increase substantially, to the detriment of type 1 and 2 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.

All things considered, Zone 8 will undergo the greatest exposure. This decrease in area is explained basically by the loss of channels 1 and 2. Unlike the situation in the other zones, type 3 channels will not increase in area.

The main physical changes regarding navigability are linked to a reduction in water levels and flow velocities following the partial diversion.

According to the proponent, the hydraulic structures planned as part of the project will make it possible to maintain, over a distance of some 150 km, the water levels currently observed during the summer low-flow period (August and September). In spite of the maintenance of these levels, the lacustrine environments thus created will be affected by a decrease of about 58 to 75% in flow velocities.

Sectors not affected by the hydraulic structures will experience a drop in water levels and in flow velocities. A decrease in water level of between 1 and 2 metres in these sectors will increase the distance between mooring spots and Cree camps. Flow velocities will decrease from 0.1 m/s, in the areas with the slowest flow, to 0.3 m/s in areas with the fastest flow velocities (Table 2-18). The flow velocity and depth data provided by the proponent represent minimum values and reflect the most significant changes from the standpoint of navigation.

2.4.2.2 Erosion and sedimentary regime

Erosion and the sedimentary regime are described in the impact statement, by stretch of river, as a function of the geomorphology of the banks and conditions observed in the field.

According to the proponent, changes to the riverbank dynamics caused by the diversion will not be significant. The will occur mainly in slow-flowing reaches, where water levels will not be maintained. Banks made of sand and fine sediment will be the most vulnerable to erosion. Erosion of the more resistant banks, consisting of till and sand/gravel materials, will be very slow and will not play any significant role in sediment dynamics.

According to the proponent, erosion of the future banks will occur mainly in the first years following the diversion. The decrease in water levels in the Rupert will cause incision by headward erosion in some tributaries at their confluence.

Upper segment

According to the proponent, the upper segment (from KP 194 to KP 314) cuts across land dominated by rock and glacial material. The banks are composed of more than 60% sandy sediment, especially downstream of KP 270, but only 3% of their length is actually eroding.

The largest decreases in flows and levels (from 1 to 2.5 m) will occur between KP 293 and the planned control structure at KP 314. The drops in level will result in the exposure of lands covering about 4.5 km^2. According to the proponent, since the river and its tributaries flow over a resistant substrate, composed chiefly of till and rock, the erosion effects will not be significant.

One of the largest areas that will be exposed (8.5 km^2) is located in the upper portion of the area affected by the weir, i.e. between KP 223 and KP 263. Although most of the exposed surfaces are composed of silty sand, they will be only slightly affected by erosion on account of their low height (under 2 m) and gentle slope.

Tributaries flowing through sandy or gravel materials will be incised very rapidly. This refers particularly to the watercourses from KP 219 to 223 and from KP 263 to 290.

Lake Nemiscau segment

According to the proponent, the banks in the Lake Nemiscau segment (KP 170 to KP 194) are dominated by

Table 2-16 Decreases and increases in area (ha) of habitat types for certain zones of the Rupert River

Habitat type	Zone 1 KP 3.5 to 24.5		Zone 2 KP 24.5 to 49		Zone 3 KP 49 to 65		Zone 4 KP 65 to 85		Zone 5 KP 85 to 108	
	before	after	before	after	before	after	before	after	before	after
Basin 1	5.2	7.0	26.3	26.7	0.9	0.5	17.7	13.1	65.7	42.3
Basin 2	0	0.0	123.5	127.2	0	0.0	91.5	80.4	170.0	148.7
Channel 1	81.8	31.8	48.2	13.3	25.4	0.2	26.6	12.6	62.9	5.6
Channel 2	520.9	60.2	636.7	18.1	475.4	15.2	227.1	17.9	576.4	43.6
Channel 3	123.8	471.2	111.5	762.7	31.9	485.7	26.6	214.9	99.7	663.3
Lake	0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0
Rapids 1	47.5	12.5	42.6	20.7	19.5	12.9	38.7	27.3	19.0	15.8
Rapids 2	27.4	34.8	54.1	51.6	16.1	16.2	46.8	42.7	28.2	22.9
Weir 1	58.9	0.0	2	0	0	0.0	2.9	0	2.4	0.0
Weir 2	70.4	86.6	1.5	0.1	0	0.0	2.6	4	1.7	1.1
Weir 3	6.2	26.1	0.4	2	0.6	0.5	1.0	0	0	0.7
Total	942	730	1,047	1,022	570	531	482	413	1,026	944

Habitat type	Zone 6 KP 108 to 170		Zone 7 KP 170 to 216		Zone 8 KP 216 to 300		Zone 9 KP 300 to 314	
	before	after	before	after	before	after	before	after
Basin 1	46.9	33.2	5.6	5.3	85.2	55.3	38.4	23.7
Basin 2	128.2	126	19.4	21.4	229.1	223.6	47.4	48.1
Channel 1	376.9	16.5	34.6	20.1	76.8	6	57.2	3.3
Channel 2	1,541	178	27	0	684	23	255	17.2
Channel 3	456	1,844	1,886	1,709	3,048	2,939	44.0	299
Lake	247.6	217	11,424	11,540	0.0	0	159.9	159.0
Rapids 1	38.4	15.9	21.2	7.7	10.4	5.4	19.7	11.7
Rapids 2	96.5	75.5	6.5	13.2	15.0	12.5	10.3	13.6
Weir 1	10.3	0	0.5	0	2.1	0.0	0.3	0
Weir 2	4.4	7	0.2	0.2	5.3	1.2	0.8	0.3
Weir 13	0.3	2.5	0	0	11.4	7.1	1	0.6
Total	2,947	2,517	13,426	13,318	4,269	3,274	635	577

Source: Proponent's documents

Table 2-17 Modification of the minimum flow velocities in areas affected by the hydraulic structures on the Rupert River

Zones affected (KP)	Minimum velocity (m/s)	
	Present	Future
20.45 – 24.15	0.54	0.20
33 – 48.15	0.39	0.12
49.2 – 64.5	0.32	0.10
85 – 95.7	0.14	0.05
110.3 – 133.4	0.24	0.10
170.2 – 214.85	0.08	0.02
223.25 – 271.3	0.38	0.10
291 – 292.5	0.30	0.08

Source: Proponents documentation

Table 2-18 Changes in the bathymetry and the minimum flow velocities in zones not affected by hydraulic structures on the Rupert River

Zones not affected (KP)	Minimum depth (m)		Minimum velocity (m/s)		Wetted area (km^2)	
	Present	Future	Present	Future	Present	Future
5.7 - 20.2	2.5	1.7	0.45	0.20	44	36
26 - 31.3	2.4	1.2	0.23	0.10		
66 - 84.8	4.0	2.3	0.13	0.05		
95.9 - 108.9	2.2	1.3	0.09	0.05		
133.7 - 169.3	3.3	1.9	0.13	0.11		
215 - 223.3	4.0	2.8	0.28	0.10	22.4	17.9
271.3 - 289.9	5.2	3.2	0.41	0.19		
294.7 - 314.3	3.7	1.6	0.48	0.12		

Source: Proponent's documentation

a natural pavement of pebbles and boulders, since the fine particles and sand are washed away by wave action.

The proponent does not expect any modification of bank dynamics to occur, because the hydraulic structure to be built at the Lake Nemiscau outlet will ensure the water level is very close to its present values. This means there should be no additional erosion and, hence, no new sedimentation source.

Central segment

In the central segment (KP 107.3 to KP 170) till and rock make up about half of the surrounding material. Erosion affects less than 4% of the streambank slopes and will generate alluvial sediment inputs to the river of less than 500 m^3 per year. The streambank slopes appear to change very slowly.

A hydraulic structure built above a set of large rapids at KP 110.3 will maintain water levels near their present values as far as KP 125. A series of rapids between KP 150 and 170 will experience a large drop in level (from 1 m to 2.7 m). The reach will be affected only slightly by a flow decrease, since its banks and exposed area consist chiefly of coarse materials and rock.

One tributary, which is located on the left bank near KP 142, could provide substantial sediment volumes. Another tributary, reaching the right bank of the Rupert near KP 162.8, could possibly become incised.

The Jolliet River (KP 129) will experience limited incision, since the decrease in level in this part of the Rupert River will be only 0.4 m.

Lower segment

The banks in this segment (KP 3 to KP 107.3) consist of 60% thick silt/clay sediments. This is the most erosion-prone segment, since the river is often deeply incised in marine clays, which are subject to slumps and landslides. Erosion will affect 12% of the streambank slopes in this segment. It severely affects the high slopes (20 m to 55 m) from KP 3 to KP 15, on the left bank, and from KP 53 to KP 80, notably on both banks between KP 67 and KP 79. The slopes in these areas now provide 70% of the volumes eroded from the banks of the lower segment. Modifications to bank dynamics will affect the slow-flowing reaches from KP 5.5 to 20.4; KP 26.5 to 29.5; KP 67 to 79 and KP 95.7 to KP 107.3, as well as a short length of rapids at the lower end of the segment, on the left bank (KP 3 to KP 5.5).

The total length of the reaches influenced by a hydraulic structure corresponds to 40% of the lower reach, or about 44 km. The hydraulic structures will help to reduce erosion.

Roughly 20 tributaries will experience decreases in water levels that could reach as much as 0.8 to 1.9 m under summer low-flow conditions. Most of these watercourses have natural weirs near their mouths and, as a result, cannot become much incised. However, two tributaries have been identified, at KP 101.5 and KP 107 that may contribute significant volumes of sediment to the Rupert River over a period of at least 10 years.

According to the proponent, suspended sediment transport in the Rupert River is 88,000 t/yr at the site where the control structure (KP 314) will be built, and sediment transport at the mouth is about 210,000 t/yr. The corresponding concentrations are 4.4 mg/l to 7.6 mg/l respectively, although they can reach 14.6 mg/l during spring flooding. Under natural conditions, the river transports 46,000 t/yr of granular material.

According to the proponent, under future conditions no sediment transport will take place at the control structure, because of the reduced flow velocity in the forebay, but it will increase to as much as 80,000 t/yr (6 mg/l) at the mouth. Bedload transport of granular material will be 11,000 t/yr.

Control of flows will be the main reason the riverbanks will supply less sediment. By raising the water level, the hydraulic structures will also help to reduce sediment runoff from the banks along nearly 154 of the total 273 km of riverine flow.

Suspended sediment transport will increase locally over a period of two to three years after diversion owing to runoff over the newly exposed banks and tributary incision.

According to the proponent, the impact of suspended solids on water quality will be noticeable only downstream of Lake Nemiscau. In the upstream area, although suspended solids will gradually increase from the diversion bay to the lake, this parameter will not change the quality of type A water in the Rupert River. Type A quality is defined on the basis of a set of optical, physico-chemical, mineralization and other parameters, as mentioned earlier in this chapter. Downstream of Lake Nemiscau there will be an increase in turbidity, with water quality going from type A to type B, which is more characteristic of the waters of the Nemiscau River. Turbidity will gradually increase from 2.8 NTU to a level of 5 to 10 NTU at its mouth. True colour, a criterion of water quality, will increase from 39 to 44 TCU. In the short term, turbidity may also reach a level comparable to that currently observed in the Broadback River.

2.4.2.3 *Changes to the thermal regime and the ice regime*

On the Rupert River, under natural conditions, the first ice appears in late November and the ice cover is present until right into May. The ice cover extends the farthest from mid-January to late March. Whereas the slow-flowing sections become covered with ice, the fast-flowing areas remain ice-free all winter. These open-water areas give rise to large quantities of frazil, which builds up in the pools at the foot of rapids and help form hanging dams. In spite of a progressive decrease in flow toward a winter low-flow level, the hanging dams and the friction of the water against the ice increases flow resistance, causing a rise in water level.

The proponent has described winter conditions on the Rupert River using data collected from 19 stations used to record water levels and flow velocities. These measurements were used to determine the relationships between these two components in order to predict, among other things, the potential exposure of the spawning habitat of species whose eggs are incubated during the winter. Special attention was paid to lake whitefish and lake cisco.

According to the proponent, downstream of the control structure on the Rupert River, water temperature will be about 1°C lower in spring and 0.3°C lower in summer and fall. No drop in temperature is expected in winter. The difference between present and future temperatures diminishes at a point 30 to 100 km farther downstream. The hydraulic structure at KP 223 will increase the residence time of the water by one day, thereby helping to bring water temperature closer to natural conditions. The other hydraulic structures planned on the lower Rupert will have no significant effect on temperature.

The ice regime will not change noticeably from current conditions. The main zones of rapids will be located around KPs 5, 25, 33, 50, 68, 80, 110, 165, 170, 217 and 285; rapids will remain ice-free and produce frazil that will build up at the foot of rapids. Because the rapids will cover a smaller area, the amount of frazil will be smaller and this will tend to delay flooding at the foot of rapids and the rise in water level due to hanging dams. This applies to the set of rapids at KP 281, the site of a lake whitefish spawning ground, from which the ice will reach upstream a month later.

The project will cause a significant increase in the extent of the ice cover between KP 168 and KP 258.2, as well as between KP 276 and KP 280.5. Along undeveloped stretches and developed stretches with hydraulic structures, lower and more stable flow velocity than at present will tend to cause the ice cover to form earlier and break up later.

According to the proponent, along undeveloped stretches, ice cover will form at a level ranging from 0.5 to 1.5 m lower. Hydraulic structures on developed stretches and instream flow will keep water at levels close to present summer levels.

Table 2-19 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 ice cover that forms at the foot of rapids or above them when they become flooded by backed-up water will minimize the exposure of spawning grounds. The water levels in some ice-free areas may drop appreciably. For example, under average natural conditions at KP 216, the transition from autumn flow velocity (942 m^3/s) to winter flow velocity (344 m^3/s) translates into a drop of 61 cm in the water level. Although the trend will be the same under future conditions, there will be a smaller difference in water level, i.e. 27 cm. This change can be explained by the smaller difference between the fall (423 m^3/s) and winter (176 m^3/s) flow velocities.

According to the proponent, the expected changes to winter conditions will be the same during the construction and operation phases, because, as soon as impoundment begins, temporary structures will be built at the site of several hydraulic structures (KP 20.4, 33, 170 and 223) in order to keep water levels close to the expected operating level during the first winter. The Waskaganish water intake pipe will be covered by at least 0.2 m of water because of delayed flooding of the rapids in early winter.

2.4.2.4 *Main changes to traplines*

Seven traplines used by the Nemaska community and eight used by the Waskaganish community border on the Rupert River, in the slow-flowing section. The changes in this section are linked to reduced flow in the Rupert River, downstream of the closure point (KP 314). In this section, the proponent plans to build the Rupert dam and eight hydraulic structures, along with associated access roads and two temporary camps for the workers.

In addition to reducing fish habitat, the hydraulic structures and the Rupert dam will destroy a few spawning grounds or affect them through changes in flow. On account of their configuration and their location near

Table 2-19 **Location of spawning grounds where incubation occurs in winter and brief description of future ice conditions**

Spawning ground (KP)	Lake whitefish	Lake cisco	Brook trout	Winter ice cover
4.5	X	X		Cover created by flooding of rapids
14-22	X	X		Cover at foot of rapids[1]
22-24	X	X		Cover created by flooding of rapids
24	X			Ice-free area associated with rapids
29	X	X		Cover at foot of rapids
48	X	X		Ice-free area associated with rapids
65	X	X		Cover at foot of rapids
79	X	X	X	Cover at foot of rapids
107.5	X			Cover at foot of rapids
214-215	X			Cover at foot of rapids
215-217	X			Ice-free area associated with rapids
281	X			Cover created by flooding of rapids

1: A patch of open water will persist throughout the winter at KP 20.4.
Source: Proponent's documentation

impassable falls, the hydraulic structures should not have an effect on the movement of fish. However, some tributaries may become inaccessible to fish. Furthermore, some uncertainty remains with respect to the changes to hydraulic conditions in the Smokey Hill fishing area. This particular point will be discussed in a subsequent section . In addition, in the area directly downstream from the spillway, an increase in the mercury level in fish is expected to occur.

Hunting, fishing and trapping activities will be disrupted during construction of the hydraulic structures. The drop in water levels will result in the displacement of some hunting and fishing areas. For the same reason, a few stretches of the river will become difficult to navigate and anyone who travels on the river will have to adjust to the new conditions. In addition, some tributaries could become less accessible to boats. Since the ice conditions will remain essentially unchanged, snowmobiling activity should not be affected. There will be a greater distance to travel between mooring spots for some permanent/temporary camps.

Traplines R21 and N25, which are located on the Rupert River near the closure point, will be affected by both the drop in water levels and the flooding of the Rupert resulting from creation of the diversion bays. Tallymen should adjust their navigation routes and identify other fishing areas. The Rupert dam and spillway will have a permanent effect on the landscape. The spur dike at KP 290 and the access roads to the facilities are in addition to these major structures.

2.4.3 Lemare and Nemiscau rivers and Arques Creek sector

2.4.3.1 Flow modifications

The Lemare and Nemiscau rivers, which are tributaries of the Rupert, will have an instream flow regime approximating the mean natural hydrograph. For technical reasons, flow will be stable during winter, since gate openings will be set in early December and not adjusted until mid-April. Flow management will ensure that these rivers are no longer subject to extreme floods and severe low-water conditions.

The Nemiscau River will be supplied via the Nemiscau-1 (C-76) and Nemiscau-2 (C-108) dams and the Arques dike (C-104). Flow adjustments will be handled at the Nemiscau-1 diversion point. The Nemiscau-2 and Arques Creek flow release structures include two pipes: the first pipe will ensure minimum flow of 0.8 and 1 m^3/s for the two rivers respectively; the second pipe, designed for a maximum flow of 6 m^3/s, will be used to discharge the spring flood peak.

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

The flow of Kayechischekaw Creek, a tributary of the Rupert, will be controlled based on its mean annual flow (0.4 m^3/s). Nonetheless, releases will vary depending on the level of the forebay. The release structure is to be built at dike C-R-7-8.

2.4.3.2 Changes to the thermal regime and the ice regime

The current and future ice regimes of the Lemare and Nemiscau rivers and Kayechischekaw Creek are not dealt with in the impact statement, because they will not be modified by the proposed instream flow regime.

According to the proponent, the diversion bays will not be thermally stratified and, therefore, the flow released in the Nemiscau and Lemare rivers will have nearly the same temperature as the water in the diversion bays. The releases to these rivers will have a temperature about 2°C lower from May to early June, 0.3°C lower in summer and 1°C lower in fall. Given the small difference in water temperature, the difference will become unnoticeable when the water reaches a point 20 km downstream from the control structures. There should be no temperature difference during the summer.

2.4.3.3 Main changes to traplines

The controlled-flow sections of the Lemare and Nemiscau rivers and Arques Creek run along the border of, or within, five traplines used by the community of Nemaska. The main change foreseen by the proponent for this area is the creation of dikes and release structures on the M25 and M18 traplines of the Mistissini community. The equivalent of the mean annual flow will be released at each of the closure points in keeping with natural hydrological fluctuations. According to the proponent, the hydraulic structures at KP 290 and 223 will ensure that water levels are sufficient at the mouths of the Lemare River and Rivière à la Marte to prevent incision and to allow for navigation. The proponent does not foresee any impacts for users of the area, except restrictions on the consumption of fish caught directly downstream of the structures, since mercury levels will be increased there.

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 825-km^2 estuarine area that is characterized by complex hydrodynamic conditions because of its large expanse and shallow depth, and the interplay of tides, weather conditions and freshwater inflows from its four major tributaries, the Nottaway, Broadback, Rupert and Pontax rivers. There are three oceanographic zones there: the freshwater zone, the mixing zone and the saltwater zone. The freshwater zone covers the upstream part of Rupert Bay, from the mouth of the tributaries to Pointe à l'Ours noir and Upemuweu Point. The mixing zone extends from between these points and the widening of the bay to beyond Saouayane and Goyeau points. The saltwater zone extends between this widening and James Bay. The zones can be distinguished by their differing tidal and salinity conditions.

Rupert Bay as a whole is shallow, with a bottom lying between three and five metres below the geodetic datum. It is a dynamic environment that has been undergoing isostatic rebound since the last ice age with effects that are observable during a human lifetime. Over the last four millennia, however, the exposure rate has remained below 0.9 m per century (9 mm/y). According to recent data, this exposure continues even today, at a rate of 4 to 9 mm/y. Predictions indicate that, if the prevailing exposure rate remains constant, Rupert Bay could disappear in a 1,000 years or so, and Boatswain and Cabbage Willow bays in less than 500 years.

Under natural conditions, the Rupert River has a mean annual flow of 875 m^3/s, the Nottaway River has a flow of 1,161 m^3/s and the Broadback, 379 m^3/s. Following the diversion bay impoundment, the mean annual flow at the mouth of the Rupert will decrease from 875 m^3/s to 423 m^3/s at KP 0, and the freshwater inflow into Rupert Bay will decrease by 51% on average.

The reduced flow will cause changes in water levels in the Rupert River estuary, between KP 2.2 and KP 8, which will vary throughout the tidal cycle. For mapping purposes, the proponent set KP 0 near the community of Waskaganish. At present, the river bed is at a depth of only a few metres immediately downstream of KP 5, as

Table 2-20 **Flows at KP 0 and KP 314**

Period	Instream flow at KP 314 of the Rupert River (m^3/s)	Flows at KP 0 (Waskaganish) (m^3/s)		
		Present conditions	Future conditions	Decrease (%)
Mid-May to mid-June	416	1,210	782	35
Early July to late September	127	1,020	411	59
Early October to mid-November	267	1,060	530	50
Mid-November to mid-May	127	667	309	53
Mean annual flow		875	423	51

Source: Proponent's documentation

well as to the west of Waskaganish. The tide is the main factor influencing water levels in the Rupert River estuary. Tidal influence is felt as far as the first rapids at KP 5.

According to the proponent, once the diversion has been implemented, the weakened flow strength of the Rupert River will enable the Nottaway and Broadback rivers to flow more easily northward, causing a slight increase in the residence time of the water (about one to two days) in Rupert Bay upstream of Stag Island. Closer to Waskaganish, the level of the River estuary will continue to be affected by the tides. Water level in the estuary at high tide will be similar to that seen under present conditions, and the effect of the diversion will be imperceptible. At low tide, water levels will be 60 to 70 cm lower upstream of the village. The drop in water level compared to natural conditions will last longer at KP 2.2 than at KP 0, near the village, because of the more extensive influence of the tides. This difference will lessen progressively in a downstream direction and, by the time the water reaches KP 8, the decrease in water level at low tide will be only a few centimetres. Channel depth, currently five to six metres, will therefore change to a depth of four to five metres.

Under open-water conditions, flow velocity will be 30 to 40 cm/s lower upstream of Waskaganish. This decrease will be less and less perceptible near the north and south channels at the mouth of the Rupert, west of Waskaganish.

2.4.4.2 Modification of the current flow pattern

As already mentioned, there will be a reduction in current strength in the Rupert River and its hydrodynamic influence on water circulation in the bay will also be reduced. This new situation will cause general freshwater flow patterns to be displaced toward the northeast, particularly during periods when the bay is ice-free. When the ice cover has formed, these phenomena will be of lesser magnitude, because flow velocities will be reduced by the friction created by the water moving against the ice and because of the natural decrease in flow velocity during the winter.

According to the proponent, aside from the banks at KP 4.5 and near the village of Waskaganish, where stabilization work had to be carried out, the banks are stable. The shoals that can be seen at the river mouth are not the result of erosion but rather remnants of the Tyrell Sea and, hence, they do not constitute a delta. Sediment supply from the Rupert River will decrease by 65%, reducing the risk of silting up of the navigation channel opposite the village. However, given the gently sloping banks on either side of the flow channel from KP 2.2 to KP 8, an additional area of 425 ha will be exposed at low tide, particularly on the left bank, where the foreshore broadens substantially at low tide, reaching 1.5 to 2.5 km. After the partial diversion, there will therefore be an increase in the extent of the area that is exposed by the tide.

2.4.4.3 Displacement of the saltwater intrusion

As mentioned in a previous section, the bay consists of three oceanographic zones. The freshwater zone contains fresh water at all times. In the saltwater zone, salinity ranges from 10 to 20%. In the mixing zone, movement

of the saltwater intrusion is dependent on climatic conditions. At present, under open-water conditions, the landward limit of the saltwater intrusion is located at the mouth of the Pontax River. When ice cover is present, the saltwater intrusion remains farther downstream, because of dampening of the tidal wave by friction against the ice.

Under future conditions, more specifically as a result of the reduced inflows from the Rupert, the saltwater intrusion limit (0.5‰ for at least 6 hours) will move about 5 km upstream, pushing back the freshwater zone somewhat and causing a slight increase in salinity between Stag Rock and Stag Island. Figure 2.9 shows current and future summer saltwater intrusion limits. Since these changes will occur near the mouth of the Pontax River, work was done to determine whether this river might be affected by the saltwater intrusion in the bay. Under present conditions, at the points used in a model designed to simulate salinity, flow velocities and water levels, the simulated salinity does not exceed 0.5% at the river mouth, downstream of Jolly Island. Under future conditions, based on the proponent's findings from flow velocity and salinity modelling, the salinity could reach 3% at the margin of the shoals. However, at the modelling point closest to the mouth, salinity will generally range from 0.5 to 1%. Flow velocity at the mouth of the Pontax River is presently, and will always be, affected by tidal currents, which cause the flow to slant southward or northward depending on the tidal regime, without any overturn. Consequently, it plays a role in pushing the salinity isocontours seaward and protects the river mouth.

2.4.4.4 Main changes to traplines

Seven traplines used by the community of Waskaganish border on Rupert Bay. Two of them are located on either side of the river estuary, between KP 0 and KP 5. Reduced flows will be the main cause of changes affecting these hunting areas.

The proponent does not foresee any changes in the freeze-up and break-up periods, or in the thickness of the ice cover in Rupert Bay. In the estuary, however, freeze-up will occur a little earlier. The ice cover in the area of rapids at KP 5 will form later owing to the decrease in frazil production in the Rupert River upstream of KP 5.

According to the proponent, although turbidity will be slightly higher in the river and the water levels will be lower, the quality of the drinking water used by the village will not be compromised, because a water treatment plant is to be built.

The proponent does not expect any impact on the reproductive functions of the fish communities that live downstream of the first set of rapids. The lower water level and slower current will cause a temporary expansion in certain low marshes and submerged aquatic beds. This will have a positive effect on fish habitat and on waterfowl use of the sector.

Families of tallymen and members of the community of Waskaganish regularly frequent the bay, its shores and several islands all year-round. The proponent does not foresee any effects on activities carried out in the bay, including fishing, hunting, berry harvesting, cultural and educational activities and boat and snowmobile travel.

The Waskaganish community uses the estuary and the islands for recreational and ceremonial purposes, as well as for fishing and waterfowl hunting. According to the proponent, the drop in water levels in this area will not affect these activities, with the exception of fishing in the zone immediately downstream of the first set of rapids. Estuary users will have to adapt to the new fluctuations in water levels.

2.4.5 Increased-flow sector

2.4.5.1 Change in flow

The increased-flow section extends from the Eastmain-1 reservoir to the La Grande 1 reservoir. Figure 2-10 shows the section made up of the Opinaca reservoir and Boyd-Sakami system, whereas Figure 2-11 presents the section including the Robert-Bourassa reservoir up to the La Grande Rivière estuary.

The increased-flow section is characterized by numerous modifications that already occurred in the region during the construction and operation phases of the La Grande Complex and the Eastmain-1 powerhouse, whose reservoir was impounded in the fall of 2005. At present, the waters that flow along this route come from the Eastmain River through the Eastmain-1 reservoir as well as from the tributaries of the Opinaca reservoir. This is what the proponent used as the reference conditions for the Eastmain-1-A and Rupert Diversion project. Since the impoundment of the Eastmain-1 reservoir, the pre-1980 mean annual flow of the Boyd-Sakami system has been increased by a factor of 48.8 at the outlet of Boyd Lake, and by a factor of 5.9 at the outlet of Lake Sakami. Table 2-21 shows the range of flows observed at different times of the year at different points in the increased-flow section, under reference conditions.

It should be noted that the minimum and maximum flow velocity values may correspond to different

Table 2-21 **Range of monthly flows (2004) (m^3/s)**

Downstream of Eastmain-1	Sarcelle	Outlet of Lake Sakami	Downstream of Robert-Bourassa
429.4 -745.3 (May–October)	497.5 – 1,094.8 (March–June)	537.5 – 1 387.2 (March–June)	2,194.4 - 3,978.1 (May–January)

Source: Proponent's documentation

Table 2-22 **Range of transitional monthly flows (m^3/s)**

Downstream of Eastmain-1	Sarcelle	Outlet of Lake Sakami	Downstream of Robert-Bourassa
672.4 - 1,320 (April–October)	768.9 - 1,636.8 (April–October)	814 – 1,800.9 (April–October)	2,519 – 4,541.4 (May–January)

Source: Proponent's documentation

Table 2-23 **Range of future monthly flows (m^3/s)**

Downstream of Eastmain-1	Sarcelle	Outlet of Lake Sakami	Downstream of 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)

Source: Proponent's documentation

months, depending on the points where the measurements were taken. For example, the minimum monthly value observed downstream from the Eastmain-1 dam corresponds to May, whereas the corresponding value for the point downstream of the Sarcelle site is in March. This situation can be explained by the fact that the Opinaca reservoir levels are not synchronized with those of the Eastmain-1 reservoir. The same is true for the Robert-Bourassa reservoir, for which minimum flow is in May and maximum flow in January. Management of the powerhouse explains this situation.

Once the Rupert diversion is in operation and until the Eastmain-1-A powerhouse is commissioned described as a period of transitional conditions—flows will increase throughout the sector (Table 2-22).

Note that, contrary to the situation that exists at present, the minimum and maximum flow values will occur during the same periods of the year all along the system, from the Eastmain-1 reservoir to the Robert-Bourassa reservoir. After that, the Robert-Bourassa powerhouse will be managed separately from the facilities located farther upstream. According to the proponent, between the time the Rupert diversion is implemented and the Eastmain-1-A is commissioned, spills from the Eastmain-1 spillway will total 254 m^3/s on average, or more than half of the flow derived 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, once the Eastmain-1 powerhouse is commissioned, the minimum and maximum flow values will not differ much from the transitional situation, with the Rupert diversion being the only factor. Table 2-23 shows the expected range of monthly flows once the project is fully operational. It should be kept in mind, however, that the instantaneous flows might be higher than the values presented here. For example, the Sarcelle powerhouse could discharge 2,770 m^3/s, of which 1,305 m^3/s would be turbined.

2.4.5.2 Hydraulic modifications

After the impoundment, the operating levels for the Eastmain-1 reservoir will range from 274.11 m to 283.11 m, which represents a drawdown of 9 m. The same drawdown will exist following the diversion of the Rupert River and when the Eastmain-1-A powerhouse is in operation. However, the water level will fall to its lowest level more rapidly, at the end of winter, and the minimum level will be reached more often.

Along the lower part of the Eastmain River, as far as the Opinaca reservoir, the water level immediately downstream from the powerhouses will be about 50 cm higher; however, it will subsequently return to the present levels observed roughly 3 km downstream of these facilities. Flow velocity in this portion of the river may increase by 30 to 90%, depending on the turbined flow. Fluctuations will occur suddenly and on a daily basis, because the Eastmain-1 and Eastmain-1-A powerhouses will produce energy to meet peak demand during some periods of the year.

The JBNQA sets the operating levels at the Opinaca reservoir; the level currently ranges from 211.84 m to 216.41 m. The levels will be the same under future conditions, once the diversion and the Eastmain-1-A powerhouse are operational. The mean annual level will increase by about 50 cm, remaining, nevertheless, within the present range of levels. The largest difference between the present level, with the inflows from the Eastmain-1 reservoir, and future levels, with the Rupert diversion and the two powerhouses up and running at the outlet of the Eastmain-1 reservoir, will occur in December and will be about 55 cm.

A simulation shows that the flow velocities at the outlet of the Sarcelle powerhouse will be lower than the velocities that currently exist at the control structure outlet. The flow velocities will drop from about 2.2 m/s to 1.4 m/s. A little farther downstream, where the proponent plans to create replacement spawning grounds for a number of fish species, the flow velocity will increase to 2.4 m/s or higher.

Downstream from the Sarcelle powerhouse, in the Boyd-Sakami system, the flow velocities will vary widely. Under present conditions, flow velocities tend to be low in Boyd Lake, except in a few narrow zones, where the flow velocity is about 1 m/s. Because of the steep streambank slope, flow velocity can be as high as 5 m/s in the Boyd River, which links Boyd Lake and Lake Sakami. Lake Sakami has the same profile as Boyd Lake, with low flow velocities, except in some narrow sections. Finally, in the Sakami River, the flow velocities are in the order of 4 m/s. Under future conditions, all these flow velocities will increase in narrow passages and in spots where there is a big drop in elevation.

The Rupert diversion and the commissioning of the Eastmain-1-A powerhouse will cause an average water level increase of around 65 cm in Boyd Lake. In the Boyd River, between KP 101 and KP 106, there will be a 54% increase in mean annual flow, which will flood some riparian strips and some islands that are permanently exposed at present. Farther downstream, no flooding will occur because of incision of the riverbed.

In Lake Sakami, there will be a mean water level increase of 45 cm, and a decrease in drawdown during ice-free periods. The maximum increase from the historical maximum is estimated at 15 cm. This is lower, however, than the maximum level stipulated in the agreement. In the Sakami River, with flow increasing by 46%, there will be slight flooding between KP 7 and KP 14 under maximum flow conditions.

The drawdown at the Robert-Bourassa reservoir, which is currently 7.62 m, will not change appreciably. The only difference will be a larger decrease in spring and summer. The mean level in La Grande 1 reservoir will be roughly 30 cm higher under future conditions, but the maximum level will stay the same since the design flow of the La Grande-1, Robert-Bourassa and La Grande-2-A powerhouses will not change.

2.4.5.3 Changes to the thermal and ice regimes

Under present conditions, the Eastmain-1 reservoir is covered with ice from the first two weeks of November until May. As levels drop in winter the ice cracks along the banks and settles to the bottom. Between the Eastmain-1-A powerhouse and the Opinaca reservoir, the ice cover on the Eastmain River is continually forming and vanishing owing to the temperature of the water exiting the Eastmain-1 reservoir and daily flow rate variations. The ice cover is therefore unstable and inaccessible to snowmobilers. The Opinaca reservoir essentially goes through the same freezing and thawing periods as the Eastmain-1 reservoir, and the ice cover is therefore passable for snowmobiles.

Under current conditions, still water areas in the Boyd-Sakami system ice up as rapidly as do the surrounding lakes. However, the Boyd and Sakami rivers remain ice-free all winter and produce large quantities of frazil ice that accumulate at their mouth, i.e. at the entrance to Lake Sakami (KP 92 – KP 84) and near the Robert-Bourassa reservoir (KP 11-1). Increases in water levels can reach five metres. Under the combined influence of the temperature increase and increased flow at the Sarcelle site, the ice breaks up early in the spring. The Robert-Bourassa reservoir ices up in early December, with break-up occurring in mid-June. The surface water in the section of river between the Robert-Bourassa powerhouse and the La Grande-1 reservoir flows freely all winter. In the La Grande-1 reservoir, the ice cover forms and breaks up at the same time as that

on the major natural surrounding bodies of water, with areas where the ice is permanently thinner.

According to the proponent, after the Rupert diversion and the commissioning of the Eastmain-1-A powerhouse, future conditions will include an average 54% increase in flow in the increased flow section. In the Eastmain-1 reservoir, freeze-up will occur slightly earlier, but overall, conditions will resemble those that currently prevail. Ice cover in the Eastmain River will be slightly more extensive, but constant changes in hydraulic conditions will keep this segment of the river inaccessible. Generally, ice conditions in the Opinaca reservoir will be identical to current conditions and are considered safe, with the exception of the Wabamisk Narrows, at the entrance to the reservoir, where there will be some open water areas as there are now. The open areas are expected to become larger under future conditions.

Under future conditions, ice cover in the Boyd-Sakami system will remain unchanged from current conditions. However, ice-up will occur later and end earlier than ice cover in the Rupert diversion bays. The fast-flowing stretches will always be open and produce slightly more frazil ice, which will be carried further downstream by the increased flow. For example, at the Boyd River exit, the frazil dune will move one kilometre downstream. Water levels will remain practically unchanged, with a maximum 0.45-m increase at KP 91 of the Boyd River, where the river narrows considerably. At the mouth of the Sakami River, the inverted frazil dune will also move downstream, which will produce little flow obstruction and cause a general 1.5-m drop in the water level from current levels, downstream of KP 11.

With respect to use by snowmobilers, Lake Sakami and Boyd Lake will become accessible, on average, six days and four days later, respectively. They will cease to be accessible in spring at virtually the same dates as under current conditions. The total open water area will increase, particularly in the stretch between KP 100 and KP 106 of the Boyd River, which will no longer be safe for snowmobiling.

With respect to the Robert-Bourassa reservoir, freeze-up will continue to occur later, and the ice regime in the La Grande-1 reservoir will remain unchanged. Under future conditions, the winter regime and the accessibility of the ice cover of both reservoirs will therefore be unchanged.

2.4.5.4 Erosion and sedimentation

Generally speaking, the increased-flow section is characterized by a succession of large bodies of water that act as sediment traps for upstream eroded matter. The Eastmain-1 reservoir also serves as a sedimentation basin for suspended solids carried by the Eastmain River. Since flow through the stretch of the river emptying into the Opinaca reservoir will be comparable to flood flows under natural conditions, erosion is not expected to be significant. This will also be the case for the Opinaca reservoir and the Boyd Sakami system, where massive erosion was observed following the commissioning of the Eastmain/Opinaca/La Grande (EOL) diversion in 1980. The substrata exposed by the massive flow increase became erosion-resistant. This will also be the case for the Robert-Bourassa reservoir.

The La Grande-1 reservoir is the portion of the increased-flow section where erosion is the most significant. In fact, between KP 37 and KP 95, the banks are sandy or silty, and the higher water level will reach particularly sensitive substances. Wave action and freeze/thaw cycles have caused and will cause further erosion and potentially major landslides. The most active section is located between KP 65 and KP 89. Unlike the Boyd-Sakami system, there is still much erosion, in spite of the reservoir's age.

Table 2-24 **Eroded volumes and deposit points of matter along the system**

	Boyd Lake	Boyd River	Lake Sakami	Sakami River
Eroded volumes (m^3)	200,000	850,000	2,700,000	820,000
Deposit point	In the lake, downstream from KP 118	Lake Sakami	In the lake, downstream from KP 85	Robert-Bourassa reservoir
% of volume of receiving body of water	0.05%	N/A	0.05%	Negligible

Source: Proponent's documentation

Under future conditions, the section between the Eastmain-1 reservoir and downstream from the Sarcelle site will not experience any erosion recurrence, with the exception of the deepening of the Wabamisk Narrows at the entrance to the Opinaca reservoir. However, along the Boyd Sakami system, a greater volume of matter torn from the banks will be carried farther downstream with the increased flow. Table 2-19 shows the volumes in question, their source and their deposit point.

In the La Grande-1 reservoir, the implementation of the project will result in an average flow increase of 14%, without changing the maximum operating turbined flow. According to the proponent, bank erosion will continue at the current rate, since neither water level variations nor the flow velocity will be altered by the commissioning of the Rupert diversion and Eastmain-1-A powerhouse.

2.4.6 The La Grande Rivière estuary and James Bay coast section

The proponent deems it 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 the La Grande-1 dam. The mean annual flow in this section is estimated at 3,287 m^3/s. The 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 2-25.

After the Rupert diversion begins to operate, the mean annual flow in the La Grande Rivière estuary will increase approximately 450 m^3/s, or 14%. The design flow of La Grande-1 will not be modified and will remain at 5,950 m^3/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 the 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 aviation 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 in comparison with its previous levels under natural conditions. This increase has been accompanied by a seasonal inversion of 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 the 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 (from 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.

Table 2-25 **Current and Future Hydrological and Hydraulic Conditions in the La Grande Rivière Estuary**

Variable considered	Current Conditions	Future Conditions
Mean annual flow	3,287 m^3/s	3,736 m^3/s
Minimum flow (950 m^3/s)*	2 % of the time	< 1 % of the time*
Flow > 3,300 m^3/s	50% of the time	67% of the time*
Reaching of design flow (5,950 m^3/s)	3% of the time	Idem
Daily variation > 430 m^3/s	98.5 % of the time	Idem
Daily variation > 870 m^3/s	90% of the time	Idem
Daily variation > 1,700 m^3/s	50% of the time	Idem
Daily variation > 2,600 m^3/s	10% of the time	Idem
Minimum water level at Chisasibi	0.25 m	0.45 m**
Maximum water level at Chisasibi	2.50 m	2.70 m**

*: Graphic estimate based on Figure 14-2 of the impact assessment.
**: Estimate based on the mean annual flow (impact assessment).
Source: Proponent's documentation

Eroding banks in the riverine and delta segments of the La Grande Rivière respectively generate 50,000 and 84,000 m^3 of material per year. These volumes represent annual inflows of 64,000 m^3 of sand and 70,000 m^3 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 the 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 the Robert-Bourassa reservoir, rises going downstream, probably because of re-oxygenation in the rapids. Water from the Robert-Bourassa reservoir is clearer than before the hydropower developments, owing 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 km 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 now 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.

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 ‰ salinity. The winter plume, measured after La Grande-2-A generating station came into service, ranged between 3,200 and 3,500 km^2 for a flow of 4,600 m^3/s (February 1993) and between 2,100 and 2,800 km^2 for a flow of 4,400 m^3/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 km^2, for a flow of 5 000 m^3/s and complete coastal ice cover. This value falls within the natural variation of the plume size of 3,200 and 3,500 km^2 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. Figure 2-12 shows the James Bay coast and the La Grande Rivière estuary, and the maximum extension of the plume under ice cover (1985).

Summer plume

According to 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 m^3/s caused by the Rupert River diversion will not lead to any measurable change in the summer plume.



3

Stakeholder Concerns Expressed at the Hearings

3. STAKEHOLDER CONCERNS EXPRESSED AT THE HEARINGS

Introduction

In assessing the project, the two review bodies jointly held public hearings on the project's social and environmental impacts and 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 thus improve their understanding of the issues involved. They also provide an opportunity 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. 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 able 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 could speak in person or submit briefs.

Sections 3.1 to 3.6 present a summary of the main comments and concerns of the populations of the six 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 six 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.

Before presenting the actual summaries of the public hearings held in the Cree communities, it should be emphasized that many Cree presentations consisted of testimonials as to their close ties to the land and to natural resources, the importance of spirituality 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 in the James Bay region, 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). At 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. They thus consist of a French translation of an English translation of comments made in the Cree language.

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 were also significant differences in the types of comments and concerns expressed by stakeholders. While the Crees expounded at length on the impact of hydroelectric projects on their culture and traditional lifestyle, as well as on the fauna in the James

Bay region, stakeholders in Chibougamau and Montréal focused instead on the issue of regional and provincial economic spinoffs from the project, comparing hydroelectricity generation and other power sources in terms of environmental impacts. Lastly, the Creeps mainly spoke on their own behalf, alluding to past experiences as a result of hydroelectric 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 into 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 six 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. Quotes are used solely to support analyses 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 expressed in Mistissini

Public hearings were held during three 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 hydroelectric power projects on the Bay James region, but also the project being assessed. The comments were grouped into three major categories: social problems, psychological effects and project rationale.

Social problems related to development projects

Many people believe that hydroelectric power projects over the past three decades in the Bay James region are directly responsible for various social problems, which were practically non-existent in Cree communities until then. The representative of the Cree Board of Health and Social Services of James Bay (CBHSSJB) says it is not be fully convinced that the project's benefits for the entire Quebec population will exceed its negative impact on Cree communities. In her opinion, a number of major individual and community problems are directly linked to hydroelectric power development projects. Crees began eating significantly 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 increased obesity and diabetes among the Cree population.

Subsequent to various major hydroelectric power 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 with the financial means to purchase alcohol or drugs: “People abusing alcohol, drugs because they have money to spend on alcohol and drugs” (VAP1, p. 76)[6] . A significant surge in the number of road deaths and drowning has been noted since 1985, possibly caused in part by the opening of the territory as a result of hydroelectric power projects.

Lastly, job creation within the framework of such projects can result in greater inequities among families and within communities, creating class distinctions based on economic factors (such as income). According to a participant, the Eastmain-1 project has had negative impacts because it generated additional income for

6 Official quotes from English transcripts of public hearings – Not a translation of the French report

certain Cree families: "And some of them don't even share the money that has been given by Hydro-Québec and it creates fights among these families" (VAP2, p. 36). Such social inequality can 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 impact on their territory, notably given their strong ties to the land and its significance to their way of life: "[…] today we come to you to express our deepest sadness thinking of what s coming our way... we have to voice our pain and the pain of our parents when we think about the loss that we will experience" (VAP1, pp. 98-99). For some residents, this feeling of loss is specifically linked to the flooding of land: "And so, when you flood these areas, you flooded not just the land, you flooded our memories" (VAP3, p. 65). The CBHSSJB shares this opinion: "The project will involve numerous losses for the Cree, loss of land which people have hunted, loss of landscape which have been familiar for thousands of years, loss of traditional burial grounds and camps, invasion of their traditional lands...These losses are partially compensated by the various programs outlined in the impact statement and the Nadoshtin and Boumhounan Agreements. But losses need to be mourned, grieved. Grieving is inevitable. There will have to be traditional ceremonies to help people to overcome the loss and grieving. The psychological impacts are immeasurable but yet very evident in the daily lives of many, daily lives of many in the communities." (VAP2, pp. 45-46)

Project rationale

Given the significant value of the Rupert River to the population, some participants cast doubt on the project's rationale. Some wished to know what Quebec's actual power requirements were, and wanted further 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 face 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 said, in fact, that it was important that the Government of Quebec acknowledge his family's decision to cede a part of their trapline for the good of the Cree community, Quebec society and future generations (VAP1, pp. 103-104).

3.1.2 Questions for the proponent

At the three public hearings, a few brief requests for additional details on various topics were made. While the majority of participant statements related to these requests, often specific, do not allow for in-depth analysis, they nonetheless illustrate concerns that deserve to be reported as accurately as possible. Among the topics raised:

- the water level of the Rupert after diversion;
- environmental assessment processes and the roles of the persons involved, including decision-making authorities;
- the instream flow regime prescribed in the Boumhounan Agreement and the role of review bodies in this regard;
- the impact on fish feeding areas in the Rupert diversion bays;
- the notion of "ecological energy" as it relates to hydroelectric power projects;
- Hydro-Québec hiring criteria, among them the condition of a mastery of the French language, as well as guarantees whereby impacted families would benefit from contracts for construction of the works and subsequent follow-up.

Main concerns with regard to the project

Various concerns regarding the project were raised by participants. These involved the importance accorded to traditional knowledge, the fear that other hydroelectric power projects would follow this one in the region, the impact on fish, the decline in sport fishing activities and the safety of the dams being operated.

Recognition of traditional knowledge in monitoring and follow-up programs

Many Crees were concerned by the significance and place that would be given to their traditional knowledge in the development and execution of Hydro-Québec's monitoring and follow-up programs. Some community 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 serious consideration. Others emphasized that they had not been adequately consulted by the proponent in the past, and wanted their traditional knowledge to be given more consideration in the future, especially 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 the follow-up studies that the way these studies are conducted. We have had too many disappointing experiences with Hydro-Québec, *SEBJ* telling us we would have a say in the way things are conducted and in the end, we did not participate in a proper way." (VAP1, pp. 113-114)

Someone else specified that it was mainly consultants hired by Hydro-Québec who failed to take traditional Cree knowledge into account: "I know Hydro-Québec and *SEBJ*. They have good intentions, at times, but it's only those that they hire, the other companies, other consultant groups, they have a different perspective with the Crees. They don t understand or listen to the Crees as they do with their own consultants. That's not the way it should be. I know what it should be like concerning works on the project […]". (VAP3, p. 69)

The fear that other hydropower projects would follow in the region

Several Crees emphasized their fear that other hydropower projects would be constructed in the James Bay region in years to come. From this standpoint, they sought assurances from the proponent that the integrity of Mistissini Lake 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 Mistissini people now expect and hope that the lake will be fully protected in its present state and that it will form a central feature of the proposed Otish-Albanel-Témiscamie Park which is now being developed in our territory. But there are members of our community who still have concerns that the lake may one day be affected by hydroelectric development. Our people seek assurances that this will not happen." (VAP1, pp. 90-91)

Impact on fish

Strengthened by their experiences from the construction of past hydroelectric power 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 concern for fish mercury levels.

Initially, various participants requested additional details regarding the effect on spawning grounds, notably those of sturgeon and lake trout. They were particularly sceptical concerning the success rates for the creation of spawning grounds in other areas, and asked for specific examples—with good results—elsewhere in Quebec.

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.

Decline 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: "[…]nowadays it's really hard to sell the Rupert River as a fishing destination and the project hasn't even gone under way and hasn't even been approved and it is hard to convince now people to my potential clients that the Rupert River still is a good river to fish […]we're struggling to convince our clients, our potential clients to come up and fish on the Rupert River. And some even say that, you know: 'Let's go and see this river for one last time'" (VAP1, pp. 51 and 57)

The safety of dams at the Eastmain-1, Opinaca, La Grande-2 and La Grande-1 reservoirs

Various participants expressed concerns 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 ago, are not designed to receive a greater water volume. In this regard, one of the participants asked a clear question of Hydro-Québec representatives: "those dams are 30 years old now almost… are you prepared, for this much extra water?" (VAP2, pp. 18-19)

3.2 Comments, questions and concerns expressed in Nemaska

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

3.2.1 General comments

The vast majority of residents took the opportunity 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 practiced and continue to practice their traditional activities. Using 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 hydroelectric power projects, with the exception of a few persons who observed a direct link between these projects and lifestyle changes: "I sit here before you and I cannot speak like my dad as he used to speak. ….Life has changed. We now have ski-doos instead of using snowshoes all the time. We now have, you know, ski-doos instead of dog teams. Main motor transportation for us on the trapline is our ski-doos. Life has changed. Great change has come to our way of life. Since we signed the original *James Bay and Northern Quebec Agreement*, life has changed." (VAP6, p. 77)

Alternative solutions

Other than the various presentations regarding the practice of traditional activities, the main comments voiced by the public addressed the proponent's assessment of various alternative solutions for the project. Various Nemaska residents believe that the proponent has not sufficiently focused on assessing alternative solutions for power generation in the James Bay region. 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 wind power could not adequately replace this project from either a technical or economic perspective. The Chief of the Nemaska First Nation is of the opinion that the wind industry in the James Bay region would have fewer environmental impacts and would be more socially acceptable to the population: "I also believe it would have a less of an environmental impact in the territory than a diversion project would. I also believe that it would be more socially acceptable. It would be a very interesting way to diversify the type of development that has taken place in the region to-date and the way the Crown corporation, the proponent, Hydro-Québec has produced energy in the past." (VAP7, pp. 60-61)

In another vein, a community member proposed another solution, namely the erecting of dams or generating stations on sites that are already extensively used for hydroelectric power generation. He offered the following example: "I know one power has been brought up. But I saw the map, the land tenure map…, I saw where they built LG-2-A and I'm asking why can't Hydro-Québec use the water they already have by building, let's say, LG-3-A or LG-4-A instead of destroying another river? That's the other option. The water is there already like at Robert-Bourassa, LG-2 reservoir, they built." (VAP7, p. 79)

3.2.2 Questions for the proponent

Participants also asked general questions on a wide range of topics. Mostly intended 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-1 project and the Eastmain-1-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 related to 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 brought out about ten concerns, shared by various persons.

Jobs

Nearly all of the residents who spoke of the planned jobs during the project construction phase noted that these would be temporary in nature. In fact, they dis-

cussed the growth phase during construction, followed by a slowdown once operations begin, better known as the 'boom and bust' phenomenon, which impacts employment and economic activity in a community during the construction of a project. According to the CBHSSJB representative, people in the region are very familiar with this phenomenon: "Although jobs will increase through this project, the boom and bust phenomenon is a well-known feature of all development projects, lots of jobs during the construction phase, fewer jobs during the operation phase." (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 trapline and who are looking for ways to meet their needs and those of their families. Residents thus frequently asked the question: "What happens after the construction is finished?"(VAP4, p. 82) 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 hydroelectric projects, it would appear more difficult for them to resume their traditional activities. The comments of one resident aptly summarize an opinion shared by certain other community members: "But what happens when suddenly there is no work? What will happen to our young who also are not able to have a strong base in traditional way of life on the land?" (VAP5, pp. 93-94)

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: "If they are not touched at all by development shall in the future remain the same." (VAP7, p. 9)

Water quality in the Rupert River

Numerous participants expressed concern about the project's impact on the quality of the water of the Rupert River. This was one of the primary concerns raised at the public hearings in Nemaska. Most people are convinced that the water quality in the Rupert River will never be the same again if the project goes ahead, despite the proponent's reassurances. Some Crees questioned the impact of dynamiting and the presence of extensive infrastructure on the quality of the river water. It was also mentioned that many Crees now drink water from the river, without treating it in any way first. Participants fear that people will stop drinking the water, assuming it to no longer be potable as a result of the turbidity caused by changes in the flow of the river and its tributaries: "Presently on the Rupert River and Lake Nemiscau, the quality of drinking water is very good. One can take a cup and drink directly from the river and lake. The family is very concerned about the quality of water due to the turbidity in the event that the project goes ahead." (VAP5, p. 64)

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 Nemiscau 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 if the project were to go ahead, and it was indicated that "more specific studies should be done on our lake here and more particularly on the sources of water flowing into it." (VAP7, p. 87)

Concerns also addressed maintaining the natural water levels of the Nemiscau River and Nemiscau Lake, as well as the impact on fish habitats in these environments. According to one of the speakers at the public hearings, several of the existing fish habitats in the Nemiscau River and Lake are considered good fishing grounds, and she does "not believe statement when they say that none of these fishing spots will be affected." (VAP7, p. 95) This person does not believe that the project will not have an impact on water levels and 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 provide for seasonal variations throughout the year. The proponent explained that instream flow variations had been determined, among other ways, by taking into account the life cycles of fish living downstream of the Rupert dam, with a view to ensuring they would find themselves in "acceptable habitats". Despite these explanations, the point was made that natural seasonal and

annual water level variations should be taken into account, along with average precipitation.

Global warming

A number of participants voiced their thoughts on global warming. While some wondered what impacts this phenomenon could have on the environment within the framework of the project, others feared that the project would contribute to the phenomenon. Some Nemaska residents felt 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 worried about the phenomenon, wondering whether it could have a negative impact on the fish in the reservoirs created by the project: "Will the water, do you expect that the global warming, that the water in these long...series of long pools will become much hotter than usual. Will that affect the movement of the fish in these reservoirs, moving and going elsewhere or will they look, go to other places for feeding?" (VAP5, p. 29)

Others consider hydroelectric projects as belonging to the group of projects that contribute to global warming, and feel that the proponent's environmental impact assessment should have lent greater weight to this reality. One person noted that: "They are altering the natural habitat, flows, waters, the land and all of these developments all around the world that have been affecting the environment, the atmosphere, the greenhouse effects, have all contributed to this global warming. And you are playing a very dangerous game with all of your developments of hydroelectric projects. And I as an individual, declare the hydroelectric developments non-renewable, non-green for the simple fact that they pollute, they flood and they destroy the environment…" (VAP6, p. 67)

Road safety

Some people felt that increased traffic through the territory from southern Quebec, 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 about road safety. One person claiming to be concerned with the project's impact on road safety asked the proponent to make the necessary improvements to the highway infrastructure to ensure driver safety: "Hydro-Québec must take seriously improving the road even paving the road. This was a concern the past when the road was first made, Route du Nord, that at some point in the future, this road will be considered upgraded or even paved. And the road condition is so bad, especially with the increased heavy trucks going up and down the highway. Our windshields are broken a lot and we even have had near accidents because of so many trucks on the road. You know, we even almost had an accident, we almost ran into one of those trucks because of the dust on the highway. We were so close, we were so close to the trees along the side of the road because of lack of visibility on the road because of all the dust. The trees were very, very close to our car. I don't like, I do not like the road condition at all, especially with the dust. Even the road to EM-1 project, you know, the road should be improved. Hydro-Québec is, you know, carrying out a powerhouse there, they should improve the road." (VAP6, pp. 62-63)

The fear that other hydroelectric projects would follow on the territory

A number of participants feared that other hydroelectric 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 hydroelectric power generation. This being said, they recommend limiting the scope and number of development projects in order to optimize the preservation of natural environments: "There has to be a limit or else, we'll destroy this land" (VAP7, p. 81) "At some point in time, we're going to loose all our rivers." (VAP7, p. 11)

Impact 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: "Well, my point is, after the diversion, I don't know if I will be able to fish this spot again..." (VAP7, p. 127)

Psychological effects

While fewer Nemaska residents spoke of their sadness and sense of loss about 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 "it's not happening yet but knowing what might happen to the river, it affects me, I don't know how to say it, it affects my mental part of my body like and it will change, it's going to change my way of life." (VAP4, p. 81) Another resident supported this potential psychological impact: "[I] feel very unhappy about the prospect of diverting a river from which we had lived and used all our lives, from which we have learned, who have taught us what they have learned from their fathers and their mothers…there are people there that I know, that I know and people there that are not, I know, that are still deeply affected by the loss of their river." (VAP7, pp. 104-105) 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 hydroelectric power 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 water quality, fauna, feelings of loss and traditional culture). In this regard, two Cree participants expressed the following viewpoints, shared by many other residents, as regards the changes they observed subsequent to the Eastmain River diversion: "Before, people used to go fish there, they used to set their nets there, they used to get their drinking water there, children used to swim there and I never got the chance to see that myself but I hear stories of it, I see pictures of it. And this is something that, I guess, our neighbouring community, Waskaganish will face, less water will be going to the bay and that means salt water will be going in, in their community on Waskaganish River and like for a young person like me, like, I like hearing stories of the past, how people lived long ago and how my parents lived, how they saw the river before it was untouched and this is something that our neighbouring community will face, there will be less fish, less fishing on Rupert River like right in front of their community and the next generation won't be able to see the river before the diversion or the dams. …I saw a picture of the Eastmain River, like the beautiful colour of the river, if you come and visit our community in summertime or springtime, you'll see the water is not really clear, you could see the brownish colour on our river…nowadays, people hardly go visit the Eastmain River even though Eastmain River is just right next to our community. I never see elders, I never see young people go canoeing on the river because the water is dirty, they're not able to fish there anymore. This is something that I wanted to express myself as a young person how I feel about seeing these rivers being killed." (VAP9, pp. 42-44)

"I also want to speak about the Eastmain River now that the gates have been closed and dammed. What we have felt, I'm sure this is what the Waskaganish community will feel in the future if the project does go ahead….Now, what we see is just in the middle of the river, is where there is deep waters and where we used to paddle before, it's all dried up. Now, we see trees growing where we used to paddle because of the river being dried up with the dams on the river and it's no longer wide and free as it used to be. And this is exactly what the community of Waskaganish will see and feel, they will see and experience the same things we have gone through. They will undoubtedly see the salt water flow upstream and it's not impossible for this to happen, for the salt water to flow up, up the fresh water streams. This will happen because we have experienced it and the fish are going to be affected. They won't be able to get fish where they used to get them and this is what the Waskaganish community will feel like. They won't be able to fish where they used to fish and where they set their nets. And it won't be like it used to be, in the past where we set a net up, we would often get a lot of fish, a 106 at one time in our nets but now, it s going to be different. The Waskaganish people are going to feel the impacts like we did." (VAP10, pp. 14-15)

3.3.2 Questions for the proponent

Regarding the project under review, those present asked the proponent a few brief questions about various topics, among them:

- terrorism, the safety of installations and emergency measures;
- conserving the natural features of the Rupert River;

- water quality in the Rupert River as well as the Eastmain-1 and Opinaca reservoirs;
- the measures that will be implemented to preserve the traditional Cree way of life;
- the cumulative impacts of hydroelectric power development and mining projects on the James Bay territory.

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 at the public hearings.

The impoundment of diversion bays

Residents had two major issues with regard to the impoundment of diversion bays, namely the impact 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 wondered what the actual scope of the impact on animals would be of changes to the territory and flooding of the land: "And, the animals that travel along the migration where they live, things are different now. And this is because of the land is different now since the reservoirs are in place. And we really don't know about the fish in the waters, how it really affects the people and even fish is destroyed over time, even the beaver and the otter, the muskrat and different animals, they sometimes come out of the water and stay on land and so we don't know if these animals are going to be affected, these ones that I have mentioned. Fish drink water to and beavers and otters, muskrats and mink, they drink water and we will not know if they will be killed and destroyed by this new proposed project. …And this is why I say and I ask you, this is a huge thing, are you sure that everything will be living, everything is not affected with all these hydroelectric development projects. Is there some death for some of the animals and the fish?" (VAP8, pp. 46-57)

Some residents were especially upset by a possibly higher mortality rate among caribou, moose and beavers during the filling of the diversion bays. One of them expressed concern about the land animals that he hunts, asking for details of the measures that might be taken to minimize the impact on these species: "I'm asking what does Hydro-Québec want to do not to affect or destroy in a negative way all these animals, especially the moose and the caribou and the beaver in their normal habitat before flooding. What is Hydro-Québec going to do to ensure that these are not so affected by these reservoirs, the flooded areas?" (VAP8, pp. 50-51) Others fear that the diversion bays will be a disturbance for bird migration corridors. In fact, one of them asked "Will the migratory patterns of birds and other species be affected due to increased water capacity in quantity in the inland area?" (VAP9, p. 49)

Different people on numerous occasions said 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: "Couldn't the timing of the closing of gates take into consideration the natural habitats of wildlife instead of flooding the reservoirs when the animals are in their natural habitat?" (VAP10, p. 26)

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 with the impoundment of diversion bays: "I just wanted to say this brief comment and just to express my concern again, the timing of the closing of the gates on the reservoirs and just to state again, make sure there is enough lead time to warn the people and to take precautionary measures." (VAP10, p. 53) 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.

Impact on fish

A few Crees were extremely worried about the project's impact on fish in the Rupert River, particularly sturgeon, which is a species of great importance to the Crees, not only as food but also culturally. In their opinion, a drop in the river's flow could negatively impact water quality, which would subsequently affect sturgeon: "…even though there may be less water flow, the fish will feel the effect themselves. The water, water is the main source of survival of fish. You look at the sturgeon, sturgeon is considered to be the wisest fish, any change in the colour of water does a lot of damage. Sturgeon is the most sacred fish of the Cree people. I will reiterate that I do not want the Rupert River to be

diverted. There is one particular area on the Rupert River, where they go fish and this is one thing that they will loose. The fish will be the most affected species from this Rupert River diversion. I stand by the people of Waskaganish, people that opposed this diversion, their lives, the life of the fish is going to change for ever." (VAP9, pp. 75-76)

On the other hand, and despite his fears about 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 impact on fish habitats and, as such, on the species themselves. He considers that the impact on fish, and thus on sturgeon, will be less significant than those resulting from the hydroelectric power works on the Eastmain River. Hence: "It was too late in our case to be able to have these weirs built on our river, whereas now that there is an indication that there will be some on the Waskaganish, Rupert River. That, I think it's got to be mentioned that these weirs definitively have to go up before you dam that river so it does not affect as much the fish habitats. And it won't be as hard for the fish to survive, especially the beaver as well too.…we don't want the same thing to happen to the Rupert River of what happened to ours. I know that there is an abundance of fish in the Rupert River, especially the sturgeon." (VAP10, p. 57)

The Chief of the Eastmain First Nation feels that the proponent failed to adequately study the impact on Eastmain River sturgeon in order to assess the possible repercussions of the diversion of the Rupert River. He states: "…we do not think that Hydro-Québec has paid much attention to the relationship between the diversion of the Rupert River and the surgeon in the Eastmain-Opinaca reservoir." (VAP8, p. 100)

Jobs

The issue of the manpower needed to build and operate hydroelectric 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 was lot of discussions about Cree employment or even training for Crees, for job training but I still don't see any of this come to fruition. I don't see those things, that were agreed to, be in place." (VAP8, p. 74) In the same breath, this participant claims to want the Crees and the proponent to work together in favour of permanent employment: "But as Cree people, we need longer term employment. This is the way we should have come to an agreement, to have longer term employment. …time should be important, it should not be short, we have much to share, we have much to say." (VAP8, pp. 69 and 80)

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 hydroelectric projects. He did not, however, provide any further details as to the type of partnership: "…the construction of the La Sarcelle project could provide a valuable opportunity to these communities, as well as other Cree communities, to gain practical experience in construction and operation of a hydroelectric project. It is important that the review of the Eastmain-1-A and Rupert development includes adequate consideration of how the Cree population, and the Cree communities of Eastmain and Wemindji, will be able to benefit from the addition of the La Sarcelle powerhouse to the project, both during construction and during project operation." (VAP8, pp. 103-104)

Archaeological inventories

Certain Crees described the value they ascribe to archaeological inventories attesting to the presence of Natives on the James Bay territory in centuries past. Today, these artefacts serve to transmit knowledge of traditional Cree methods from one generation to the next. According to a resident, archaeological digs "…they were looking for things that tell of our way of life and those people, our ancestors, who made those artefacts that we find, this is what they used to survive on the land." (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 materials that we find here, I guess, is for elders because I work a lot with elders and the thing that I want here is the material that we find, our elders always say that: 'It belongs to us, it's in our own backyard, its our people that made these tools' and I want to clear out where all these materials is going to go, all these materials that are found in our own backyards. I know right now

they are all hidden in museums and in all of the research labs all over Québec. I want these young people, maybe even, or future children to know that these artefacts that were found in our backyard, that we assure that do come home to our communities and stay in our communities not in this lab and just hidden in cupboards in museums or labs across Québec" (VAP8, pp. 62-63)

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 have also heard what Hydro-Québec has to say on the subject of dam stability, and in general we are comfortable with Hydro-Québec's presentations. However, dam stability is an ongoing issue and we expect Hydro-Québec to keep our communities informed of the results of their inspection activities, and that the committees will also provide relevant advice and guidance on the subject." (VAP8, p. 99)

In addition, by relying on the idea that the diversion of the Rupert River would bring about a change in the operation 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 hydroelectric development projects, a few residents expressed their sadness and sense of loss regarding the significant changes in the natural environment of the sites and in 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 hydroelectric 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 am hoping that what happened to these trappers, to these hunters and to the members of this community doesn't happen to the people who will be affected by this project of EM-1-A/Rupert River diversion. …we are the wounded people of river diversion or a megaproject." (VAP9, p. 58)

3.4 Comments, questions and concerns expressed in Wemindji

Public hearings were held during three 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 hydroelectric development activities at the La Grande Complex. They mainly focused on impacts ensuing from the flooding of hunting grounds and traplines; the drop in the number of fish and their quality; the opening up 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, 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 were not necessarily directly linked to the concerns regarding the project under study, they should still be noted. They concerned the construction of access roads to certain hunting and fishing grounds and various recreational activities; the paving of some roads, including the Sarcelle road; the clean-up of wood debris in Boyd and Sakami lakes and the Opinaca reservoir; the development of a communications plan regarding the safety of the Sarcelle control structure; and ice conditions. They also involved the introduction of a high school history course on the various agreements between the Government of Quebec and the Cree communities.

3.4.2 Questions for the proponent

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

- reasons why the Wemindji First Nation did not sign the Boumhounan Agreement;
- alternative solutions to the project;
- differentiation between the two review bodies (provincial and federal);

- the impacts of the Eastmain-1 Reservoir and of planned diversion bays on Canada Goose migration corridors;
- the cumulative impacts of hydroelectric 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 change.

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, impact 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 under the *James Bay and Northern Québec Agreement*: "The other thing is, they talked about the flow in the Sarcelle, there is going to be more flow, what s preventing it, the water being higher than the level now? Is it at that the max level now or is it below the max level in the Sakami, Boyd-Sakami?" (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 were concerned about 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 recapped what others had mentioned previously: "And from what my comprehension is, that the water will be increased in the reservoirs and that concerns me as I think that where will I be hunting now, as most of my trapline is under the trapline, under water. It is my trapline that is directly impacted by the dams and by the reservoirs that have been put in place to date and my hunting and fishing and trapping have been severely impacted by those projects. ...And now that I thing about, and now that the proposed project is being discussed and proposed, I am concerned about one of my hunting camps which will be possibly impacted by the increased water flow and increased water in the reservoirs." (VAP12, pp. 8-9)

One person in turn expressed concern over the flooding of burial sites during the impoundment of diversion bays: "I want to speak to you about the reservoirs and the impacts about the burial sites that have been impacted. All of those burial sites that we once had are now under water. Now, because of this proposed project, I know for a fact that there will be some areas, there will be some burial sites that will be impacted again." (VAP12, p. 12)

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 in 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: "…what kind of impact it will have on my trapline and whether the turbidity of the water will be good enough to drink or whether there will be a change in the water quality? And I think it s important that I know this whether I'll be able to consume the water that will be passing through my trapline. …the thing that really concerns me and that is the quality of the water on my trapline whether I'll be able to, or whether our family will be able to consume this water" (VAP12, pp. 14-15)

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: "The river that we're speaking about, that river is a mighty river. In the event that it is diverted and the river will be reduced in its flow but the headwaters of the river will be altered and damaged and the water quality will be changed. Presently, the water level is very strong and very mighty because it (inaudible) itself presently, cleans itself presently…." (VAP13, pp. 5-6)

The safety of the works

If the project is built and flow increases downstream from the diversion bays, several individuals emphasized that they would worry about 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 hydroelectric facilities of the La Grande Complex: "I'm very concerned for the people

of Chisasibi…in the event that the unpredictable does happen to the La Grande Complex, what will happen, what do you think will happen to the people 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 would happen in the event should that there be a disaster at these dams in Chisasibi? And what would happen to Chisasibi? For, I do have family members who live in Chisasibi." (VAP12, p. 59)

Impact 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 impact on fish populations (and especially the sturgeon). They have observed a decrease in numbers of fish, caused, they believe, by past hydroelectric projects: "I'm not angered by what had happened and what has been agreed to in the past related to the New Agreement. I am not against the Agreement, however, I was able to tell firsthand what type of impacts they should expect should the river be diverted because I have experienced this myself and the type of impacts you expect to the fish, related to the fish… But, however, it is the sturgeon and the fish, the sturgeon that has severely been impacted by this project. And every year, as I observed the water quality, I noticed that the sturgeon population has been severely been impacted…" (VAP11, p. 109)

Secondly, some people mentioned being alarmed by the project's possible impact on natural sturgeon spawning grounds currently found in the Rupert River: "But in the event that this river is diverted, I am certain the impacts will be like that of the other rivers. …they will lose their fishing, spawning site and upstream, there was another place where they used to kill sturgeon on the Rupert River, again, that sturgeon spawning ground where they used to kill sturgeon will be lost should the river be diverted." (VAP13, p. 16)

Still with regard to sturgeon spawning grounds, a resident inquired whether the weirs erected on the Rupert River could constitute obstacles, i.e. prevent the sturgeon from reaching their spawning grounds. He made the following comment: "I want address about the weirs proposed for the Rupert River. We all know that there is very good sturgeon spawning areas in the Rupert River and I am not too sure how many weirs there are proposed and I'm asking myself, will it be possible for the sturgeon to continually swim up these areas to go further up the river or will these weirs create an obstacle 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: "…what is being proposed by the Rupert River, I know for a fact that they will lose a lot, they will lose a lot of traditional game and food that they relied on and they will come to a point where it will be inedible, talking about fish, beaver. This will be the impact." (VAP13, pp. 61-62)

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 hydroelectric projects: " I don't know if they went through with the recommendations but I think one of the recommendations was to have a division, an aboriginal division to make it more sustainable, make it more effective and I believe this is the process we can do it.." (VAP11, pp. 96-97)

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 it s important for the review committee to keep in mind the importance in this review of education, Cree young men and women take full advantage of employment prospects connected with natural resources development. They need adequate (inaudible) in mathematics and science relevant to those careers and specifically more is environmental studies as well as physic, chemistry and biology." (VAP11, p. 89)

Otherwise, given that there is still much wood debris in the Eastmain-1 and Opinaca reservoirs created during the construction phases of various hydroelectric 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: "So that perhaps what would be good is if we were given the task to do the clearing because we have young people too that could possibly have the opportunity to have employment to clear and to clean these areas…."



Public hearings in Mistissini

(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 other thing that I hope and that I hope that will be realized is that once this project is realized or, I really hope that traditional Native knowledge will be given equal value as that of scientific knowledge because my impression is that traditional Native knowledge is not given equal footing when it comes to environmental impact assessment." (VAP12, p. 27)

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: "Another point I would like to make is if the permits are issued to go ahead with this project, I think there should be some consultation with all the Cree communities, continued consultations before the construction, during the construction and after the construction" (VAP12, p. 54)

3.5 Comments, questions and concerns expressed in Waskaganish

Public hearings were held during six 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[7], this river helps keep the Crees in good physical condition, having both a physical effect (through the supply of

7 The canoe brigades, for example. Each July, a group of about 20 young Cree travel the historic fur-trading route along the Rupert River. This one-month canoe trip provides an opportunity for various generations within the community, guided by experienced trappers, to relive the past.

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 these ties to the Rupert River made the following statements, evoking sentiments shared by most Waskaganish residents: "…the aspect thats closest to my heart, of course, if the spiritual nourishment that the river gives to me. Even during the most difficult times in my life, I could go to the river and stand on the bank and look out at the mouth and watch the river flow into the bay. And I thought, no matter what happens in my life, the river will always be the same flowing silently, steadily, uninterrupted, ever present, just like the moon. I've always taken great comfort in this idea…" (VAP31, pp. 76-77) "The Rupert River is what we call Waskahikaniw Sipi holds a lot of different values to our people. It is reminiscent of the land that we have around us, the beauty that has been created for the use of our children, this provides our food and nourishment. It s our spiritual connection that we have to the land that makes us strong, practising our traditions and our culture and the hunting and the fishing and the trapping activity that we still pursue today even, something that we've done for thousands and thousands of year." (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 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: "So, if we are going to protect the economy to sustain humanity on earth, we need to focus on keeping those natural resources healthy. We can't exploit natural resources for the short term because eventually, we'll run out of natural resources. The river needs to be preserved because human life depends on it. We know the entire world is facing environmental destruction on a daily basis and if the Rupert River is diverted, it means that Québec and Canada are continuing to chip away at the planet s ecosystems in exchange for short-term capital gains" (VAP31, p. 80-81)

3.5.2 Questions for the proponent

The proponent was asked a wide range of questions during the sessions held by the review bodies. Most of these came 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 hydroelectric power generation), with consideration given to production costs and environmental impacts;
- safety measures implemented at the mouths of water intakes of hydroelectric powerhouses;
- the transfer of fish species and their parasites between the Rupert and Eastmain basins;
- the stability of the banks of the Rupert River, in light of its clay soil, and the safety of residents in the event of a landslide;
- water turbidity and the presence of algae in the Rupert River because of the planned weirs.

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: "I know that the hunting and trapping way of life will start to disappear, it's already started to decrease." (VAP36, p. 24) Some feel that these changes in lifestyle are a result of the growing population, the opening up of the territory and increasing job opportunities due to development projects on the James Bay territory. The Crees have said that they are extremely nostalgic and sad because of these changes in their way of life, which is the very foundation of their culture.

Many people fear that the Eastmain-1-A project and Rupert River diversion will also contribute to a drop in traditional activities and further changes in the Cree lifestyle: "Some day, I d like to be able to bring my grandchildren here to see where I am from and to see people living a way of life that is directly connected to the natural world. But now, I fear that that way of life will be reduced to a tiny trickle along with the river." (VAP31, p. 77-78) 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 paddled this river with my parents. I was at Nemaska. There were no skidoos, planes or motors, we only used our paddles. That is what we are trying to teach the youth and what we're trying to show them. What will happen in the future, 10 years or even 20 years from now when we want to show them this river? … And if the river is not exactly as it was or it is broken up and it will seem like the traditional, the culture of the people will be broken and destroyed." (VAP33, p. 94)

In addition, a few residents mentioned on more than one 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'll also lose these fishing sites where people used to set their nets, we will lose those permanently." (VAP32, p. 69) 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: "…the possible loss of Smokey Hill, a very important fishing site for the community." (VAP34, p. 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 am very concerned that in the future that the Cree people will lose Smokey Hill. What I'm worried about is that, if that water, the water changes, that the fish will not be available, will not be as plentiful and they will not swim through that same, through Smokey Hill. Those fish that come through Smokey Hill have been there for a long, long time and it is very possible that we will lose that place and the fish at Smokey Hill because of the water." (VAP32, pp. 66-67)

In another perspective, a certain number of Crees wished to emphasize that the changes to their traditional 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 commonly found in North American society. Also, the transportation methods they now use to hunt, trap and fish, despite their cost, make accessing these resources significantly simpler. One resident stated: "Many times, people did not have much, all they had was broth to feed their children. Today, it is not like that. Its not as difficult to feed their children today. I was also in that same position. Many times, I would get up two hours before daylight to start walking to find food for my family and I would not get home till about 10:00 at night to be able to provide food for my children, my family. It was hard, what I have seen, and it was hard in the past but the people in the past experienced a very difficult life compared to what it's like today." (VAP32, pp. 60-61)

Means of travelling

Numerous Crees are very worried about the new travelling conditions that might result from partial diversion of the Rupert River. The majority of Crees stated that they used 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 said that: "…and for purposes of navigation, I want a clarification, what does Hydro mean when they say that the water level would be 1.4 metres, I believe, was the number that you gave and does that involve the water level to be at that level during low tide or during high tide because we have experienced conditions here on the Rupert River when we have a very strong south wind, water gets pick up in the bay and the water level here at the mouth of the Rupert gets very shallow and it s very difficult to navigate and very difficult for… also very dangerous for people that have to travel back, especially in conditions when the night has fallen, people do travel at night depending of the time of year." (VAP32, pp. 22-23)

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: "The other thing I wanted to know was at the mouth of the river. What will be the ice conditions on the river in the fall and in the springtime? How dangerous is it going to be? Where will the crossing be? In the spring, how long will we be able to travel on the ice at the mouth of the river? This is where we practice our hunting activities in the springtime, in the springtime, along the shore, on the mouth and out on the bay…" (VAP33, p. 100) "If the water is taken, at the mouth of the river, the ice is sometimes very thick and the water level is very

low. We don't know...what I want to know is what will happen when the ice starts breaking up in the springtime? What will happen to the ice in the springtime when it starts to break up?" (VAP34, p. 59)

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: "Because of the experience of this spring s early breakup and the uncertainty of ice conditions in front of our community in the future, it is for the safety of the community and I recommend that a permanent bridge crossing be constructed at the first rapids of the Rupert River and then a secondary access road to the Pontax River estuary or just passed proper point for access to Rupert Bay and North for those who hunt and trap in that direction. The use of a helicopter for both fall and spring would be too costly in remedial works and in the long term, a bridge and an access road would be much more wiser and safer for the community… the immediate construction of the bridge and access road for the use of Cree hunters of Waskaganish be done in the remedial program." (VAP31, pp. 93-94)

Impact on wildlife

A high percentage of the Cree residents having expressed an opinion at 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 in 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 the wild animals are becoming scarce and many other living things along the banks of the Rupert River. I still use the river, the shores of the Rupert River. I have also seen that the moose is affected, is already impacted by what is taking place on the river. There was a time, it has been many years since the beaver was... beaver has increased in population, they're still there today. I know very well what the wild animals such as... how they are affected, how they react to development on the land. There are things that we will lose forever, that will be lost forever." (VAP32, pp. 70-71)

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: "Forestry activities in the south need to be included in assessing the possible impacts on birds at risk list. …the boreal forest population are on the next level as a threatened species which is more serious than the animals and plants identified at risk and there are no plans to protect or provide some type of management for the woodland caribou…" (VAP34, p. 10) This viewpoint was corroborated by another resident, who is of the opinion that caribou have adopted new migration corridors subsequent to other hydroelectric development projects, and that this may happen again with this project, partly because of the creation of upstream and downstream diversion bays: "And then, as to their time after time, they say the animals are not going to be affected. I'd like to have their take then on how come the caribou migration is changed in the last five years, completely. I'm from Mistissini right now, my friends trap in the northern areas, used to live all winter on caribou. The last couple of winters, they haven't seen a caribou. But caribou goes through Nemaska, right through the village in fact, the Old Village on Nemiscau Lake is covered with caribou sometimes, never heard of it before, never saw a caribou there before. Champion Lake, caribou there all the time, never heard of that before. And the reason is, that I see, now I'm not God himself so I'm not sure but my idea is that all of these lakes that they made up north, don't grow a very good moss and the caribou, because their old feeding grounds are flooded, they move around and you know what, they're lazy just like we are, when they see a big wide road, they take off the snowshoes and they hit down the highway. And that's why the migration is changed." (VAP33, p. 47)

Finally, some Crees believe that fish in the Rupert River will be significantly affected once the project is operational. Among other reasons, the drying up of feeding areas has been cited: "If this project does go through, there are steps that will need to be taken to make jobs available for these people who are seeking employment or if this project does go through, it will impact on everyone, even the wildlife, the fish. The fish knows where... there is a source where the fish can get his food and if this happens, it will be different, that fish will not look for his food in that same place, he will seek for food elsewhere if that area where his food usually is dry." (VAP36, pp. 11-12). Moreover, changes in the quality of the river's water will kill off fish. "This is one of the

peaceful reserve we ever had. We have fish, we have animals, coming this way. If the dam is coming this way, do you think our fishes, our animals, our birds and plus tide do they go in or out more or less, less water, plus do you think water will be the same, I don't know. … I don't want fishes to die in our river and ending up on our shore and plus, our birds go over us, we love to see that but if those birds don't come, it was the dam, plus our trees, the air we breathe" (VAP33, pp. 82–83)

Water quality in the Rupert River

Generally, Crees believe that the decreased flow of the Rupert River, once the project is under way, 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 the Rupert diversion will take place, we can expect salt water to be very close to the Rupert River estuary." (VAP34, p. 61)

Also, some people expect other negative repercussions as a result of changes in water quality and levels. They are thinking of the impact on drinking water and leisure activities for children. In this regard, one resident indicated that her children often play in the river, and wonders whether they will be able to continue doing so: "I can say that we use this river during our summer games. We also have games in the wintertime and we also, some of those activities take place right on the river. Where will our children play their games in the future? I don't think that consideration... that the children are taken into consideration in the future… The children are always asking, their questions are where will they swim, where will they go fishing. Those are the two questions that they always ask, if this project does go through." (VAP36, pp. 91 and 94)

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: "In the future, jobs will require a higher education. We have to learn what we want to do. We can't just get jobs just like that anymore." (VAP36, p. 4) Furthermore, faced with relatively new social realities such as a rapid increase in population and a drop in traditional activities, Crees consider that a growing number of paid jobs will be necessary, particularly for youths. One resident emphasized: "More than anything else here in Waskaganish, we need jobs, jobs and more jobs. With the post-secondary graduation to soon reach over 400 students for the Cree Nation, we need to create jobs that these young people will need. … We don't have enough jobs at the present time to keep everybody at work here in Waskaganish. Here in Waskaganish, there is no development or creation of jobs." (VAP31, p. 95)

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: "…and concerning the employment, if the project does go through, that employment will still be made available even after the project is completed. … I am asking that we will still find employment in the future…that is why I'm asking that people will be able to find employment…" (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 say they are 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 dry up and its banks will be exposed: "I have seen many rivers and how they flow and I have seen how much the Rupert River has provided and how the flow, and he also mentions the flow of the river. There are many impacts... works that will be done, that will not be...and damage that will be irreversible. And we will not be able to mitigate the damage that will be done." (VAP32, p. 65) Another resident speaks of the river's aesthetic value, noting that this will likely be lost if the river's character is altered: "I have seen how beautiful it was along the shore. I am certain that when the project goes through that it will not look like the way I saw it before." (VAP33, pp. 97-98)

Cree comments about changes to the river generally convey a profound sadness and a sense of loss, both individually and as regards the community: "And everyone that using that river, that has a trapline, has a lot of hurt, I'm hurt. I want to explain to you that, because I know those portages will never be the same. They'll

never be the same." (VAP36, p. 76) Or yet still, "The Rupert River diversion will be a great loss for the community…" (VAP34, p. 42) Young Crees seemingly share these feelings: "Some of the youth that I've spoken with in the community already feel the loss." (VAP35, p. 24)

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 the costs through the social problems present in our community. The drug abuse and alcohol abuse, gaming addictions, self-destructive behaviour, neglect and abuse and these were already pointed out to in the presentation from the Cree Health Board previously. These problems are the cost of the adaptation that we are already paying and we expect these problems to rise sharply if the Rupert diversion goes ahead, is this what we want?" (VAP34, p. 45)

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. His comments in this regard were eloquent: "I can tell you that the Rupert River diversion is a major megaproject and a major threat to this community s social cohesion and well-being because of the absence of consent and acceptability. My community is very divided and split on this issue and people are divided within themselves and this creates much confusion about this issue and this has an effect on people's health and well-being. There is even a split within the persons themselves about how they feel about this project." (VAP34, pp. 42–43)

Tourism potential

According to some, the natural features of the Rupert River are the foundation for all of this region's tourism promotion activities. In fact, according to the tourism co-ordinator of the Waskaganish First Nation: "And when we promote our product, we mention that Rupert River is this unspoiled wilderness, that is our market when we advertised, that s our selling pitch, it s an unspoiled wilderness and is beauty and it s nature." (VAP36, pp. 50-51) 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-off for the community. He recommended that the region's tourism potential be comprehensively evaluated, by specifically considering the attraction of the Rupert River, before the two governments reach a decision about the project: "So, all this potential is going to be lost after the diversion. Who is going to come to visit a series of ponds, dead, lifeless, stinky ponds instead of a mighty northern river that has been running for thousands and thousands of year? Before we agree to this project, we need to do a study for the potential for tourism and ecotourism…" (VAP34, pp. 49-50)

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 in the development of ecotourism products and services that could contribute to the growth of a sustainable economy for the sector, while 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, to develop various training programs on Cree culture, and promote the potential of the Rupert River.

The fear that other hydroelectric projects would follow on the territory

Residents made a few allusions to a fear that were the project authorized, the proponent would plan other hydroelectric projects on the James Bay territory. One stated: "That is why I do not believe when I hear them say that they will not touch the Broadback or the Nottaway River. In the *James Bay and Northern Quebec Agreement*, it states that these rivers would be developed and I do not believe that these rivers will be left alone." (VAP33, p. 97). Another resident expressed the wish, without much believing in it, that there would be no other hydroelectric projects over the next few years, stating that at a certain point, development has to stop: "I'm not sure that this is the last dam, the last meeting

that we're going to have to talk about damming rivers, I don't believe, I wish that there could be a stop to it, I wish we could say: you've gone this far, there is a mark, no more. We can't take any more…I would like to see an end to these projects and I doubt if they get a foothold on the Rupert River if they'll stop with a little foothold. This is Rupert River-1-A, let me remind you, there is 26 letters in the alphabet." (VAP33, pp. 49-50)

3.6 Comments, questions and concerns expressed in Chisasibi

Public hearings in Chisasibi were held at the Mitchuap Centre and took place in seven sessions, from June 6 to 9, 2006.

3.6.1 General comments

The Crees of Chisasibi spoke on several occasions of their ties to the land, the deity 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 Cree society has undergone over the past thirty years, since the beginning of hydroelectric mega-projects in the territory, especially the La Grande Complex project, executed in the 1970s and 1980s. Despite the fact that some changes, such as improved overall health conditions and a greater pool of paid jobs, were beneficial for Cree communities, 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 hydroelectric development projects: "And over the years, on my visits back to Chisasibi, I've seen many changes in snapshots over the years. We all recognize that the standard of living has increased dramatically, there is more money around for people and their families but with that comes problems, you know, drugs, alcohol readily available now, and I find people have lost their way over the years. Life has become a little more materialistic, we own things like four-wheelers and fully-loaded trucks and I think we've forgotten a lot of our traditions because of this money. And I think this has come as a result of the La Grande project and, you know, the funding that has resulted from the *James Bay and Northern Quebec Agreement*. On the other hand, there has been many advances, the creation of the CBHSSJB and the Cree School Board and definite economic impact over the years and I see this as a good thing as well. Unfortunately, it has a significant impact on our mental health, physical health, spiritual health and emotional health." (VAP41, pp. 50-51)

In view of the comments about 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 hydroelectric project has flooded a vast trapline area, with ensuing problems for tallymen (damaged fishing nets and the risk of accidents due to floating debris under water or in the reservoirs, and limited access for tallymen 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 flood destroyed most of the... most of our hunting territory or most that was on there. Since the flooding when on, we haven't subsisted from anything in the way of food source and I wanted to tell you that. He says, I don't need anymore water, I don't want anymore water". (VAP37, p. 76) Citing his own experience, he said that he wanted to ensure that other tallymen would not be similarly affected: "I don't hate to think that other people would...other people who have their territories flooded, I wouldn't want that to happen to them. They go back to their trapline whether it is knowing that its impoverished and knowing that they won't get anything from the land because after all, this is their homeland and this is where they subsisted and grew up on the territory." (VAP37, p. 77)

Several Crees indicated that burial sites had been submerged when there was flooding of the territory due to the hydroelectric facilities of the La Grande Complex. The majority of them have a hard time with the thought of these sacred sites now under water: "You know the thing that hurts is the things that are under the water, the grave sites, we have some in LG-2." (VAP42, p. 53) 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: "Where my father was buried, there was a grave yard where my father... but my mother, his mother was

buried at a different place and when I saw these, when they flooded, when the burial sites were flooded, I never thought, I never thought that these grave sites would be under water. And this, it did not please me and I saw the water level overtake the grave site. And this is not the only grave sites that I'm talking about but I know of other grave sites and there were some that people were buried that we didn't know about." (VAP38, pp. 94-95)

The fact that these sites are now under water makes it harder to identify these persons and hold commemorative ceremonies, as noted by a resident: "…what those elders talked about at the time the picture was taken. They talked about the burial site, took part in the funerals and their own children. Took part in the burial of their children and which is now under water." (VAP41, pp. 83-84) 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: "I want him to see their ancestors who have, whose graves have been flooded, all those graves, have flooded the grave sites and those people...the grave sites are all under water." (VAP42, p. 33)

Traditional lifestyle

The Crees spoke repeatedly of the major changes to their traditional way of life since the onset of major development projects, particularly the hydroelectric 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 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: "When you change the environment of a river, you change the animals, the fish, waterfowl and especially the people who had survived off the land and now we see the impact on our youth. …Cree through the knowledge of their elders, grandfathers used every part of the land which the Creator had provided for them, it was their garden, they used everything. See the boat there, the canoe was made out of birch bark. Those were the happy times before. Now, you don't see that no more." (VAP41, p. 77)

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 made the following comments, highlighting these changes: "Since you have destroyed a lot of our land, we have no choice but to live like non-Natives, now we have to buy food or whatever, we use money nowadays. Can Hydro promise us long-term employment for Crees since our traditional way of life is disintegrating, we need money to support ourselves." (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: "And a lot of people here, they were not...they travelled by themselves, by their own power and there was no machinery through the means of travel. There was nothing like that. And no matter how far people travelled, they travelled on his own power. And now, it s very certain that people are becoming less powered, they depend on machines to take them everywhere and it s the same with us, we're always looking for machines to take us somewhere and we're losing, we're losing the will to travel and it s by our communication with others that we can hope to come up with a solution to help themselves and we are concentrate on the youth to help themselves and then the elders have to teach this to the youth." (VAP38, pp. 83-84)

Among the traditional fishing sites impacted by La Phase 2 of the La Grande Complex hydroelectric project, the first rapids on the Chisasibi River were 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: "Chisasibi once had a place similar to Waskaganish s Smokey Hill but ours was called the First Rapids presently LG-1. This place is now gone, replaced by a dam where we once used to catch good, healthy cisco. We now have other, probably mercury laden in fish." (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:

"One of the important results of these changes was the building, the LG-1 powerhouse, at the first major rapids on the Chisasibi River, an especially important site for the Chisasibi people one which for many years, I will change that, one which for many centuries as provided an important fishery to our people. The fishing site has now disappeared and the fish who is there, is just a memory now." (VAP43, p. 150)

Social problems

The public hearings offered Chisasibi Crees a forum for reiterating that their community was experiencing numerous social problems. They mostly attribute these problems to the La Grande Complex hydroelectric project, which in addition to destroying territories where they once engaged in traditional activities, also promoted the opening up of the James Bay territory, which among other things facilitated access to Western culture and values. The Crees hence experienced major changes in their way of life, along with the loss of traditional values. Many Crees spoke of negative effects that can sometimes be attributed 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 youth out there that feel lost and angry because they don't have identity, cultural identity that they can connect to because of the ripple effect of the change of our lifestyles." (VAP41, p. 92)

The main social problems cited involved alcohol abuse, drug abuse and suicide. According to many 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 think most of us here will agree that the changes didn't happen, sorry, the changes happened after the highway was built, after the dams were built and that kind of led the way for, influences from the South, that is alcohol, drug trafficking." (VAP41, p. 57) As was alluded to by other residents, the Cree Nation Youth Council representative stated that alcohol and drug abuse generally led to other problems, such as compulsive gambling and child neglect. According to him: "Over the years, we've seen so many social issues arising and we seem to know they're a growing trend but we don't know how to overcome this battle. We have seen so many suicides, drugs, alcohol, and how we have a new addiction which is gambling. We have seen so many children being neglected by their families and they seem to act out their problems by one of these ways. We have lost so many young people due to drugs, alcohol and they seem to take the easy way out of to get relief from their problems which is suicide. We seem to have lost that part of our human nature of being a community as a whole, we seem so distant from each other, some of us don't even see our relatives in months at a time." (VAP42, pp. 25-26)

As regards suicide, a community worker for the CBHSSJB has 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 speak openly about it, as a first step towards working together to find solutions. One young person did just that, by sharing her personal experience with addiction, a problem that experts claim is now all too frequently seen in the community: "I cannot live like my ancestors and born after the projects were completed and now live a lot of us can't live, well, can't live off, make a living off our traditional pursuits due to the La Grande Complex project. And if you were asking about if this La Grande project had a negative effect, I'm living proof of it. I battled alcoholism, drug addiction and I have attempted suicide more than five times, I was very lucky to be talking to you today because not a lot of people survive suicide." (VAP41, p. 92)

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 problems did not exist when the community was located on the island of Fort George: "And the housing situation, I know that we are faced with overcrowdings, social discords, family breakups and also having worms in our home that are starting to infest like invade our homes. This, we were not faced with this problem of worms or bugs in our homes when we lived on the island of Fort George. And this is something that we live with, we sleep there and we have these certain bugs that are in our homes with us. So, I would consider that as invasion or overcrowding both animal and humans…" (VAP40, pp. 67-68)

Some people also mentioned the marital problems resulting from Crees holding down jobs on hydroelectric project construction sites. Some of them at times drink too much alcohol and neglect their families, visiting

them less often than before or failing to contribute financially to household 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: "And the EM-1, we feel the impacts because we have to take care of families. Families come to us because of breakups. They have no money to feed their family because the worker who is in EM-1 does not send their family their money and they are not... whenever they have a holiday, they don't come home, they go another route. So, the families come to us for help, for support..." (VAP40, p. 71)

Psychological effects

We must first emphasize that many people gave extremely moving speeches at the hearings. The Crees explained that the flooding of traplines and burial sites, combined with changes to their traditional lifestyle and values since the 1970s, have had 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 hurts the spirit and you cannot tell me to hide that and tell me not to talk about it. You cannot tell me that you don't care, you have to feel something. This is what we carry. What are you going to replace that is affecting us today. I need that answer, I'd like to see how you respond. I d like to see how the proponent responds." (VAP43, p. 127)

In considering the various sources of psychological impact, many evoke the 1980s referendum by the community which led to the move, for safety reasons, from the island of Fort George to the current 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 hydroelectric project. They still find it difficult to talk about this era, and feel that they have not yet completely healed: "There have been several community relocations in the Cree territory in the past few years but the largest relocation by far is that of Fort George. When the community was moved to the riverbank site you now know as Chisasibi, this relocation and the way in which it took place was very closely related to the La Grande project and to Hydro-Québec wish to increase the flow of the river, as we have explained. We do not think that the community has fully recovered from the relocation, the scars are still to be seen and we believe that will remain for a long time." (VAP43, pp. 166-167)

Some Crees point out that in some 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: "When we relocated, you see our basements, they were completely bulldozed over and they carried the houses up. Some youths, still had their valuables in their basements when they were covered with sand, gravel, it really hurt us and the elders still remember. Another lady told me: I still remember my valuable things that were there in my basement, I just didn't have enough time to collect them all. The houses... it was a big rush to relocate us. How do you think that this did not affect us? You do not see how much it hurts us inside." (VAP41, pp. 85-86)

Impacts on wildlife

The main impact on wildlife, as perceived by the Crees and for which they blame the La Grande Complex project, concerns changes to the migration corridors of geese: "and today, it impacts the flight of geese, different impacts from megaprojects." (VAP41, p. 79) With geese not flying the same routes as they used to, where Crees used to hunt, there has been an impact on this traditional activity: "And they talk about the spring goose hunt, the geese are not on the coast anymore as they used to be in the past, there used to be a lot of them but now, they have moved further inland. It s not that the geese populations have declined, it s because they've moved, they altered their migrating routes." (VAP40, p. 33) The Chief of the Chisasibi First Nation gave an example of hunting for the red-throated loon, which no longer frequents the same areas because of changes in the La Grande Rivière: "The disappearance in the last few years of the red-throated loon. We do not know whether the reservoirs can explain why we rarely see the red-throated loon these days, the questions are being asked. Each season, each season, the spring, after the goose hunt, this was the bird which my people used to hunt. This bird followed the ice. That s a species of loon which is more abundant, was more abundant and is still more abundant in the common loon that we see but there can be no longer hunt that. It s due to the river and how it has changed after the project had been finished. The ice melts away so fast. As I mentioned earlier, this bird used to follow the ice. By the end of April, the ice is gone from this river. The bird just flies through. It is not that it s the danger of being extinct, it just flies through." (VAP43, pp. 159-160)

As regards the impact on fish, certain Crees feel that hydroelectric projects have brought about a drop in the populations of species found in the La Grande Rivière as



Collage carried out by children of Waskaganish and posted in the municipality's public hearing room

well as causing diseases among certain species and making 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: "And since the reservoirs, the fish is different, are different. Before the reservoirs, nobody ever told me to, well, you can only eat this, this amount of fish. Right now, since the reservoir, I am told now what fish, amount of fish I can eat or cannot eat. On the reservoir, the LG-2, before that I put my net out and I caught some fish, I noticed, it s different, the fish was different, looked different on the outside. The fish was very fat, very fat, fatty but that s not true, the fish was not... it was not good, it looked fatty but it wasn't good." (VAP38, p. 93)

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 carried out for the La Grande Complex project, many of them no longer drink the water straight from the La Grande Rivière or that from the water treatment plant installed for the community's needs. One person said that they only drank bottled water. Crees explained that the difference in taste and the use of chemicals 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 to drink straight from the river, but today we can't do that, we have to treat our water with chemicals in order to get the water standards that are recommended. Some community members don't drink our community treated water. Especially our elders, they say that it s the taste that they don't like, especially when we have high chlorine residual in the water system. If not for the James Bay project, the river water today probably would have been pure enough to drink without any kind of 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 people's safety, especially when travelling on the La Grand Rivière, given that the water does not freeze as it used to and the ice is not as thick as before since the increase in flow. One person mentioned that new ice conditions increased the risk of drowning: "The river doesn't really freeze anymore and this is just another item I want to bring up and it should be looked at. Very dangerous to try and walk on the ice and how they lost their lives trying to get on the ice, that should be looked at carefully." (VAP40, p. 26)

Some Crees mentioned that travelling over the ice had become more difficult, either on foot or by snowmobile. This limits access to the territory. A tallyman made the following comments about travelling by snowmobile: "…skidoo travel, and it s very tricky for people to travel by skidoo, especially the young people and we learned how to travel on the ice by our elders, we learned from our elders how to travel on the ice. Today, since the dams have been built, there is open water when you don't expect it and the ice conditions are tricky." (VAP41, p. 31) Another resident supported these comments, but with regard to travelling on foot: "People do experience difficulties and north of here, it still affects a few traplines. Before the project, we could just go across the river at any time and there was no danger and you could walk, you could go right across the river here and now, we can't do that, you can't go straight across, you can't go straight across on the river. You can't walk on the ice to go straight. You need something to take you across." (VAP41, p. 41)

The issue of the safety of people boating 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 to create the reservoirs, there is still evidence of surface wood debris, which represents a real hazard to people travelling across the territory: "For many years, we have had to stay away from them because we consider them hazardous because of floating wood and because of waves. We are beginning to use the reservoirs as travel routes now but it is important to realize that the reservoirs, as a whole, are difficult areas for us to use for travel or for hunting. They have a major impact on our use of land and water for travel, for hunting, for fishing." (VAP43, p. 156)

Problems communicating with the proponent

On numerous occasions, Crees reported communication problems between the proponent and the Cree population, particularly during past hydroelectric projects on the territory. However, some of them said they appreciated the current 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, even though Hydro-Québec knows that this is our territory." (VAP41, p. 81)

3.6.2 Questions for the proponent

The public asked the proponent a series of questions on a number of topics, among them:

- environmental monitoring program for fish;
- mitigation measures to preserve the twenty-two species counted in the Rupert River and maintain 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;
- the economic partnership agreement between the proponent and the *MBJ*, and economic spin-off for tallymen;
- the impact assessment method adopted by the proponent in its environmental impact assessment program;
- the measures that the proponent intends to introduce, under the principle of Native operational control comprised in the JBNQA;
- the eelgrass situation along the shores of James Bay;
- the JBNQA and the *Paix des braves*.

3.6.3 Primary concerns regarding the project

Despite the fact that viewpoints expressed by public hearing participants mostly related to the perceived impacts of past hydroelectric 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, landslides, the impacts on wildlife, ice and travelling conditions, mercury levels in fish, jobs and training and the potential for Aboriginal arts and crafts.

Safety of dams and related works

The safety of dams and related works is no doubt the primary concern of Chisasibi residents in terms of the project being assessed. Their community being located

downstream of the La Grande Complex hydroelectric structures, the Crees are already feeling a great deal of insecurity about the possibility of a catastrophe that would destroy the infrastructure. Should the Eastmain-1-A and Rupert diversion project be carried out, 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: "I feel I'm always asking myself, you know, is this community safe and will the faster water in the river change things." (VAP41, p. 55) There was also frequent mention of uncertainty regarding events that could irreparably alter the infrastructure and the concrete impacts of such a situation on the community: "And I'm going to talk about the dams a little bit. And I know that people are monitoring and surveying the dams, I know that, but it will be dangerous, they'll always be dangerous no matter how well he'll make the survey, no matter how well you look after them, the danger will always be there. Because nobody can predict that and nobody can stop it if it wants to happen." (VAP38, p. 81)

Often-cited events that could damage dams and related works include exceptional precipitation, terrorist acts and earthquakes. The Crees consider terrorist acts and earthquakes as events that will eventually occur and which no one will be able to control. Several people stated that they had had premonitory dreams that their community had disappeared following the destruction of the dams. They are constantly worried, with resulting impacts on mental health, which ultimately affects their quality of life. One of the tallymen alluded to terrorist acts as well as earthquakes: "And right now, the terrorists threats just only confirm my suspicions. Nobody can say, for sure, that, yes, we know this through dreams and the Creator knows all this and knows that if anything is going to happen, it will happen. And you perhaps won't know when these things will happen. It s not that... back in the day there were earthquakes and nobody knew about it and they did tell us, the experts that tell us that we shouldn't expect earthquakes but I've heard he said that back in the day, there used to be some earthquakes although I know people didn't expect that to happen. And at that time, there was nothing to tell you that these things, these earthquakes were going to happen. He says, nobody will know, it will happen and the dams will break and we will flow out to sea. We will, if it happens during cold weather, we will be destroyed." (VAP38, pp. 29-30)

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 again: "And he said they will talk about of move again, he said, I'm not really crazy about that." (VAP38, p. 31) Many other people, meanwhile, hope that the option of relocating the community for safety reasons will be given serious thought: "I saw all the dam areas and I saw LG-4, LG-2, LG-4, she said we're just like LG-2 is our pillow, LG-1, LG-1 is our pillow. She said, I thought about this for quite some time and I'm thinking about the children when I speak of this. I think that when I think of the children, they should move the children to another area or move this town to another area, it s too dangerous for the children. She said, when I talked about they started their projects and there should be enough money right now so that we could have enough money so that we could move this town, it was Hydro who moved us in the first place and why couldn't you do it again." (VAP38, p. 33-34)

Erosion of riverbanks and landslides

With the increased flow of the La Grande Rivière because of hydroelectric projects, residents have noted the continuous erosion of the river's banks, punctuated by more significant episodes, especially in winter. Recent instances of erosion have been reported. According to some Crees, if the Eastmain-1-A and Rupert diversion project is carried out, the flow of the La Grande Rivière will increase. They fear that erosion will increase over the coming years. One of the tallymen explained this widespread apprehension among community members: "We don't agree with the diversion of the Rupert River and when that happens, we will have a lot of... the water level will fluctuate and it will affect the river banks. The river will be faster, if the river is faster, it ll erode the river banks. And we know, what people here discussed is that when the diversion is done, the water level will be a lot faster and there will be erosion. When the diversion comes through, we're not crazy about that, we don't want the... because all we will experience is erosion and that happens quite a bit now, experience a lot of erosion." (VAP38, pp. 30-31)

Closely linked to riverbank 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 to one of the concerns voiced by the Chief of the Chisasibi First Nation: "The question is the landslides happening in the middle of winter. We all seem to be concerned just the summertime but we noticed that it does happen in the winter, in

the middle of winter and it is going to be, to me, personally, and it is going to be additional if the diversion goes through." (VAP39, p. 4)

Impacts on wildlife

As regards the impacts of the Eastmain-1-A and Rupert diversion project on wildlife, the Crees are concerned about a potential drop in the various animal populations, especially geese, fish and beaver. One resident inquired: "You say the current will increase 12% when or if you do divert the Rupert River, does that mean that the number of pray will also decrease by the same percentage?" (VAP42, p. 32) Some expressed their anxiety with regard to the guaranteed harvest levels provided for in the JBNQA. As underscored by the Chief of the Chisasibi First Nation, cumulative effects of other hydroelectric development projects on the James Bay territory have left people all the more fearful with regard to the diversion of the Rupert River: "To us, to me, personally, the impacts from the previous project and another 80% of a major river coming out this way, it s going to be additional impacts to already, what we're already experiencing, the ecosystem, on the marine life. Eelgrass come, start talking... getting into eelgrass, we start talking getting into fish out in the bay, we start getting, talking about the birds in the bay." (VAP39, p. 12)

Ice and travelling conditions on the La Grande Rivière

Since the La Grande Complex project, the Crees have noted major changes in the ice conditions of the La Grande Rivière, which makes travelling in the spring, summer and winter, especially by snowmobile, less safe and more difficult. They worry that these problems will be exacerbated if the Eastmain-1-A and Rupert diversion project goes ahead. One of the tallymen also said he was anxious about the frequency and size of ice jams, which could cause flooding: "[...] I'm afraid of the blockage of ice on the river. And it will be the fault of Hydro whatever happens." (VAP38, p. 31)

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: "My people travel up and down the coast of James Bay, north and south of the mouth of La Grande and there are impacts. And as far as we understand, there are going to be additional impacts and I don't think there is ever been a study that is satisfactory to us on the bay, along the coast. Mitigating measures, are there going to be any taken? The dangers of traveling, especially every spring, getting more dangerous. Long-term impacts that we've seen that never appeared, until 15, 20 years later." (VAP39, pp. 12-13)

Fish mercury levels

Following the La Grande Complex project, guidelines on fish consumption because of 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: "I could not change the way they told us that, you won't be able to eat your fish and I know that back on the island, we used to have fish almost on a daily basis." (VAP40, p. 68)

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 was under way. 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, EM-1, goes through, are we going to be told the same thing? The same situation we were in the 1980's? Not to eat fish again in the La Grande Rivière or anywhere in the reservoir." (VAP41, pp. 65-66), or yet still, "They are going to feel the effects of the diversion and I am sure we will end up with mercury, we won't be able to eat this and that. The last words that you're going to tell us, I'll bet you'll tell us we can't eat any fish." (VAP38, p. 27)

Jobs and training

In the sense that Crees must now increasingly rely on paid jobs, partly because of a growing population, some have emphasized that the jobs generally available within the scope of hydroelectric 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 create only a few jobs for a few years and what happens after. I think the point has to be made here, Mr. Chairman, our people are not after jobs. What we want in our careers? Not just a few jobs for a few years when the project is done then people are looking elsewhere." (VAP43, p. 15)

It is relatively well known that Crees must overcome 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: "We always hear that people having French as a second language can only work with Hydro-Québec, we feel that not only people with French as a second language can do these things that they can do." (VAP42, p. 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. Some people find it difficult to leave their family and friends to go study in Rouyn-Noranda, Val-D'Or or Montréal. This obviously hinders their performance and may even lead to their dropping out: "I like that jobs are available but I don't like that our young people have to go out, not everyone who goes out, graduates from the training programs, I'm sure the record is probably less than 50%, you can easily check, you know and it s hard when you grow up where you have support mechanisms, all of a sudden, to be sent down south where you don't have any. Even in our school here, despite lots of criticism, teachers work hard to help our young people to graduate. But when they go down to college, it's not the same." (VAP40, p. 17)

Potential for 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 poses a threat to the production of arts and crafts, and could even curtail economic spin-off because there would be 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 suggested that the proponent create an arts and crafts development and mitigation fund.

3.7 Comments, questions and concerns expressed in Chibougamau

Three sessions of public hearings on the Eastmain-1-A and Rupert Diversion Project were held at the Chibougamau Golf Club, on April 25 and 26.

The opinions expressed during the Chibougamau hearings came primarily from Jamesians, with a total of five presentations being made by institutions and municipalities. Other regions presented comments and concerns, including: Abitibi–Témiscamingue, with two presentations being made by institutions; Saguenay–Lac-Saint-Jean, with two presentations being made by institutions and two by engineering firms in the region. The Association de la construction du Québec offered an analysis of the project from a provincial perspective in its presentation. Only one presentation expressed the position of the Crees: that of the CBHSSJB. There was also only one presentation by a non-governmental organization: *Révérence Rupert*.

The key concerns expressed at the Chibougamau hearings revolved around the economic spin-off of the project for Chibougamau, the Northern Quebec region, the Jamesian population and contractors. The economic benefits were often mentioned to emphasize the project's importance for the region and its inhabitants.

3.7.1 Comments made

Comments were made on the following subjects during the question period at the Chibougamau hearings:

- The economic situation of the Northern Quebec region and the potential economic benefits of the project.
- Economic spinoff and the role of hydroelectric projects in replacing traditional industries in Northern Quebec.
- The tourism potential of Northern Quebec.
- The development of alternative sources of energy, particularly wind energy, as a complement to hydroelectricity.
- The awarding of contracts to contractors in Northern Quebec, Abitibi-Témiscamingue and Saguenay–Lac-Saint-Jean.
- The establishment of permanent Hydro-Québec offices in Northern Quebec, particularly Chibougamau, the region affected by the project.

3.7.2 Concerns raised

At the hearings in Chibougamau, the environmental impacts were mentioned less often than the social and economic aspects.

Job security in Northern Quebec and surrounding regions

Job creation and job security were the two primary concerns relating to the economic impacts of the project. All other aspects of economic development seem to depend on job creation capacity; this is a concern for companies in the Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean regions. It was felt that in Northern Quebec, any lasting jobs that were created would not be directly related to the project; they would instead be in the tertiary sector (e.g. services provided by small businesses like book shops and florists), to which the project's considerable economic benefits would be a boon. The economy of the entire region, it was felt, depended on the Eastmain-1-A and Rupert Diversion Project.

Tourism potential

Tourism is a potential source of economic activity for Northern Quebec. According to the brief presented by the *Conférence régionale des élus de la Baie-James (CREBJ)*, tourists come to the region for recreational activities, including hunting and fishing, which bring in $34 million a year and support 300 jobs. Moreover, "there is an astounding underdeveloped tourism potential, nearly not developed at all [in the region]" (VAP14, pp. 142, 15-17) To evaluate tourism potential, it is necessary to keep in mind that three cultures coexist in Northern Quebec: the Crees, the Jamesians and the Inuit. Cultural richness, natural resources and hydroelectric facilities would therefore be drawing cards for tourism.

In its presentation, the *Commission économique et touristique de Chibougamau* stated that the Eastmain-1-A and Rupert Diversion Project in particular would have a beneficial effect on the tourism industry of Northern Quebec, provided that Hydro-Québec played a key role in improving the region's infrastructure, in order to facilitate tourism development, particularly with respect to "…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 perspective

Hydro-Québec Production has adopted a regional development perspective in awarding contracts, helping to spread economic benefits in such remote areas as Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean. Many stakeholders stated repeatedly that the project proponent must continue to award contracts to companies in the region where the project is located. It is obvious that the economy of Northern Quebec, which is not very diversified, is entirely dependent on forestry and mining and should therefore be the first to enjoy the Eastmain-1-A and Rupert Diversion Project's economic benefits.

To maximize the project's positive economic impacts, some parties have asked that the value of contracts earmarked for bidders from Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean be raised from $1 million to $5 million. This request was made in the hope of increasing the economic benefits for the regions and directly reflects the increased ability of contractors in those regions to meet the proponent's requirements.

Hydroelectricity as an alternative to the region's traditional industries

Hydroelectricity has been hailed as an alternative industry for the Northern Quebec and Abitibi–Témiscamingue regions. Historically, the towns in those regions have grown up around sites of natural resource exploration and exploitation, i.e. forests and mines. They have therefore suffered greatly from the economic uncertainty of recent years, and they have experienced an economic slowdown owing to the closings of major companies. To compensate for the closures, it was recommended that the Government of Quebec "…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) Many stakeholders said that Hydro Québec should open offices in the Northern Quebec region, as this would create permanent jobs in the region, establish points of contact to help the region's contractors maintain sound relations with Hydro Québec, and decentralize the decision-making process by moving it away from major urban areas. Moreover, contractors would be able to optimize the expertise they acquire during the project and they would be better positioned to bid on future international projects. This would also open up new vistas of economic activity for the region.

Benefits of infrastructure to future generations

Infrastructure improvements, such as repaving the Route du Nord from Chibougamau northward to facilitate access to the project site and the La Grande Complex, would promote economic and tourism development in Chibougamau. According to the *Commission économique et touristique de Chibougamau* representative, it is essential "that the Route du Nord be rebuilt in its entirety, 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 of Jamesians will then be able to reap the benefits of the improved infrastructure they will be able to rely on and use for future development needs.

Potential social impacts

Social impacts are tied to and sometimes even confused with economic impacts. For the purposes of the analysis of the Chibougamau public hearings, the social impacts relate mainly to the Jamesian regional identity and health issues among the Crees.

Regional pride

According to the mayor of Chibougamau, Donald Dubar, the city's survival hinges on providing jobs for its inhabitants as an incentive for them to stay. To assess the region's potential, the Director General, *CREBJ* presented the results of a survey indicating that 80% of university and college-level students would return to their native regions if they could find work there. This information was presented with a view to promoting the creation of jobs for young people and preventing a population exodus, in line with the Northern Quebec plan to promote sustainable development in the region and maintain a viable economy.

Residents told the review bodies that their region offers exceptional quality of life. They expressed their desire to live there and benefit from the area's natural resources and the lifestyle the region offers. Job availability remains the only stumbling block in this regard. Historically, their attachment to the land is recent, but this does not prevent them from expressing pride in their region. They feel their role is to develop their region and they paint a sombre picture of a province devoid of its northern lands and the resources that may be present in that region.

Mercury-related health problems

Health issues associated with mercury levels are a problem for the Cree communities, which have traditionally relied on fish as a food source. According to the representative from the CBHSSJB, it is difficult to monitor fish consumption, and the Cree people do not always completely understand consumption advisories. However, public warnings of mercury in fish and recommendations to avoid consuming certain types of fish have meant that "...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) According to the CBHSSJB, there is a direct link between development projects, including hydroelectric ones, and the health of the Cree people. A statement was made to the effect that "…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)

Diversion of an untouched river

Arguments related to the environmental impacts of the proposed Rupert River diversion were expressed through concerns focussing on the diversion of an untouched, pristine river. The presentation on this aspect underscored the sense of loss felt in relation to the river, given its historical importance and recreational potential. The *Révérence Rupert* representative emphasized that the project provides only a short-term economic solution and suggested that the proponent explore wind energy as an alternative solution. He also said that the best way to reduce the environmental impacts would be to refrain from diverting the river. This argument was repeated several times during the consultation and question periods.

Rupert River strain of brook trout

A Chibougamau citizen expressed his concern over the loss of habitat for the Rupert River strain of brook trout, which is considered a unique subspecies. This question was asked: "If the proposed project were to be approved, what would the species' chances of survival be after the project?"

3.8 Comments, questions and concerns expressed in Montréal

Public hearings on the Eastmain-1-A and Rupert diversion project were held at the Dom Polski Centre during the week of May 1 to 5, 2006, and at the Palais des congrès de Montréal on May 16 and 17, 2006. The first week of public hearings consisted of presentations dealing

with all the areas of concern, but time was also set aside to allow the review bodies to hear testimony on three specific themes: fish and other biophysical aspects, the James Bay and Hudson Bay region, health and other social aspects. The federal government departments took advantage of this opportunity to present their views on the project's impacts and to answer questions from the public or from the review bodies.

In all, there were 67 presentations during the seven days of hearings. During the same period, 14 individuals asked questions which the review bodies passed on to the proponent.

Of the 67 presentations:

- twenty-seven represented interests relating to the project's commercial and economic spin-off, supported by businesses, associations of engineers, consulting firms and municipal and provincial chambers of commerce;
- six represented organizations with environmental concerns, for example environmentalist groups, research groups, non-governmental organizations and groups representing civil society;
- eight represented government organizations, including municipal governments and federal government departments;
- eight represented Aboriginal interests, including six presentations from Cree individuals, Cree organizations and the GCC (Eeyou Istchee); one presentation from the Nunavut Hudson Bay Inter-Agency Working Group (composed of a number of stakeholders, who took turns speaking); and one presentation from the Metis Corporation of Quebec and of Eastern Canada;
- two presentations were made by private citizens.

3.8.1 Comments made

The comments can be broken down into the following categories:

Economic impacts

- promoting energy efficiency programs as an alternative to hydroelectric developments
- the cost of energy generation relative to the justification of the proposed project
- the cause and effects of energy efficiency
- the relationship between Hydro-Québec Production and Hydro-Québec Distribution
- the balance between energy generation and the interconnection of Quebec's power grid to other countries facing a similar energy situation

Social impacts

- the impacts that the project under study will have on human health
- the provisions of the Agreement Concerning a New Relationship Between the Government of Quebec and the Crees of Quebec, known as the *Paix des braves*, concerning approval of the project
- comparison of the social and environmental impacts of wind power development and those of hydroelectric power development
- the sense of loss within the Cree communities due to the hydroelectric developments

Biophysical impacts

- the impact that the project will have on the Rupert River strain of brook trout
- the cumulative environmental impacts of the project under study and of other hydroelectric development projects
- the variation in the temperature and flow of the river and its effect on lake sturgeon habitat
- river water quality after construction of the diversion structures
- mercury contamination and its migration downstream
- an explanation of the methods used to identify spawning grounds
- the impacts of the diversion of warm water to higher latitudes, and its potential impacts on the terrestrial ecosystems of the North, as well on the marine ecosystems of Hudson Bay and James Bay
- traditional Cree knowledge and the mapping of areas of cultural importance and environmentally sensitive areas

3.8.2 Concerns expressed

The concerns can be categorized under three themes: potential economic impacts, potential social impacts and potential environmental impacts. The social impacts and economic impacts are generally combined and usually referred to as socio-economic impacts. However, in this analysis, we have separated the social impacts from the economic impacts for greater clarity.

Potential economic impacts

Many stakeholders pointed out the potential economic spin-off of the Eastmain-1-A and Rupert diversion project. However, the *Union Québécoise de la Conservation de la Nature-Nature Québec (UQCN-*

Nature Québec) emphasized the fact that this project could reduce the economic value of the Rupert River for local residents who depend on it for food and tourism. The following are some of the points raised at the hearings and considered potential economic impacts.

Project rationale

With respect to justification, the argument made by many advocates of the project emphasizes the need for this project as a stable, low-cost energy supply. As the Canadian Hydroelectric Association explained, hydroelectricity is a stable, low-cost source of energy, with low operating and maintenance costs. *Pôle Québec Chaudière-Appalaches* pointed out that hydroelectricity has been an important factor in the history of Quebec's development, that it has become a pillar of the economy and that the project under study will help Quebec deal with its high debt.

Industrial benefits of the project under study

The project under study is considered a way of directly and indirectly improving quality of life for residents of the province. This opinion is shared by many large corporations as well as small businesses, which feel that hydroelectric development projects provide skilled, well-paying jobs. *Société SGS, Fernand Gilbert Inc.*, the *Association de l'industrie électrique du Québec* and the *Fédération des travailleurs du Québec* all emphasized that the Eastmain-1-A and Rupert diversion project, in particular, is necessary in order to keep technicians and engineers in Quebec and ensure skilled jobs over the next five to ten years.

According to the Canadian Hydroelectric Association the Eastmain-1-A and Rupert diversion project is critical for Quebec and Canada, since it will help maintain jobs in the turbine and components manufacturing sector, as well as in consulting engineering firms. Furthermore, argued the Canadian Hydroelectric Association, it would be hard to understand how Quebec and Hydro-Québec Production, in particular, which enjoy international expertise in the area of hydroelectric development, would fail to use this expertise to offer the province an opportunity for sustainable development.

According to *Les Manufacturiers et Exportateurs du Québec*, the Eastmain-1-A and Rupert diversion project could result in growth of $4.2 to $6.1 billion for the Quebec manufacturing sector, which makes it a key factor in keeping Quebec manufacturers competitive on the world market. This viewpoint is also shared by the Aluminum Association of Canada, which pointed out that this project would make available a low-cost source of energy. This association stated that the additional electricity generated as a result of this project would enable the Quebec aluminum industry to expand by as much as $4 billion, creating more jobs and fostering regional economic development.

In the view of Eeyou Communications Network, the project under study offers a good opportunity to incorporate fibre optics into the Hydro-Québec transmission lines, rather than having to find alternate ways of providing fibre optics for Cree communities. Eeyou Communications Network argued that this technology can provide diversified alternative employment in Cree communities.

Regional economic spin-off

From a more regional perspective, the project under study is welcomed as an economic solution to the problem of job security and economic diversification. The representatives of several chambers of commerce and regional governments pointed out that this project would create jobs and would help the Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean regions, which are grappling with the closure of a number of long-established forest and mining companies.

The anticipated spin-off for the Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean regions are significant, since it is here that jobs will be created, enhancing economic stability. The representatives of the municipalities and towns of Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac-Saint-Jean all confirmed the need for the Eastmain-1-A and Rupert diversion project. During the presentation made by *Pôle Québec-Chaudière-Appalaches*, it was pointed out that the project under study will have economic spin-off in this central Quebec region and that the spin-off will not be limited to the region in which the project is located and neighbouring regions, but will also benefit all the regions of Quebec by helping to raise the standard of living in general, contributing to intergenerational equity, the development of technological know-how, maintenance of a skilled labour force and enhancement of networking opportunities. The engineering consulting firms that presented briefs also emphasized the enormous economic spin-off that the project under study will have for the entire province. However, Techmat stressed the fact that major projects

in general, and the project under study in particular, will enable the regions to compete at the regional level for jobs and even increase their ability to bid on national and international projects.

This project will help maintain Quebec's advantage, as a result of its international reputation, in hydroelectric engineering capability and know-how. Engineering consulting firms, regional businesses and regional government representatives argued that this project would provide not only economic spin-off, but would also help maintain the international reputation that Hydro-Québec has built as a result of its engineering successes.

Some also stated that the contracts reserved for regional businesses are expected to rise from $1 to $5 million. As the representatives of the regional municipalities and regional chambers of commerce explained, this increase is based on their confidence in the ability of regional businesses to meet the proponent's needs. In addition, during the public hearings, the *Conseil des élus d'Abitibi-Témiscamingue* formally requested that the proponent split up the largest contracts so that small firms could bid for contracts. This will help small businesses, often located outside urban areas, to meet the proponent's requirements and, therefore, keep the economic spin-off in the regions rather than in urban centres in southern Quebec.

The *Fédération des travailleurs du Québec* argued that the Cree communities would feel the positive impacts of the project's economic spin-off. For example, a training centre was recently opened in Waswanipi in order to facilitate the employment of Crees in the territory and at Hydro-Québec construction sites. In its presentation, *Construction Péribonka* gave examples of how an Innu community pooled its efforts to take advantage of contracts relating to projects in Saguenay–Lac-Saint-Jean, and mentioned that First Nation communities could also participate in other contracts associated with the project.

According to *Groupe SM*, the project will promote the development potential of the Northern Quebec region. *Groupe SM* and James Bay Tourism stated that the roads built to support the project will help develop the region's tourism potential by facilitating travel to previously inaccessible areas. The indirect spin-off of the project will provide the necessary resources for regional economic diversification.

Regional diversification

In its presentation, James Bay Tourism emphasized tourism potential and pointed out that Hydro-Québec facilities have become major tourist attractions in their own right, drawing 12,000 visitors a year. This organization believes that if adequate resources are devoted to improving the quality of the infrastructure, tourism can contribute to the diversification of the regional economy of Northern Quebec and promote sustainable economic development of the region. In the case of the Eastmain-1-A and Rupert diversion project, the tourism potential is even greater for the regional economy, since it will be located closer to major urban centres than existing developments. In its presentation, ComaxAT noted that the Abitibi–Témiscamingue region has been making strenuous efforts to diversify its exclusively resource-based economy, dependent on mining and forestry, and has only gradually been able to add agriculture and tourism to the region's economic activities. ComaxAT also pointed out that hydroelectric developments are a good way of diversifying the economies of these regions, since the current skills of the mining and forestry labour force can be easily adapted to this type of project.

Regional identification and youth employment

From a social perspective, the municipal governments point out that the Eastmain-1-A and Rupert diversion project will provide job opportunities for young people in the regions, so that they are not forced to migrate to major urban centres in southern Quebec. Municipal officials note that the contribution of young people is essential to sustainable community development. Without jobs or future prospects, young people will leave the regions, leading to a breakdown of the social structure and economic system.

The consulting engineering firm Cima+ pointed out that the project under study will take place at a critical time, since many engineers are approaching retirement age and young people will have an opportunity to learn by working with them, which will help transfer knowledge between generations of engineers. By encouraging the local population, and especially young people, to stay in these regions, this hydroelectric project will contribute to regional economic development. The *Association de constructeurs de routes et grands travaux du Québec* (ACRGTQ) pointed out that there is a generation gap in the labour force for major hydroelectric projects, since most workers are either in their twenties or fifties, while very few are in their thirties or forties. This makes it difficult to ensure the intergenerational transfer of knowledge and know-how. However, the ACRGTQ argues that the Eastmain-1-A and Rupert diversion project will create opportunities to pass on knowledge to future generations of workers.

Use of traditional ecological knowledge

The NTK Working Group explained that traditional ecological knowledge could be effectively used to better understand the changes occurring in a local area and that individuals with this traditional knowledge could be called upon to contribute to the establishment of monitoring programs. The Makivik Corporation, which represented the views of the Inuit of Nunavik in northern Quebec, presented a similar argument.

According to Ted Moses, former Grand Chief of the Cree and signatory of the *Paix des braves*, the tallymen were and continue to be very involved in the remedial work, attend meetings with Hydro-Québec and will be involved in impact monitoring. He added that there is also a very positive relationship between the Crees and the *SEBJ*. However, at the hearings held in Montréal, several presenters acting in a personal capacity stated that the project did not constitute sustainable development as perceived by the Crees and that a greater effort must be made to take the Cree viewpoint into consideration in the decision-making process. This argument is based mainly on the contention that, although tallymen took part in the process, the community members and the tallymen not directly affected by the project feel that their views were not sufficiently taken into account in the decision-making process.

Hydroelectricity and its social acceptance

According to the Canadian Hydroelectric Association, hydroelectric power generation is supported by 90% of the population and should be developed to the maximum. However, this point was expressed differently by *Révérence Rupert* (*EnerZonia*), which argued that a combination of wind and hydroelectric power would be more socially acceptable, while reducing the environmental impacts.

The *Groupe de recherche appliquée en macroécologie* (*GRAME*) presented its view that all the social and environmental impacts must be considered in the assessment of the Eastmain-1-A and Rupert diversion project. According to this research group, the sacred nature of the Rupert River is not a sufficient argument to prevent the development of a renewable energy source. The *CREBJ* noted in its presentation that the people from southern Quebec who are opposed to the project are not from the region and that their comments therefore have little merit, since they would not be concerned at all with the region if it were not for this project.

Cima+ pointed out that Hydro-Québec is an economic engine for the Quebec government and that, from a social perspective, it provides assistance through its funding programs for community projects and festivals, which is a means of developing and preserving the province's social and cultural heritage.

The consulting engineering firm Tecsult testified about the international recognition of the agreement signed by Hydro-Québec and the Crees, called the Boumhounan Agreement, and its acceptance as a constructive means of adopting a positive participatory approach to project design and mitigation measures.

Social acceptance of hydroelectricity from the Cree perspective

From the Cree perspective, there are differences of opinion about the acceptability of the project. The signing of the Agreement Concerning a New Relationship Between the Government of Quebec and the Crees of Quebec, better known as the *Paix des braves*, is the main reason why the Crees of Eeyou Istchee accepted the project under study. Signed in 2002, following a referendum, the *Paix des braves* received the approval of 70% of the Cree nation. In their presentation, the GCC (Eeyou Istchee) and the CRA pointed out that the *Paix des braves* was signed because Quebec's previous participation in the JBNQA did not live up to its promises.

In their presentation, the GCC (Eeyou Istchee) and the CRA indicated their acceptance of the project as set out in the *Paix des braves*, subject to a thorough social and environmental impact assessment process. These organizations also pointed out that the only way to secure project acceptance is to implement the monitoring and monitoring measures.

Mr. Moses indicated that he considered the *Paix des braves* to be a way of getting the Crees to accept the concept of development of Cree territory and to take part in that development. He went on to say that the entire Cree nation would benefit from the Eastmain 1 A and Rupert diversion project and that, if this project passes the social and environmental analysis process phase, the NBR project, as provided for in the JBNQA, will be shelved since it is considered a non-viable solution because of its significant adverse effects.

Mr. Moses stated that the reason why some members of the Cree communities might oppose this project was the inaccurate media coverage concerning the *Paix des braves*. He blamed the Cree media for this misinterpretation of the agreement. Mr. Moses pointed out that the Cree communities had accepted the Eastmain 1 A and Rupert diversion project by referendum because the

lives of the Crees have changed and they now increasingly rely on salaried jobs. He went on to note that the land and the environment no longer constitute a means of subsistence for the Crees, but rather have become a cultural activity.

In all the presentations made by Crees at the hearings held in Montréal, the fact that the land and the environment play a key role in the spiritual realm of Cree existence was emphasized. The importance of the land and the environment was evident in the presentation made by Charles Esau and the Chief of the Waskaganish First Nation, Robert Weistche, who pointed out that the Rupert River is vital to Waskaganish and that the community members identify with it. Chief Robert Weistche, who spoke of the importance of the river for the spirituality of community members, fears that they will lose contact with their identity if the flow of the river is reduced by a dam. Kenny Blacksmith contended that destruction of Eeyou Istchee land has led to cultural genocide and considers it unacceptable that Cree culture should be destroyed in order to satisfy the lifestyles of other people (i.e. southern Quebec and export markets such as the United States and Ontario) In his presentation to the review bodies, Kenny Blacksmith wondered why the Crees should have to renounce their human rights in respect of their land in order to receive essential services that other people elsewhere receive.

In addition, the CBHSSJB pointed out that development project worksites, including those for hydroelectric projects, bring the Cree communities into closer contact with drugs and alcohol, which represent a potential source of social impacts associated with the project under study

Understanding Cree health

The presentations dealing with health were made primarily by Health Canada and the CBHSSJB. However, the *Fondation Rivières* placed great emphasis on the fragility and quality of the food supply.

Spirituality is an integral part of health status and is considered an essential factor in understanding Cree health. According to the CBHSSJB, a holistic approach to understanding health includes emotional, mental, physical and spiritual health. This organization added that psychological problems are directly linked to development in the North and to the far-reaching changes that have contributed to the adoption of the current lifestyle.

According to Health Canada, the negative social impacts associated with the project under study will lead to a loss of identity, traditions and land, a worsening of food security, a weakening of the social fabric and a loss of social resilience. In its presentation, Health Canada particularly stressed that the project under study will not help solve social problems in the Cree communities, but rather will increase their fragility in the face of current problems, since assistance networks and social networks will become more vulnerable. Health Canada also pointed out that social impacts such as the sense of loss and the loss of cultural identity are much harder to measure and to mitigate than biophysical impacts.

The Sierra Club of Canada expressed its concerns about the impact on the health of the Crees, because of the abandonment of a diet high in fish and problems related to fish consumption in Hydro-Québec Production's recommendations and the adverse impact that this may have on Cree eating habits. According to the Sierra Club of Canada, in the final analysis, the project's acceptability will have to be measured against the unrestricted consumption of fish and, when a project results in a population being deprived of access to a food supply, then that project should be declared unacceptable. In its presentation, the CBHSSJB stressed the fact that, for the Crees, having to give up eating fish represented the greatest social impact on the Cree Nation. In its view, "[…] the mercury levels, fish consumption, obesity, diabetes, all of these issues are interconnected." (VAP23, p. 147) This has had general impacts on well-being within the Cree population.

The point that the change in fish consumption habits has caused health problems among the Crees was raised in many presentations, receiving particular emphasis in those from the *UQCN-Nature Québec* and Health Canada. In the opinion of Health Canada, the solution offered by Hydro-Québec Production, namely to issue recommendations concerning fish consumption as a measure to mitigate the health impacts, is of little value. In fact, Health Canada disagrees with the mitigation measures proposed by the proponent, since they fail to take into account scenarios aimed at vulnerable groups, such as young mothers and children, who represent a large proportion of the Cree population and seasonal fish consumption, which can be intense for short periods. The other point of disagreement raised by Health Canada was that Hydro-Québec did not have a communication plan or monitoring measures concerning the project's health impacts. In its presentation, Health Canada called for the establishment of a monitoring program that would include ways of measuring the

social determinants of health, adapted to the realities of the Cree communities.

The main argument made in Health Canada's presentation was that, in its Environmental Impact Statement, Hydro-Québec Production presented data based on dubious assumptions, i.e. the acceptability of thresholds higher than those considered acceptable by Health Canada.

Potential environmental impacts

Environmental impacts were an underlying theme in many presentations, although not the main issue discussed. Major areas of concern in this category of impacts were related to biodiversity, renewable energy, the cumulative impacts of the project and mercury contamination of fish.

Justification of green energy

A number of presenters, from various backgrounds, raised arguments concerning renewable energy, for different reasons. Representatives of the Canadian Hydroelectric Association pointed out that hydroelectricity is a renewable energy source that is green, reduces air pollution and, ultimately, helps combat climate change. In its presentation, Cima+ pointed out that Canada is a signatory of the Kyoto Protocol and that it is essential to take full advantage of hydroelectricity, a source of energy that produces low greenhouse gas emissions compared to fossil fuels. From a more global perspective, the Canadian Hydroelectric Association stated that environmental impact 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, it can be argued that the *Canadian Environmental Assessment Act* and the *Fisheries Act* in fact create obstacles to the more intensive development of hydroelectric potential in Canada and that some adjustments to this legislation are therefore needed. In its presentation, *Construction Péribonka* noted the contribution of the environmental impact assessment process to sustainable development.

According to the *Association de l'industrie électrique du Québec*, hydroelectricity is a reliable source of energy generation. Wind power and hydroelectricity are complementary and should not be considered competing energy sources.

GRAME adopted a holistic viewpoint toward the other energy generation options, describing the project under study as a good long-term sustainable option for energy generation in the province. The main factors motivating its decision to adopt this position were the potentially significant adverse impacts, such as acid rain and climate change, associated with the use of fossil fuels. *GRAME* is convinced that hydroelectric developments can reduce our fuel needs and help reduce the production of greenhouse gases.

In terms of alternatives to the project, *Révérence Rupert* criticized the Environmental Impact Statement submitted by Hydro-Québec Production as not including a sufficiently in-depth examination of alternatives to the project, pointing out that the proponent's analysis failed to give serious consideration to other energy sources, such as solar energy, biomass and wind power. *EnerZonia* argued that wind power could constitute a viable alternative to the project and that wind generators could be installed in existing reservoirs, minimizing their visual impact. To justify the potential of wind power in Quebec, it cited as examples Spain and Denmark; according to *EnerZonia*, Spain provides a good example of the use of wind power, although its situation is one in which achieving balance is extremely difficult.

A look at James Bay and Hudson Bay

The main point raised by the *UQCN–Nature Québec* concerned the importance of considering cumulative impacts because of the sensitivity of northern environments to environmental impacts. This argument was repeated by the NTK Working Group, which argued in its presentation that the James Bay and Hudson Bay ecosystem is fragile and this factor must therefore be taken into consideration in the environmental assessment, especially in light of the cumulative impacts affecting water bodies originating in several provinces, such as Manitoba, with the construction of dams on major rivers that flow northward, Ontario and finally Quebec, with its many hydroelectric developments. Specifically, *UQCN–Nature Québec* pointed out that because a significant quantity of water that flows into Hudson Bay is currently "turbined." it is therefore imperative to study the extent to which the hydroelectric developments completed by Hydro-Québec have caused cumulative impacts in the region.

The NTK Working Group argued that the cumulative impacts in the James Bay and Hudson Bay region must be studied collaboratively by the various authorities, given the many overlapping responsibilities for managing water resources. In order to gain a better understanding of these impacts, we need more detailed data about the processes taking place in this ecosystem. Fisheries and Oceans Canada called for a joint study

project that would include Nunavut and the other bodies responsible, in order to properly assess the impacts on James Bay and Hudson Bay. In its presentation, *UQCN–Nature Québec* also raised the issue of the need to assess the cumulative impacts with the participation of all the bodies responsible in order to obtain an accurate picture of the environmental impacts of developments in the region, pointing out that James Bay and Hudson Bay are important ecosystems, especially for migratory birds.

The unique nature of the Rupert River strain of brook trout

The Rupert River strain of brook trout is a unique species in the world, being found only in the Rupert River watershed. The Sierra Club of Canada, the *UQCN–Nature Québec* and the *Fondation Rivières* argued that the project will have impacts on fish populations in the Rupert River watershed and will particularly adversely affect the Rupert River strain of brook trout, which has a unique genotype. The Sierra Club of Canada pointed out that as a signatory to the Convention on Biological Diversity, Canada must meet its obligations to protect unique species.

On the subject of the habitat of the Rupert River strain of brook trout, the *Fondation Rivières* explained that this species occupies a localized habitat downstream of the dam, requires rapids and deep pools, and occupies specific niches and will therefore be affected by the construction of weirs along the Rupert River. Finally, the *Fondation Rivières* commented on the lack of information about the Rupert River strain of brook trout in the Environmental Impact Statement. Although the Crees have identified spawning grounds of this species downstream of the dam under study, Hydro-Québec Production failed to mention this point in its site options for this structure.

Fisheries and Oceans Canada believes that the project will not have significant adverse impacts on fish and pointed out that mitigation measures will be taken to conserve the fisheries and protect fish species and fish habitats. Fisheries and Oceans Canada confirmed that there will be local impacts on fish populations immediately downstream of the dam, but that these impacts will decrease further downstream, where conditions will be maintained closer to natural conditions. It is satisfied with the proponent's analysis and with the proposed mitigation and monitoring measures.

Potential impacts on migratory birds

Environment Canada was concerned that the mitigation and monitoring measures proposed by Hydro-Québec Production do not go far enough. In addition to creating ponds and restoring degraded portions of construction sites, it would like the Crown corporation to create sustainable areas for waterfowl, monitor wetlands, develop adaptive management strategies for migratory birds and, finally, build artificial nests and plant trees. Environment Canada noted that implementing adapted mitigation and monitoring measures could even result in an increase in the number of birds in the affected area.

In its presentation, Health Canada noted that Hydro-Québec Production's Environmental Impact Statement did not provide sufficient information on mercury contamination of waterfowl and the health impacts for humans who eat these birds.

Monitoring and follow-up measures and adaptive management strategies

From the presentations made, it appears that the follow-up and monitoring measures were a decisive factor in the acceptance and justification of the project under study. Through the Makivik Corporation, the Inuit of Nunavik called for these measures and for the implementation of a monitoring program in collaboration with the First Nations; this viewpoint was echoed by the NTK Working Group, which expressed the hope that the Inuit of Nunavut would be involved in the monitoring program. The presentation of the GCC (Eeyou Istchee) and the CRA included a strong position in favour of long-term monitoring of the project's environmental and social impacts, involving the participation of Cree representatives, scientists and industry members, independently of Hydro-Québec. The GCC (Eeyou Istchee) and the CRA also stressed the need for an independent body, given the Crees' lack of confidence in Hydro-Québec, and indicated that this body should not include provincial government representatives in view of the close ties between the Quebec government and the Crown corporation. The idea of setting up monitoring programs is supported by industry, as the *Groupe SM* indicated in its presentation. The points raised by the GCC (Eeyou Istchee) and the CRA are reflected in the presentations of individual Crees, who presented their own requests to the review bodies. For instance, Kenny Blacksmith argued that since the proponent had conducted a subjective analysis in its report on the impacts, it was imperative that a separate organization be asked to conduct an in depth assessment of the project's cumulative impacts.

The management of the water flows resulting from the diversion is a particularly important point for the GCC (Eeyou Istchee) and the CRA in terms of developing

monitoring methods. They argued that Cree participation in this management would significantly increase the chances of creating a sustainable biological environment in the river after the diversion. To this end, consideration should be given to establishing an independent water management control board composed of Crees.

The Niskamoon Corporation explained that the purpose of the Niskamoon Agreement is to create an effective framework of collaboration between the Crees of Eeyou Istchee and Hydro-Québec for all the agreements signed by the two parties and that it was designed as a framework agreement for all the other agreements. In its presentation, the Niskamoon Corporation pointed out that the Boumhounan Agreement is of particular importance for the Eastmain-1-A and Rupert diversion project and stipulates that Hydro-Québec shall assume all costs associated with the remedial measures listed in the certificate of authorization issued for this project. The remedial measures are specified in the Boumhounan Agreement. However, in their presentations, the Niskamoon Corporation and the GCC (Eeyou Istchee) and the CRA stressed that these measures constituted only a minimum and that they would rely on the review bodies' recommendations to ensure additional remedial measures to address the impacts of the project under study. In its presentation, the Niskamoon Corporation indicated that unanticipated impacts are likely and that the Boumhounan Remedial Works Fund ($32 million) could also be used to correct these impacts. In concluding, it stated that it was prepared to apply the Boumhounan Agreement if the project is approved.

Fisheries and Oceans Canada believes that a follow-up plan should be implemented that would apply to all the areas to be monitored. For example, Fisheries and Oceans Canada expressed its concerns about the unhindered movement of fish and noted that this is frequently a matter of slope. According to Transport Canada, Hydro-Québec Production will have to chart the navigable waterways in the affected areas, mainly so that mitigation measures can be implemented if necessary. Transport Canada also pointed out that the mitigation measures for navigation implemented by Hydro-Québec Production will have to cover a five-year period and that particular attention will have to be paid to wood debris in the diversion bays.

Mercury contamination of fish

In its presentation, Natural Resources Canada discussed the origin of the mercury. This federal department explained that while the soil in the project area contains mercury, the concentration varies both vertically and horizontally, and that the vegetation serves as a catalyst for the release of mercury into the environment. It therefore suggested that the proponent consider scraping in order to reduce the level of mercury that would eventually be released into the water through methylation after impoundment.

The Sierra Club of Canada, whose main points dealt with mercury and biodiversity, indicated it had some concerns about the models used to calculate mercury concentrations in the flooded areas.

Gaps in the data collected

The purpose of this section is to highlight the arguments concerning the general idea of a need for information in order to be able to properly assess the social and environmental impacts of the project under study. This includes not only information about the assessment process, but also information provided by the proponent in its Environmental Impact Statement.

Citing the information provided by Hydro-Québec, the GCC (Eeyou Istchee) and the CRA accused the proponent of minimizing the impacts that the project under study would have on the environment and on Cree society as a whole. This organization indicated that it has come to the realization that the Eastmain-1-A and Rupert diversion project will have significant impacts and that there is no precedent anywhere else in North America for diverting such a large river.

At the public hearings held in Montréal, one point raised by the non-governmental organizations, the NTK Working Group and government organizations was the lack of baseline data, especially concerning the status of the James Bay and Hudson Bay ecosystems prior to the hydroelectric developments in the region 25 years ago. A similar argument was presented by the GCC (Eeyou Istchee) and the CRA, which, in their presentation, deplored the lack of data for the baseline reference year in the case of the development of the La Grande Complex. It questioned how another project on such a vast scale can still be justified since this information is not available for the La Grande Complex.

Counter-assessments submitted by non-governmental organizations (NGOs)

This section deals mainly with the environmental and social assessment process followed to assess the proponent's Environmental Impact Statement. A few presenters at the hearings expressed their dissatisfaction with the timetable for the review and the restrictions on the

financial assistance provided, which did not allow the non-governmental organizations to prepare an effective counter-assessment.

The Sierra Club of Canada claimed that the assessment process differs depending on whether the project being assessed is located in northern or southern Quebec. In its presentation, this organization expressed its concerns about regulatory measures in northern Quebec and claimed that if a project such as the one under study, projected to result in such significant increases in mercury concentrations, were to be proposed for southern Quebec, it would be considered unacceptable because of its major environmental impacts.

The *Fondation Rivières* also expressed its dissatisfaction with the lack of financial assistance, in view of the significant environmental and social impacts of the project under study. The Sierra Club of Canada, with the support of *Révérence Rupert*, which presented similar demands, questioned the validity of the environmental assessment process given the limited financial assistance allocated for public hearing participants, which reduced the quality of the presentations made.

Finally, the Sierra Club of Canada complained about the fact that the timetable imposed, in 2003, for review of the project by the review bodies was too short, intimating that this "[could] even possibly lead to a legal appeal of the process" (VAP18, p. 33) *Révérence Rupert* made similar comments, claiming that the time allowed to read the documents tabled by Hydro-Québec was inadequate and considered it outrageous that it had less than 30 days to review certain documents before the hearings were announced.

In its presentation, the Metis Corporation of Quebec and of Eastern Canada argued that the financial assistance process followed for the Eastmain-1-A and Rupert diversion project did not respect the rights granted to the Metis, since they were neither consulted nor received funding for the review of the project under study.

The Town of Matagami criticized the public hearing process since no sessions were held in Matagami to allow residents to voice their concerns about this project. The town's mayor argued that Matagami residents had to travel long distances in order to participate in the public hearings. The mayor of Matagami asserted that the process therefore did not allow the residents of Matagami to present essential information to the review bodies.



4

Project Justification

4. PROJECT JUSTIFICATION

The project justification and the choice of hydroelectricity were discussed at length during the public hearings. The proponent had to clarify and explain its electricity supply and demand forecasts, as well as details about how wind power generation is being integrated into Quebec's electricity distribution grid. The attention given to the forecasts was all the greater given the changes in the proponent's data since the original impact study documents were filed and the response to requests for additional information by the review bodies.

This interest in the justification of energy projects is understandable, given the fact that the proponent is a Crown corporation, the investment required to carry out the projects is substantial, the expectations regarding economic spinoff are high, the social and environmental impacts are major and the forums for debating this issue are few and may appear arcane to ordinary people. In addition, during consultation of the Cree communities on whose traplines this project will be constructed, with its associated environmental and social impacts, the review bodies heard suggestions about the development of other forms of energy, allegedly less harmful to the environment.

Justification for a project of this size is a complex issue, deserving of an in-depth study based on a variety of factors and focusing on different angles, including the reasons given by the proponent, energy planning, commercial objectives, alternatives and project costs.

In June 2006, the Quebec government released its Energy Strategy 2006-2015, which is added to the factors to be considered during the study under way. The strategy reports on the supply of electricity required to 2014 and takes into account exports to neighbouring markets. It also allows for updating of the data on energy needs submitted by the proponent.

4.1 Hydro-Québec Distribution's need for additional supplies

4.1.1 Energy and capacity

Since the tabling of the Environmental Impact Statement in December 2004, forecasts concerning the balance between the energy and capacity requirements of Hydro-Québec Distribution (HQD) and the energy and capacity available from Hydro-Québec Production (HQP) have changed, as attested by the documents tabled in connection with the environmental assessment procedure as well other documents. It is normal for such forecasts to be periodically revised in order to reflect, as accurately as possible, changes in the various parameters that affect these balances. In order to ensure that the discussion is based on assumptions that are as realistic as possible, Hydro-Québec's Strategic Plan for the 2006-2010 period, released in June 2006, will be used as a basis for the following analysis. Tables 4-1 to 4-5 summarize these new data and take into consideration the data presented in the Quebec government's Energy Strategy mentioned above. The scenarios presented below are valid for average runoff and average growth.

Tables 4-1 and 4-2 reflect the new data contained in Hydro-Québec's Strategic Plan 2006–2010 concerning additional supplies required by HQD. These tables are not as detailed as the ones presented in the Environmental Impact Statement prepared by the proponent. However, they indicate a decrease in energy needs and capacity compared to the Environmental Impact Statement.

Energy needs between now and the year 2014 (1st line of Table 4-1) were reduced by 3.5 TWh compared to previous forecasts, while the capacity required beyond the heritage pool electricity (3rd line of Table 4 2) was reduced by 387 MW for the 2012–2013 period compared to the forecast provided in the progress report of the Electricity Supply Plan 2005–2014. This decrease can be explained by the inclusion of a new annual energy savings target of 8.1 TWh during the period leading to the year 2015, as called for by the Quebec government in its Energy Strategy.

Concerning the additional supplies required between now and the year 2014 (last line of Table 4 1), the energy demand that HQD will have to meet is 2.4 TWh lower, instead of an additional required supply of 1.1 TWh, as forecast in the Supplement to the Environmental Impact Statement (RD-10, Tables B and B 1). This therefore obviates the need for HQD to rely on calls for tenders for supplies until the year 2014.

However, in terms of additional capacity required by HQD between now and the year 2014 (last line of Table 4-2), there continues to be a need for 1,140 MW for the 2009–2010 period, falling to 880 MW for the 2012–2013 and 2014–2015 periods. In all probability, HQD will have to acquire blocks of capacity in order to meet additional demand.

Table 4-1 **Projection of additional supplies required by Hydro-Québec Distribution (TWh)**

(actual)	2005	2006	2007	2008	2009	2010	2012	2014
Energy needs	**182.5**	**183.9**	**187.8**	**189.8**	**191.1**	**192.3**	**193.8**	**194.1**
Minus heritage pool electricity (165 TWh + losses)*	178.6	178.5	178.4	178.4	178.6	178.6	178.6	178.6
Supplies required beyond the heritage pool	**3.9**	**5.4**	**9.4**	**11.4**	**12.5**	**13.7**	**15.2**	**15.5**
Minus non-heritage-pool supplies**	**3.9**	**3.9**	**9.1**	**10.7**	**11.1**	**12.4**	**15.0**	**17.9**
TransCanada Energy (Bécancour) (A/O 2002-01)	-	1.4	4.1	4.1	4.1	4.1	3.7	4.1
Hydro-Québec Production Baseload deliveries (A/O 2002-01)	-	-	2.6	3.1	3.1	3.1	3.1	3.1
Hydro-Québec Production Cycling deliveries (A/O 2002-01)	-	-	1.8	2.2	2.2	2.2	2.2	2.2
Biomass (A/O 2003-01)	-	0.1	0.2	0.3	0.3	0.3	0.3	0.3
Wind power (contracts signed) 990 MW (A/O 2003-02)	-	0.0	0.5	1.1	1.5	1.9	2.7	3.0
Wind power (call for tenders) 2,000 MW (A/O 2005-03)	-	-	-	-	0.1	0.9	3.0	5.3
Short-term contracts signed (A/O 2004-01/03/04, 2005-01/02/04, 2006-01)	3.9	2.4	-	-	-	-	-	-
Additional supplies required	**0.0**	**1.5**	**0.3**	**0.7**	**1.4**	**1.3**	**0.2**	**2.4 (surplus)**

*The energy supplied is less than the maximum contracted (178.9 TWh) as a result of real-time supply management.

** Not including 500 MW of wind power earmarked for the regions (regional county municipalities) and First Nations. Delivery dates to be determined.

Source: Quebec's Energy Strategy and Hydro-Québec's Strategic Plan, June 2006.

It therefore appears that consumers' electricity conservation decisions do not influence capacity and energy demands in the same way. Incentives aimed at the residential and industrial sectors will primarily influence energy consumption, which does not change the need for available capacity at certain periods of the year.

At the public hearings, some stakeholders reviewed the capacity and energy supply/demand calculations provided by the various Hydro-Québec entities. They also concluded that there would be an energy surplus by the year 2014, which gives the impression that the project would not be justified by the domestic demand of the Quebec grid. However, it must be pointed out that this surplus is largely dependent on attaining the energy savings targets of 4.1 TWh in 2010 and 8.1 TWh in 2015 set by Quebec's Energy Strategy 2006–2015. Hence, it must be borne in mind that this is an area where the proponent does not have full control over all of the parameters, which largely depend on the willingness of consumers to conserve energy.

Tables 4-3 and 4-5 reflect the new data contained in Hydro-Québec's Strategic Plan 2006–2010 concerning HQP's projected energy (scenario with a 50% probability – average runoff 1943–2003) and capacity balances. Table 4-4 was also adjusted in order to deduct the capacity provided by the Eastmain-1-A and Rupert diversion project and thereby illustrate its contribution to the energy and capacity balance. The same exercise could

Table 4-2 **Projection of additional capacity required by Hydro-Québec Distribution (MW)**

Winter (actual)	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2012-2013	2014-2015
Capacity required	**35,784**	**39,299**	**39,794**	**40,334**	**40,570**	**40,692**	**40,817**	**40,950**
Minus heritage pool electricity (34,342 MW + capacity reserve)	37,442	37,442	37,442	37,442	37,442	37,442	37,442	37,442
Supplies required beyond the heritage pool	**(1,658)**	**1,857**	**2,352**	**2,892**	**3,128**	**3,250**	**3,375**	**3,508**
Minus non-heritage-pool supplies*	**1,750**	**1,105**	**1,809**	**1,847**	**1,990**	**2,145**	**2,495**	**2,630**
TransCanada Energy (Bécancour) (A/O 2002-01)	-	547	547	547	547	547	547	547
Hydro-Québec Production Baseload deliveries (A/O 2002-01)	-	-	350	350	350	350	350	350
Hydro-Québec Production Cycling deliveries (A/O 2002-01)	-	-	250	250	250	250	250	250
Biomass (A/O 2003-01)	-	20	36	36	36	36	36	36
Wind power (contracts signed) 990 MW (A/O 2003-02)	-	38	126	164	217	252	347	347
Wind power (call for tenders) 2,000 MW (A/O 2005-03)	-	-	-	-	90	210	465	600
Short-term contracts signed (A/O 2004-01/03/04, 2005-01/02/04, 2006-01)	1,250	-	-	-	-	-	-	-
Interruptible electricity	500	500	500	500	500	500	500	500
Additional capacity required (rounded to the nearest 10 MW)	**-**	**750**	**540**	**1,050**	**1,140**	**1,110**	**880**	**880**

Note: Not including 500 MW of wind power earmarked for the regions (regional county municipalities) and First Nations. Delivery dates to be determined.

Source: Quebec's Energy Strategy and Hydro-Québec's Strategic Plan, June 2006.

not be carried out for Table 4-5 since the capacity balance table in the proponent's Strategic Plan 2006–2010 does not provide a breakdown of capacity from new generating projects.

The conclusions to be drawn from the new data on HQP's energy and capacity balances provided by Hydro-Québec's Strategic Plan are that:

- with the Eastmain-1-A and Rupert diversion project, a margin of flexibility of 15 TWh is achievable by 2010;
- with the Eastmain-1-A and Rupert diversion project and the commissioning of the first Romaine generating station (0.4 TWh), HQP's uncommitted resources available for sales will rise to 7.8 TWh in 2014;
- without the Eastmain-1-A and Rupert diversion project, the margin of flexibility of 14.3 TWh will be attained in 2014, but HQP will then have no uncommitted resources available for sale.

It can therefore be concluded that Quebec's domestic energy needs will be met in 2014, since a surplus of 7.8 TWh should be available according to HQP's balance calculations and if HQD's demand in fact reduces by 2.4 TWh. However, the proponent has clearly signalled its intention to be active in the export market and has mentioned this objective as one of the justifications for the project.

During the environmental assessment process, some stakeholders outlined various scenarios which, should

Table 4-3 Hydro-Québec Production's projected energy balance (TWh) with the Eastmain-1-A and Rupert diversion project

Energy reserves	2005 (actual)	2006	2007	2008	2009	2010	2012	2014	Growth 2005-2014
At December 31	105.3	105.3	105.3	106.3	107.9	111.5	114.2	116.1	10.7
Annual energy	**2005 (actual)**	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**	**2014**	**Growth 2005-2014**
Current resources									
Hydroelectric generation	153.6	155.1	155.1	155.1	155.1	155.1	155.1	155.1	
Conventional thermal generation	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Nuclear generation Gentilly-2	4.8	4.6	4.5	4.4	4.4	3.7	0.0	5.2	
Long-term purchases (including Churchill Falls)	34.3	35.6	35.9	35.7	35.7	35.7	35.7	35.7	
	192.9	**195.5**	**195.7**	**195.4**	**195.4**	**194.7**	**191.0**	**196.2**	**3.3**
Commitments in Quebec									
Planned deliveries of heritage pool electricity	178.6	178.5	178.4	178.4	178.6	178.6	178.6	178.6	
Deliveries to HQD call for tenders A/O 2002			4.4	5.3	5.3	5.3	5.3	5.3	
Deliveries to HQD other contracts 2005 and 2006	0.3	0.7							
Other (deliveries under agreement and station service)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	
Commitments outside Quebec									
Short- and long-term contracts	3.4	3.0	2.9	2.9	2.9	2.9	2.8	2.5	
	186.2	**186.1**	**189.5**	**190.4**	**190.6**	**190.6**	**190.6**	**190.2**	**4.0**
Current resources minus commitments	**6.7**	**9.4**	**6.1**	**5.0**	**4.8**	**4.1**	**0.4**	**5.9**	**(0.7)**
Variation in energy reserves and electricity purchases									
Runoff (deviation from average)	1.7								
Drawdown (increase) in energy reserves: leveraging, filling and adjustment of reserves	(3.9)	0.6	(0.0)	(0.7)	(1.6)	(3.5)	(1.4)	(0.5)	
Purchases from independent power producers	0.0	0.1	0.7	1.5	1.5	1.5	1.5	1.5	
Short-term purchases	4.7								
	2.5	**0.7**	**0.7**	**0.8**	**(0.1)**	**(2.0)**	**0.1**	**1.0**	**(1.5)**

Table 4-3 (continued) **Hydro-Québec Production's projected energy balance (TWh) with the Eastmain-1-A and Rupert diversion project**

Annual energy	2005 (actual)	2006	2007	2008	2009	2010	2012	2014	Growth 2005-2014
New generating projects on the 2006-2014 horizon									
Refurbishment + turbine optimization projects (MATH)		0.1	0.3	0.6	0.7	0.9	0.9	0.9	0.9
Mercier		0.1	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	
Chute-Allard			0.0	0.3	0.4	0.4	0.4	0.4	6.1
Rapides-des-Cœurs			0.0	0.4	0.5	0.5	0.5	0.5	
Péribonka				0.6	2.2	2.2	2.2	2.2	
Rupert diversion (gains at LG-1, LG-2-A and Robert-Bourassa)						5.3	5.3	5.3	
Eastmain-1-A							2.3	2.3	8.5
Sarcelle							0.9	0.9	
First Romaine complex generating station (commissioning in November 2014)								0.4	0.4
	-	**0.7**	**3.4**	**5.0**	**6.8**	**13.0**	**15.5**	**15.8**	**15.8**
Margin of flexibility for managing runoff risk and short-term sales	**9.2**	**10.8**	**10.2**	**10.8**	**11.6**	**15.0**	**15.0**	**15.0**	**5.8**
Uncommitted resources available for long-term sales	-	-	-	-	-	-	**1.0**	**7.8**	**7.8**

* Output at Eastmain-1 generating station is 2.7 TWh, except in 2010 and 2011, when inflows from the Rupert diversion temporarily increase it to 3.4 TWh until Eastmain-1-A powerhouse is commissioned.

( ) Figures in brackets are negative.

Source: Quebec's Energy Strategy and Hydro-Québec's Strategic Plan, June 2006.

they prove accurate, would result in even slower growth of demand in Quebec. These scenarios dealt, for instance, with the future of industrial development in relation to Hydro-Québec's rate structure and price projections for electricity sold outside the province. Based on these scenarios, the project would be justified only in the short and medium term for exports, for which no detailed profit projections have been calculated. The reservations expressed by these stakeholders demonstrate that they are not opposed to exports in principle, but question the assumptions underlying the calculations of the profitability of such sales, particularly in the long term, in a context where energy generation outside Quebec's border is constantly changing. However, this is speculation and brings no new objective elements to the debate on justification.

4.1.2 Increasing the margin of flexibility

Like the concept of balance between the energy supply and demand of HQD and HQP, the concept of margin of flexibility was a focus of attention during the compliance analysis of the Environmental Impact Statement and at the public hearings. The proponent argued that a margin of 15 TWh is necessary in order to be able, as an operator, to meet its obligations. It claims that the concept of margin of flexibility is particularly important since it must regularly report to the Régie de l'énergie on changes in this margin, thereby demonstrating its capacity to meet electricity demand at all times.

Tableau 4-4 Hydro-Québec Production's projected energy balance (TWh) without the Eastmain-1-A and Rupert diversion project

Energy reserves	2005 (actual)	2006	2007	2008	2009	2010	2012	2014	Growth 2005-2014
At December 31	105.3	105.3	105.3	106.3	107.9	111.5	114.2	116.1	10.7
Annual energy	**2005 (actual)**	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**	**2014**	**Growth 2005-2014**
Current resources									
Hydroelectric generation	153.6	155.1	155.1	155.1	155.1	155.1	155.1	155.1	
Conventional thermal generation	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Nuclear generation Gentilly-2	4.8	4.6	4.5	4.4	4.4	3.7	0.0	5.2	
Long-term purchases (including Churchill Falls)	34.3	35.6	35.9	35.7	35.7	35.7	35.7	35.7	
	192.9	**195.5**	**195.7**	**195.4**	**195.4**	**194.7**	**191.0**	**196.2**	**3.3**
Commitments in Quebec									
Planned deliveries of heritage pool electricity	178.6	178.5	178.4	178.4	178.6	178.6	178.6	178.6	
Deliveries to HQD call for tenders A/O 2002			4.4	5.3	5.3	5.3	5.3	5.3	
Deliveries to HQD other contracts 2005 and 2006	0.3	0.7							
Other (deliveries under agreement, station service)	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	
Commitments outside Quebec									
Short- and long-term contracts	3.4	3.0	2.9	2.9	2.9	2.9	2.8	2.5	
	186.2	**186.1**	**189.5**	**190.4**	**190.6**	**190.6**	**190.6**	**190.2**	**4.0**
Current resources minus commitments	**6.7**	**9.4**	**6.1**	**5.0**	**4.8**	**4.1**	**0.4**	**5.9**	**(0.7)**
Variation in energy reserves and electricity purchases									
Runoff (deviation from average)	1.7								
Drawdown (increase) in energy reserves: leveraging, filling and adjustment of reserves	(3.9)	0.6	(0.0)	(0.7)	(1.6)	(3.5)	(1.4)	(0.5)	
Purchases from independent power producers	0.0	0.1	0.7	1.5	1.5	1.5	1.5	1.5	
Short-term purchases	4.7								
	2.5	**0.7**	**0.7**	**0.8**	**(0.1)**	**(2.0)**	**0.1**	**1.0**	**(1.5)**

Tableau 4-4 (continued) **Hydro-Québec Production's projected energy balance (TWh) without the Eastmain-1-A and Rupert diversion project**

Annual energy	2005 (actual)	2006	2007	2008	2009	2010	2012	2014	Growth 2005-2014
New generating projects on the 2006-2014 horizon									
Refurbishment + turbine optimization projects (MATH)		0.1	0.3	0.6	0.7	0.9	0.9	0.9	0.9
Mercier		0.1	0.3	0.3	0.3	0.3	0.3	0.3	
Eastmain-1*		0.5	2.7	2.7	2.7	2.7	2.7	2.7	
Chute-Allard			0.0	0.3	0.4	0.4	0.4	0.4	6.1
Rapides-des-Cœurs			0.0	0.4	0.5	0.5	0.5	0.5	
Péribonka				0.6	2.2	2.2	2.2	2.2	
First Romaine complex generating station (commissioning in November 2014)								0.4	0.4
	-	**0.7**	**3.4**	**5.0**	**6.8**	**7.0**	**7.0**	**7.4**	**7.4**
Margin of flexibility for managing runoff risk and short-term sales	**9.2**	**10.8**	**10.2**	**10.8**	**11.6**	**9.0**	**7.5**	**14.3**	**5.1**
Uncommitted resources available for long-term sales	-	-	-	-	-	-	-	-	-

( ) Figures in brackets are negative.

Source: Quebec's Energy Strategy and Hydro-Québec's Strategic Plan, June 2006.

The proponent indicates that the Eastmain-1-A and Rupert diversion project will add 893 MW of capacity and 8.5 TWh of output to its generating fleet, including 5.3 TWh beginning in 2010, helping to restore HQP's annual target margin of flexibility of 15 TWh. According to the proponent's explanations, no long-term contractual commitments inside or outside Quebec will be made as long as the annual margin of flexibility for managing runoff risk remains below 15 TWh (RP10).

In the event that the project does not go ahead, the margin of flexibility would be almost back to 15 TWh in 2014 (14.3 TWh) after fluctuating between 7.5 and 11.6 TWh between 2005 and 2012. However, there would be no excess energy available for long-term sales, as Table 4-4 shows.

The desired margin of flexibility thus seems justifiable as a business strategy to cover the vagaries of power supply, demand and exports.

4.2 Alternatives

4.2.1 Wind power potential

The growing public interest in wind power was clear throughout the study and was often seen as an alternative to the project. The trend that emerges from the oral presentations and the briefs tabled is generally that wind power is considered less environmentally damaging than hydroelectricity because it has less impact on the receiving environment. A number of stakeholders advocated accelerated development of wind power potential on JBNQA territory.

On a number of occasions, the proponent presented the argument that implementation of the Eastmain-1-A and Rupert diversion project would also provide HQD with additional power that would facilitate the integration of new wind power supplies forecast for the period leading up to 2014. It pointed out that electricity generated

Table 4-5 **Hydro-Québec Production's projected capacity balance (MW) with the Eastmain-1-A and Rupert diversion project**

	(actual) 2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2012-2013	2014-2015	Growth 2005-2014
Current resources	38,682	39,155	39,149	39,139	39,129	39,119	39,003	38,754	71
Commitments		-							
Capacity associated with heritage pool, other commitments in Quebec and contracts outside Quebec	35,279	35,279	35,279	35,279	35,279	35,279	35,219	34,984	(296)
Reserve required	3,210	3,240	3,260	3,260	3,260	3,260	3,260	3,170	(40)
Short-term sales to Hydro-Québec Distribution	350								(350)
	38,839	38,519	38,539	38,539	38,539	38,539	38,479	38,154	(686)
Sales to Hydro-Québec Distribution			600	600	600	600	600	600	600
Firm capacity for wind integration (contracted and planned)		38	126	164	307	462	812	947	947
	38,839	38,557	39,265	39,303	39,446	39,602	39,891	39,700	861
Current resources minus commitments	**(157)**	**598**	**(116)**	**(164)**	**(317)**	**(482)**	**(887)**	**(946)**	**(789)**
Electricity purchases (from private producers and short-term)	**159**	**19**	**60**	**102**	**102**	**102**	**102**	**102**	**(57)**
New generating projects in the 2006-2014 horizon (net of capacity reserve)	**-**	**461**	**734**	**1,317**	**1,420**	**1,420**	**2,268**	**2,848**	**2,848**
Uncommitted capacity	**2**	**1,078**	**678**	**1,255**	**1,205**	**1,040**	**1,483**	**2,004**	**2,002**

Source: Quebec's Energy Strategy and Hydro-Québec's Strategic Plan, June 2006.

from wind power fluctuates over time, depending on weather conditions, wind strength and temperature and that the variability of wind power generation must be offset by energy generation from a more controllable source, such as hydroelectric power, in order to maintain a continuous supply of electricity. It evokes the case of Denmark, a country that is often cited as an example concerning wind power use, pointing out that Denmark can count on a supply system that is well interconnected with neighbouring countries to ensure constant delivery of electricity, regardless of the contribution of domestic wind power.

This requirement is confirmed by the first wind power integration agreement signed between HQP and HQD and approved by the Régie de l'énergie in February 2006. Under the terms of this agreement, HQP shall make available to HQD a firm capacity equal to 35% (346.5 MW) of the contract capacity of the wind farms selected during the first call for tenders (990 MW). This requirement is also confirmed in HQP's energy and capacity balance, where the firm capacity for wind power integration is included and ranges from 38 MW in 2006–2007 to 947 MW in 2014–2015.

The prospects for wind power development in Quebec also appear to be limited by the ability to integrate wind power into the energy transmission system. A study conducted by RSW showed that, based on current technology, the capacity that can be efficiently integrated is limited to approximately 10% of network peak demand, i.e. approximately 3,600 MW in 2005 and 4,000 MW in 2015. However, research in this field is continuing and upward revision of the figure is expected. This sector is very dynamic and rapid change is to be expected.

In conclusion, while wind power is a worthwhile complement to Quebec's core hydroelectric system, replacement of viable hydroelectric projects with this production method cannot be justified at present.

4.2.2 Energy efficiency

The current efficiency target of 8.1 TWh by 2015 set in the Energy Strategy has been incorporated in HQD's forecasts and is largely responsible for the reduction in forecast energy needs in Quebec in 2014 compared to previous forecasts. The chances of meeting this target depend on parameters that are beyond the proponent's control, such as the cost of other forms of energy, the degree of participation of the various customer categories in energy savings programs and the economic context in energy-intensive industry sectors.

It should be pointed out that, since 1992, the proponent has had varying degrees of success in attaining its efficiency targets, depending on the customer category concerned. It must therefore be borne in mind that the new target of 8.1 TWh could, in fact, only be attained with the right combination of external factors that influence consumer behaviour. Of these factors, many experts note that electricity rates are an important energy savings incentive. If rates were to fall, it may not be possible to attain the margin of flexibility of 15 TWh required by the proponent by 2014, even assuming that the project under study goes ahead, which would compromise attainment of the desired margin of flexibility (Table 4 3).

4.2.3 Other alternatives

The Government of Quebec has announced that it plans to speed up development of the hydroelectric industry with the implementation of 4,500 MW of new projects over the next five years (R20). None of the new projects has yet been subject to a complete environmental assessment or public consultation. Consequently, these projects are part of the proponent's supply and demand forecast for a more distant future than that of the Eastmain-1-A and Rupert diversion project and cannot be considered as alternatives for the 2015 objectives.

Other alternatives mentioned at the public hearings were geothermal energy, biomass and solar energy. These forms of energy are considered by the stakeholders to be sustainable or renewable, in terms of sustainable development.

These forms of energy are certainly promising, but they are dependent on technological developments in order to make them financially more accessible to the entire population. Progress is currently being made in equipping public buildings with geothermal systems, which indicates a genuine interest in energy efficiency. Moreover, the Quebec government's Energy Strategy mandates Hydro-Québec, as well as the Agence d'efficacité énergétique and the Société immobilière du Québec, to study the inclusion of geothermal and solar energy in Quebec's energy generation mix and the management of government buildings. These concerns are also shared by other jurisdictions that are working on the development of solar energy. Hence, there appears to be a keen interest in promoting these two forms of energy in a context of energy efficiency, particularly for residential and building heating. However, in the short or medium term, none of these forms of energy can compete with hydroelectricity in terms of rapid availability of large blocks of energy and capacity or in contributing to the collective economic well-being.

The proponent also has the option of importing electricity up to a limit of 15.5 TWh. However, the import mode interconnections are used by both HQD and HQP and the risks of congestion are such that it was decided to give priority for interconnections to HQD in order to supply the local load. As things currently stand, import mode interconnections could not be considered a regular and reliable supply mode, but rather a business opportunity on the short-term market (R19).

4.3 Project cost and cost-effectiveness

The estimated total cost of the project, including financing costs, is $3,946 million, i.e.:

- $2,043.5 million for the partial diversion of the Rupert River;
- $1,179.2 million for the Eastmain-1-A powerhouse;
- $723.2 million for the Sarcelle powerhouse.

Table 15-1 of the Supplement to the Environmental Impact Statement provides a breakdown of the total cost

of the project by the main project components (RP10). As noted on page 2-19 of Volume 10 of the Supplement to the Environmental Impact Statement (RP21), this cost does not include the amounts for the agreement with the MJB ($300 million), the amounts allocated to fund the Boumhounan Agreement ($43.65 million) or grid integration costs ($185 million). The transmission costs for the project, estimated at $179.7 million, are identified in Table 15-3 of Volume 1 of the Supplement to the Environmental Impact Statement (RP10). The total of these costs, $708.3 million, represents an 18% increase over the estimated cost of $3,946 million.

At the public hearings, some stakeholders pointed out that the total cost of the project should include all the transmission costs and the costs of the various agreements signed with the community. Others stressed the proponent's contribution to the Generations Fund and the water-power royalties payable to the government effective January 2007. On this point, it should also be noted that the proponent specified in its Strategic Plan released in June 2006 that this fund would indeed be financed by water-power royalties calculated on a basis of $3.28 per 1,000 kWh generated and by profits on exports.

On the subject of project cost, a quick calculation indicates that, if the cost of $708.3 million is added to the base cost of $3,946 million, production costs will increase from 4.4 cents to about 5.2 cents cost per kWh generated, which is clearly advantageous compared to other hydroelectric projects being considered or to wind power.

As a Crown corporation, and given the investment involved, the proponent must nevertheless demonstrate transparency. It would therefore be in the proponent's interest to present environmental impact statement documents that include clear, detailed information in order to demonstrate that all costs are taken into consideration and to avoid giving the impression that some information is not easily accessible to the public.

Conclusions

It is recognized that the project can be justified in strategic and commercial terms and that it could help the proponent consolidate its position as an energy supplier and exporter.

The analysis of the available data, testimony and presentations following the impact assessment and the public hearings leads to the conclusion that:

- the proponent will be able to take advantage of existing infrastructure to generate additional energy at an advantageous cost;
- the project is economically viable in light of the generation costs, the implementation costs and the reasonable forecasts of profits on domestic and international markets;
- the project can make a significant contribution to attaining the desired margin of flexibility of 15 TWh, which will help the proponent to meet variations in domestic demand while generating profits on export markets;
- in light of the lower revised forecasts for additional supplies required between now and the year 2014, the proponent's improved margin of flexibility and exports constitute the primary rationale for the project and are a legitimate business strategy;
- the project will enable the proponent to pay higher dividends to the Quebec government, which will benefit all of Quebec society;
- to date, there is no alternative or combination of alternatives that can guarantee the same operating and economic benefits as this project;
- while wind power generation is a worthwhile complement to the project and the project will create opportunities to expand wind power generation capacity, it cannot replace the project;
- the project must, nevertheless, meet the criteria for social and environmental acceptability.



5

Impact Assessment on the Biophysical Environment

5. IMPACT ASSESSMENT ON THE BIOPHYSICAL ENVIRONMENT

This chapter deals with the main biophysical issues associated with the project. An issue is an environmental or social concern that is a deciding factor in the environmental or social acceptability of the project. The selected issues were 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, land and semi-aquatic animals, birdlife 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 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 (see Figure 5-1). 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 are 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 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), the most abundant 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 primarily comprises 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 netcatch species. As for the seine net catch, the main species are yellow perch and, in smaller numbers, lake chub and logperch.

The streams are populated by mottled sculpin, followed by suckers, longnose dace, burbot and lake chub. Overall, just as in rivers and lakes, the fish community in the tailbay is less diversified and less abundant.

In lakes and rivers, the biomass is largely made up of the lake whitefish, the dominant species, followed by the walleye, white sucker and northern pike. In the streams, the biomass mainly comprises 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 comprising 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 two to six years after impoundment, these yields gradually increase. For example, in the Opinaca Reservoir, four to six years after impoundment, lake cisco, northern pike and lake whitefish yields had increased 2.5 to 10 times (R23). However, not all species enjoy the same success during this yield-increasing phase. The results of the Environmental Monitoring Network, 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, fifteen years after impoundment, the walleye catch continues to grow after dropping off in the first five 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 term, the lake sturgeon, longnose sucker and brook trout will also be found in the tailbay. 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 tonnes in the tailbay, largely comprising 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.

Panel analysis

The Panel 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 the Panel 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 Environmental Monitoring Network'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 Crees affected by impoundment 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 GCC at 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 discussions 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.

According to the Supplement to the Environmental Impact Statement of December 2005, the proponent made a commitment to redo the environmental baseline characterization before impoundment of the diversion bays to better identify the impact of impoundment on fishing yields. After the impoundment, the follow-up program will continue to characterize the development of fish populations over time (RP10).

This follow-up program, which will monitor fish communities and the fish production capacity of the diversion bays, will be carried out with measures intended to assess the effectiveness of developed spawning grounds and problems specific to certain species (see Figure 5-1). These matters will be discussed below.

5.1.1.2 Lake trout

Baseline

During experimental fishing aimed at characterizing the fish communities, the lake trout was found only 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 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 m^2 (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 have been collected.

Panel analysis

The proponent's efforts to ensure the breeding of lake trout are acceptable and consistent with 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. 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* (SADP22). 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, the Panel 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.

5.1.1.3 Lake sturgeon

Baseline

The experimental fishing in this forebay section shows that lake sturgeon are found only in fresh water, specifically in a 20-km stretch of the Rupert River, between KP 309 and 329, and a 36-km 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 catches 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 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. Thus, 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. flow from the Rupert River of 1,260 m^3/s and more (800 m^3/s diverted and 460 m^3/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 300 m upstream of the maximum diversion bay level. This spawning ground could also be used for the walleye and lake whitefish (see Figure 5-1).

With these developments, the proponent believes that 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 the sturgeon if it populates the entire diversion bay (DCAP25). According to the minutes of the meeting held on 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 have been collected.

With regard to the tailbay, the proponent assumes that the 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 Boyd Lake, where a population of sturgeon from the Opinaca Reservoir has successfully made a home there for the last 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 specimens 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.

Panel analysis

Given that lake sturgeon is a species valued by the Cree and likely to be labelled vulnerable or threatened, the Panel 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.

The Panel 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 regard 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. As already mentioned in the proponent's analysis, the lake sturgeon from the bays could eventually be found 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 the possibility of a mix of the two genetic pools, because the diversion bay sturgeon is genetically different from its counterpart in the Opinaca Reservoir. However, 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, so this line can be preserved, despite the risk of mixing. The Panel therefore considers that, despite the possibility of colonization downstream by the Mesgouez Lake-Rupert River line, the Opinaca Reservoir line will be protected by topography.

The Panel also 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.

Indicators for the success of the spawning grounds should be appropriately chosen. It has been agreed between Fisheries and Oceans Canada, *Ministère du Développement durable, de l'Environnement et des Parcs* and the proponent that the larvae drift would be a good indicator of use, as it includes both the clutch of eggs and the developmental success of these eggs (DCAP22). The Panel 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 were no catches 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 specimens from the river itself, as well as on specimens from the different lakes and tributaries that will be part of the forebays and tailbays and from the Misticawissich River. These analyses were intended to determine whether the fish belong to the typical Rupert genotype, known for its strong growth rate when environmental conditions allow. After an analysis, it was determined that 12 out of 16 brook trout have a genotype that is similar to 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 because they serve as prey 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 few 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 regard 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).

Panel analysis

The literature concerning this species shows that the Rupert genetic line is found in Lake Mistassini, 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 Lake Mistassini and its mouth, even if the genetic characteristics have not been verified between Lake Mistassini and Mesgouez Lake. 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. Although the number of fish analysed in the Rupert River basin, downstream from Mesgouez Lake, was quite limited (16 individuals, ES5), the simple fact of having confirmed that 12 of them had a genotype very similar to that of the giant specimens in Lake Mistassini proves that this line is present in the area. In addition, the limited catch during this study (ES5), despite a major fishing effort in 2002 and 2003 to catch brook trout, indicates that the Rupert line brook trout is not very abundant downstream from Mesgouez Lake and supports the hypothesis that these individuals come from the Lake Mistassini population. 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 Panel 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 the *Fondation Rivières* expressed concerns regarding the species' survival. Some were also particularly concerned by the negative impact 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 impact 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 Lake Mistassini and Mesgouez Lake, the Panel 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 regard 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. The Panel is in favour of these developments downstream of KP 314 of the Rupert River, which are anticipated by the proponent.

5.1.1.5 Mercury problem

Baseline

Under natural conditions, fish in the diversion bay section show the mercury concentrations indicated in Table 5-1.

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.

Table 5-1 Mercury concentration in fish in the diversion bay section and in the west section of the La Grande Complex

Species	Mercury concentration in the diversion bay section and the Rupert, Lemare and Nemiscau Rivers (mg/kg)	Mercury concentrations in the bio-physical environment of the west section of the La Grande Complex (mg/kg)
Longnose sucker (400 mm)	0.14 (0.10-0.29)[1]	0.12 (0.12-0.22)
Lake whitefish (400 mm)	0.11 (0.07-0.22)	0.11 (0.05-0.20)
Lake sturgeon (900 mm)	0.18 (0.17-0.19)	0.25 (0.03-0.40)
Walleye (400 mm)	0.57 (0.29-1.04)	0.60 (0.30-1.02)
Northern pike (700 mm)	0.61 (0.34-0.73)	0.59 (0.30-0,89)
Lake trout (600 mm)	0.69 (0.66-0.74)	0.57 (0.23-0.89)

1: Range of values for each species of special interest.

Source: Adapted from EI1.2, Table 10.30

Table 5-2 Predicted maximum fish mercury concentrations in main forebay and tailbay species

Parameters	Lake Whitefish (400 mm)		Northern Pike (700 mm)		Walleye (400 mm)		Lake Trout (600 mm)	
	Forebay	Tailbay	Forebay	Tailbay	Forebay	Tailbay	Forebay	Tailbay
Initial value (mg/kg)	0.11	0.11	0.61	0.61	0.57	0.57	0.69	0.69
Maximum value (mg/kg)	0.38	0.44	2.52	3.08	2.25	2.42	1.89	2.15
Maximum increase factor	3.5	3	4.1	5	3.9	4.2	2.7	3.1
Time to reach maximum value (years)	3	4	10	10	10	10	7	6
Time to return to range of natural values (years)	11	11	26	26	20	19	29	27

Source: EI1.2, Table 10-32.

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.

It should be noted that all the considered species found in both 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 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.

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.

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.

Panel analysis

The public hearings revealed that there is still a scientific debate regarding the detailed mechanisms for releasing methylmercury in water. The proponent's method of calculating changes in mercury concentrations was also criticized. For example, Natural Resources Canada and a consortium made up of four environmental groups (OED37) have made clear their positions on this issue.

However, despite the interest in this regard, the Panel 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 Cree 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. This aspect will be addressed in greater detail in the section on health. 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 (OED27). 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.

Table 5-3 Predicted fish mercury concentrations downstream of control structures

Espèces		Rupert River				Lemare River down-stream of closure point	Nemiscau River down-stream of closure point	Champion Lake
		KP 314 Lemare	Lemare-Nemiscau Lake	Nemiscau Lake	Down -stream of Nemiscau Lake			
Lake whitefish	Maximum value	0.17	0.15-0.17	0.16	0.15	0.22-0.26	0.22-0.42	0.15
	M.I.F.(1)	1.5	1.4-1.5	1.5	1.4	2.0-2.4	2.0-3.8	1.4
	Time to achieve maximum value(3)	3	4	3	4	3	3	2
	Return time(2)	0	0	0	0	0-6	0-9	0
Northern pike	Maximum value	0.84	0.78-0.86	0.80	0.78	1.03-1.19	1.04-1.84	0.76
	M.I.F.	1.4	1.3-1.4	1.3	1.3	1.7-2.0	1.7-3.0	1.2
	Time to achieve maximum value	6	6	6	6	6	6	5
	Return time	13	11-13	12	11	17-18	17-22	10
Walleye	Maximum value	0.79	0.73-0.8	0.74	0.73	0.96-1.11	0.97-1.71	0.71
	M.I.F.	1.4	1.3-1.4	1.3	1.3	1.7-1.9	1.7-3.0	1.2
	Time to achieve maximum value	6	6	6	6	6	6	5
	Return time	0	0	0	0	0-9	0-15	0
Lake Trout	Maximum value	0.95	0.88-0.97	0.90	0.89	1.17-1.35	1.18-2.08	0.86
	M.I.F.	1.4	1.3-1.4	1.3	1.3	1.7-2.0	1.7-3.0	1.2
	Time to achieve maximum value	5	5-6	6	6	6	6	6
	Return time	19	17-19	17	17	21-23	22-23	16

(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

The Panel 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, 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. Communication and information regarding mercury levels in fish will be addressed at greater length in the section on health. The Panel would nevertheless 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 impact.

The following subsections present the baseline and project impact on the caribou, moose, black bear and beaver, which are the main species valued by the Crees, as well as on small mammals, 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 consists 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 Quebec 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 Quebec. 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.

Work carried out by the *Ministère des Ressources naturelles et de la Faune* 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 five-kilometre peripheral strip (E11.2, pp 10–175). 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 five-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.

Small mammals

While small mammals 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 small mammals in the study area and identified 10 species (ES13). The *Ministère des Ressources naturelles et de la Faune* also took inventories that show the presence of additional species (see table 5-4).

Proponent's assessment of future conditions

Land clearing and the construction of structures will change wildlife habitats, displacing animals that will move toward less disrupted areas. After impoundment, scheduled for December, animals still in the area that are able to move quickly, such as moose and caribou, will leave the section. During impoundment the proponent has also planned to have a helicopter fly over the diversion bays once a week 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, small mammals, 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 km^2 of high-potential winter habitats for the caribou or 53% of all the high-potential habitats (PD11). As well, 51 km^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, relocate or catch them.

The impoundment will result in a loss of 82 km^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

Table 5-4 Inventory of small mammal species in project sections

Species	Status in Quebec	Section where species was identified			
		Diversion Bays	Rivers	Rupert Estuary	Increased Flow
Grapper's red-backed vole	No status – G5, N5, S5 Regional status: being documented	x	x	x	
Meadow vole	No status – G5, N5, S5 Regional status: being documented	x	x	x	x
Rock vole*	Likely to be designated in Quebec G4, N4, S3 – Regional status: vulnerable		x		
Northern bog lemming	No status – G4, N4, S4 Regional status: of special concern	x			
Southern bog lemming	Likely to be designated in Quebec G4, N4, S3 – Regional status: vulnerable				x
Woodland jumping mouse*	No status – G5, N5, S5 Regional status: being documented		x		
Meadow jumping mouse	No status – G5, N5, S5 Regional status: being documented	x	x		
Deer mouse	No status – G5, N4, S3 Regional status: vulnerable	x	x	x	
Arctic shrew	No status – G5, N5, S4 Regional status: of special concern			x	
Common shrew	No status – G5, N5, S5 Regional status: being documented	x	x	x	x
American water shrew*	No status – G5, N5, S5 Regional status: being documented		x		
Pygmy shrew	Likely to be designated in Quebec G5, N5, S5 – Regional status: vulnerable	x			
Heather vole	No status – G5, N?, S4 Regional status: of special concern		x		

*: Species listed by *Ministère des Ressources naturelles et de la Faune* – Wildlife Section

G: Global (total distribution area of species)

N: National (Canada)

S: Sub-national (Quebec)

1: In great danger

2: In danger

3: Vulnerable (rare)

4: Not common or 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)

Source: ES13 and *Ministère des Ressources naturelles et de la Faune*

remove bears found in the section. The impoundment will result in a loss of 235 km^2 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 245 beavers. The tallymen are planning an intensive beaver trapping or relocation program before the impoundment. Furthermore, a monitoring program will make it possible to spot beavers endangered by the rising water, and if applicable, relocate or trap them.

The creation of the diversion bays will result in a loss of 67 km^2 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.

Small mammals

The proponent foresees the death of a number of small mammals 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 small mammal trapping campaign, the proponent will check for the presence of special-status species in wetlands and seeded environments.

Panel analysis

The Panel considers that, despite the loss of land habitat for a number of species and the death of a number of 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 regard to human activities, particularly logging and line structures (roads, power lines, etc). Avoidance distances of 106 m (OED13) up to 1 kilometre (OED12) 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 to the increased land access, the Panel believes that the proponent should use telemetric monitoring to track the woodland caribou in the various project sections during the construction and operation phases. The 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. Consequently, the Panel 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 small mammal 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, specifically, the impact on biodiversity in the study area. Although the proponent has planned a follow-up program for small mammals 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 Canada goose, American black duck, common merganser and green-winged teal. Large concentrations of Canada geese are observed during spring migration and moulting season, whereas American black ducks represent the most abundant breeding pairs. The inventory taken in May 2002 revealed the presence of 577 breeding pairs[8], 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[9] per 10 kilometres of banks is 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.

Proponent's assessment of future conditions during the construction phase

During the construction phase, waterfowl will be disrupted by the clearing of shorelines and work areas and all of the activities on the construction site. 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 nest loss or unsuccessful nesting. Ground nests will be trampled during land clearing; hollow trees, used for nesting by certain tree-nesting ducks, will be cut down. The common merganser, the hooded merganser, the bufflehead and the common goldeneye are known species that use tree hollows to nest, at least in southern Quebec (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 that will be flooded by the diversion. Based on this proportion, the proponent estimates that approximately one-third of the indicated breeding pairs (about 50) that use hollow trees for nesting in the diversion bay section could be directly affected by land clearing activities. 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 (RP10). A decline in breeding success is therefore feared during the land clearing period.

In addition to the mitigation measures that will be applied to the land clearing work, construction machinery and traffic, the proponent is proposing to revegetate the worksites to mitigate the impact of the construction on the waterfowl. The worksites will be revegetated once the construction work has been completed.

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 Quebec, 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

8 Including the common loon, the greater scaup 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.
9 The 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.

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 approximately 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, while others even stand to benefit from the situation (see Table 5-5).

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, albeit 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* species, 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 toward 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

Table 5-5 ***Anatidae* gains and losses (indicated pairs) during the operation period in the diversion bay section**

Species	Lakes 500 ha and over within diversion bay boundaries in 2002		Total number of indicated pairs within diversion bay boundaries		
	Number per 100 Ha	Total number	2002	Operation period	Difference
Canada goose	0.123	8	66	44	-22
Green-winged teal	0.061	4	52	22	-30
American black duck	0.215	14	144	77	-67
Northern pintail	0.031	2	12	11	-1
Common goldeneye	0.000	0	25	0	-25
Red-breasted merganser	0.031	2	19	11	-8
Common merganser and merganser	0.461	30	129	164	35
Other species (n = 5)[a]	0.000	0	35	0	-35
Total	-	60	482[b]	329	-153

a. Other species: mallard, ring-necked duck, surf scoter, bufflehead and hooded merganser.

b The greater scaup and the black scoter are not considered breeders because their known breeding area is located beyond the 53rd parallel.

Source: RP11, p. 10-224

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).

The increased size of the riparian wetlands could favour *Anatidae* species, since these birds have a predilection to these environments.

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 *Anatidae* species. 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 has included a technical note with regard 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

Table 5-6 **Area with good wetland restoration potential in the Rupert diversion bay section under future conditions**

Riparian environment	Good-potential area (Ha)		
	Forebay	Tailbay	Total
Peat swamps	0	557	557
Swamps and marshes	467	561	1 028
Shallow waters (grass beds)	957	858	1 815
Total	1,424	1,976	3,400

Source: RP17, p. 13.

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 *Anatidae* species. 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 years.

Panel 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 supplement, 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 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 regard 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. The Panel 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 regard to the mitigation measures planned for the operation phase, the Panel considers that applying a careful combination of the measures contemplated to increase waterfowl potential should encourage waterfowl use of the diversion bays. The Panel 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 monitoring 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, the Panel 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 the work 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 km^2 of the songbird's forest habitat will be cleared in addition to 1.28 km^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 km^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 regard to flooding, two trees each supporting a great blue heron nest will be checked and possibly moved before the impoundment. If need be, 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 km^2 of land biotopes will be flooded, resulting in a loss of land habitats at the local level.

Still, some 26 km^2 of land biotopes and peat bogs will be flooded only there are 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 northern 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 medium-term increase in 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 sites 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 measures have been planned for forest birds.

If need be, artificial nesting platforms will be installed 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 the use of ponds developed for Bonaparte's gull. 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.

Panel 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 linked to the land clearing period, which will take place at the same time as the bird breeding season.

The proponent has presented no mitigation measures to reduce the impact on forest birds. The proponent justifies its refusal to change the cutting period, citing quality criteria with regard 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. The three-year land clearing period and the disruptions resulting from the construction work should cause the birds to gradually relocate during the breeding season, given that adjacent areas are already used by these same species (AV36). As was mentioned previously, this will likely result in a saturation of habitats due to competition for several years. The loss of forest habitat will therefore reduce the population of several local species. However, 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. Within this context, the Panel 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*. 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 are 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 the instream flow regime

It should be remembered that ecological instream flow is defined as 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 segments. These activities may be related to spawning, feeding and brood rearing. The free movement of fish must be ensured by appropriate modulation of the ecological instream flow or by specific developments at impassable sites (R9).

The analysis of the instream flow regime took into account the eight hydraulic structures (weirs, blankets and spurs) used in the project to maintain water levels and avoid major bank exposure. 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 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 (E11.6).

Instream flows in spring and fall spawning periods

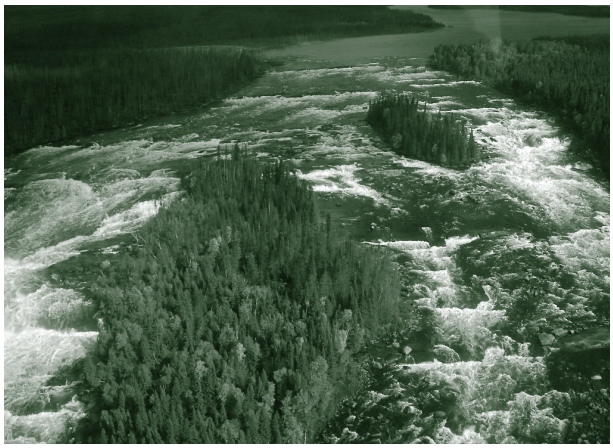
Minimum flow conditions required to protect fish habitats during the spring and fall spawning seasons were determined using microhabitat modeling (MHM). This modeling is used to predict, for a given species and vital stage, a precise quantitative and qualitative relationship between flow and habitat availability. MHM is based primarily on hydrodynamic modeling of one or several stretches of the river and biological modeling of the habitat preferences of the species being studied. The goal of the modeling in the case at hand is to predict the quantity and quality of spawning habitats (weighted usable area or WUA) that will be available based on flow variations (RP11).

Spring spawning was represented by the walleye, longnose sucker, white sucker and lake sturgeon, whereas fall spawning was represented by the lake whitefish. The species selected spawn in lotic environments and are particularly affected by flow reductions. In addition, these species represent 75% of the relative abundance of fish caught in the decreased flow sector of the Rupert River. Although the socio-economic interest of the sucker is not as high as the walleye and sturgeon, this species is abundant and serves 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



Rupert River



PK 257 rapids

elsewhere in this section of the Rupert River. The habitats in all the lotic areas of the Rupert are found in the two selected sites. Furthermore, the proportion occupied by the habitat types in the two selected sites is largely the same as in all the lotic areas (RP11).

Two microhabitat models were used in the impact assessment. The model using a Habitat Probabilistic Index (HPI) is generally 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. Only the conditions of the spawning habitats of the walleye, longnose sucker and white sucker were subject to the HPI model in the impact assessment. Due to a lack of sufficient data, the proponent used only the HSI model for the lake sturgeon and lake whitefish. At the request of the review bodies, a new model, based on the HPI, was developed and validated for these two species. 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 considered only the highest flows for the spring and fall, selected from the scenarios analyzed.

The instream flow regime estimates did not change as a result of the new analyses requested by the review bodies. However, these new analyses led the proponent 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. These analyses showed that the habitat simulations (WUA) were robust and did not call into question the values of the proposed instream flows. However, this exercise brought to light an error in the instream flow regime estimate. For example, the result for the lake whitefish at KP 216 showed a dispersion that could reach 39 m^3/s around the mean instream flows (RP11).

Instream flows in summer feeding periods

Scientific documentation and readings taking in 2002 and 2003 show that fish tend to feed primarily in lentic flow reaches of the Rupert River where the flow is slow and the water is relatively deep. These areas abound downstream of the closure point, where they make up 86% of the river (269 of 314 km). The main impact of a reduction in flow in lentic reaches is a decrease in water area and, consequently, a potential loss of feeding grounds for fish.

In accordance with the Policy on instream flow for the protection of fish and fish habitat, an approach aimed at minimizing aquatic area losses for this type of habitat involves applying an established instream flow determined using the wetted-perimeter method. Aquatic areas maintained in this manner were compared were compared with those by leaving the instream at 20% of the mean annual flow according to the requirements of the Boumhounan Agreement, combined with the implementation of the eight hydraulic structures (weirs, blankets and spurs) used in the project.

This exercise involved one-dimensional hydraulic modeling of the entire length of the Rupert River using data gathered from 319 cross-sections located between KP 5 and KP 314. The instream flow established by the wetted perimeter method would ensure that approximately 91% of the aquatic area is maintained under natural conditions. Instream flows equivalent to 20% of mean annual flow, combined with hydraulic structures, would also ensure maintenance of approximately 91% of the aquatic area. Consequently, instream flows equivalent to 20% of mean annual flow, in combination with hydraulic structures, would be comparable to those established by the wetted perimeter method, since they would ensure the maintenance of the same number of habitats. It can therefore be used for the instream flow for the summer feeding period. This estimate does note take into account the latest adjustments to the weir at KP 223, which allow for a recuperation of some 800 ha of additional aquatic habitat (PD5).

Instream flows during winter egg incubation

The goal of the ecological instream flow in winter is to avoid exposure of the lake whitefish spawning habitats, which are generally found along the edge or at the foot of rapids. In the fall, the eggs are laid on the river bed. They incubate over the entire winter and hatch in May. They may therefore be subject to exposure when the winter low flow is most pronounced (March and April) and flow is at its lowest annual level. The specific objective in this case was to verify whether instream flow equivalent to 20% of mean annual flow at the closure point, as provided for in the Boumhounan Agreement, was sufficient to maintain flooding of lake whitefish spawning habitats. This was verified by analysing level–flow relationships, both in the ice-free season and when ice was present, in the known lake whitefish spawning areas at sites KP 216 and 281.

Further to a visit to both sites during the winter low-flow levels (March 2003), it was noted that the sites had different glaciological features. KP 281 is entirely covered by ice during the winter, whereas KP 216 is only partially covered (approximately 40%, based on an analysis of aerial photos). The review bodies made numerous requests for further details concerning water levels in relation to winter instream flow, which made it necessary to obtain new data. It appears that the minimum flow of 127 m^3/s at the closure point is sufficient to maintain lake whitefish spawning grounds flooded during the winter, both at the sites entirely covered by ice as well as those only partially covered.

Panel analysis

The Panel deems that the instream flow regime is consistent with Quebec 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, complementary analyses requested by the review bodies revealed that an error had occurred in the determination

of instream flow and that the changes in instream flow value fell within a flow range higher and lower than the one obtained using current calculations. Consequently, the Panel feels it is 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 regard 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.

The Panel has learned of a proposed agreement regarding the management of the water in the Rupert River. The purpose of this agreement is to allow the GCC, the CRA, Hydro-Québec and the *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* work together with the Crees to resolve any problems that may arise with regard 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, the Panel 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 with 9 for the lake cisco and only 2 for the brook trout.

As mentioned in the previous section, 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 (RP11).

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. The Panel 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). The Panel considers that these changes to the transition periods will improve the spring spawning conditions of these species.

The brook trout was not given any special attention since it rarely uses this section. However, the presence of brook trout in the tributaries led 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 KP 290 (PD9) and the existing spawning grounds at KP 281 and 216 of the Rupert River based on the follow-up findings.

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 anticipated with regard to potential 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 comprising fine materials. This stabilization will reduce erosion and foster bank use by wildlife.

According to 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 also 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 River.

Panel analysis

The Panel agrees with the impact assessment and the mitigation and compensation measures put forward 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 to other sections. 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.

5.2.2.2 Case of the anadromous lake cisco

Proponent's analysis

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 Figure 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 at 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 (RP11). 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 (see Figure 5-2).

However, the mean flow velocity will fall approximately 61%. Downstream 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, preferred 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.

The proponent is aware that reductions of approximately 100 cm 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 lies in its abundance in the river in fall and the way it is now harvested by Crees at the Smokey River site. According to the proponent, there are no field studies that quantify the number of anadromous lake cisco spawners. The Crees annually catch approximately 10,000 at Smokey Hill, apparently with no negative effects on the population. The proponent assumes that the size of this population is at least in the tens, perhaps even hundreds of thousands. This exceptional wildlife resource calls for great caution with regards to the project impact.

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.

Panel analysis

Following analysis of this information and the opinions obtained, the Panel 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.

The lack of data on the abundance and structure of this population is problematic, and prevents proper monitoring 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. Before diverting the Rupert River, it is important to use other indicators such as larvae drift to better determine the current conditions of anadromous 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.

In addition, the migration of anadromous lake ciscos is not well documented. This potential migration of spawners and immature anadromous ciscos in the Rupert River should be documented either through experimental fishing before 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.

Consequently, as was brought up in discussions with the departments concerned, the lake cisco population between KP 13.5 and 25.5 of the Rupert River should be monitored (PD9). This follow-up should include 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.

Given the current state of knowledge, no one can predict whether the lake cisco will continue to frequent the traditional Smokey Hill fishing site after the diversion of the Rupert River. There is a lingering uncertainty as to the harvest that the current site or another nearby can yield. Based on its monitoring activities, the proponent will have to respect its commitment to develop one or more new traditional dip-net fishing sites equivalent to Smokey Hill. The Panel 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.

The Panel 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 become less popular for various reasons (relocation of the fishing site, fishing or fish quality, etc). This program should also include promoting voluntary catch reporting among fisherman and tallymen.

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, the fish communities in the Rupert River will continue to survive in future conditions. This conclusion is drawn from lessons learned monitoring the Eastmain and Opinaca rivers, both of which underwent a total flow diversion, and where the fish communities survived in the long term. The analysis of 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, there could be minor changes in fish communities 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 entire lake is highly productive 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 impacts 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. These channels represent the majority of habitats on the Rupert River. In future conditions, these channels will occupy 79.3% of the total area.

Owing to the extent 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. Fisheries and Oceans Canada has performed a parallel analysis subdividing the habitat areas into zones 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 Fisheries and Oceans Canada reached essentially the same conclusions (M32).

During the transformation of a type 2 channel into a type 3 channel, flow velocity in this habitat type will be 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, the potential of suckers and yellow perch should 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 less 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 km^2, 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 Fisheries and Oceans Canada 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).

Panel analysis

In agreement with the proponent's conclusions about the fish communities, the Panel underlines the importance of monitoring, 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.

The Panel 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.

While no negative impact is anticipated on the lake sturgeon's feeding habitat, thorough monitoring should be conducted for a period long enough to follow the development of cohorts 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. The Panel 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 a sustainable development context.

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.

Following diversion of the Rupert River, five obstacles considered impassable with reservations (KP 65.9, KP 77, KP 164.5, KP 308.5 and KP 310) should be passable with reservations. 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.

Panel analysis

The Panel believes that the project will not create new obstacles and that there will be no notable impact on 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 stretch 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 monitor the effectiveness of the four hydraulic structures on the lower reaches of the Rupert River, designed to allow for the free movement of fish (KP 20.4, 33, 223 and 290).

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.

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. The 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 of 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 sow 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.

Panel analysis

The Panel 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. Based on the monitoring of the Eastmain and Opinaca rivers, both rivers with reduced flow, it appears that the impact of the reduced flow on the Rupert River should be minimal, if not positive, as concerns the use of the riverbanks by beavers. The monitoring 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 Birds (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 of peatland, often very large. 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 owing 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.

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 2 300 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 the 17 stretches of the Rupert River (see Table 5–7).

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

Table 5-7 **Rupert River - Riparian and Aquatic Vegetation by Stretch of River Current and Future Conditions**

Stretch	Target KP[a]	Area in Current Conditions (Ha)			Area in Future Conditions (Ha)				
					Exposure [b]		Long Term		
		Swamp	Marsh	Grass Bed	Total	Grass Bed	Swamp	Marsh	Grass Bed
KP 5-20	-	50.0	3.3	5.2	198.9	5.2	244.4	7.8	0.0
KP 20-33	-	9.8	3.3	2.9	38.6	2.5	45.2	6.5	0.4
KP 33-49	KP 47.8	8.3	0.0	7.8	0.0	0.0	5.3	0.0	7.1
KP 49-85	KP 52.6	30.6	0.0	6.7	116.6	2.8	147.2	0.0	3.9
KP 85-110	KP 86.4	18.5	2.1	33.6	86.9	5.1	102.0	5.5	28.5
KP 110-170	KP 117.5	52.9	2.0	76.0	416.5	24.7	461.2	8.4	51.0
KP 170-223	KP 187	237.7	213.0	294.7	207.3	81.0	502.5	155.5	213.7
KP 223-290	KP 243	5,515.4	270.4	222.4	1,161.1	50.1	1,611.9	334.9	172.3
KP 290-314	KP 292	11.3	1.4	0.0	119.4	0.0	124.8	7.3	0.0
Total	-	934.5	495.5	649.3	2,345.3	171.4	3,244.5	525.9	476.9

a: Area where, after the diversion, the average water level in summer will not change from current conditions, owing to the implementation of a hydraulic structure.

b: The exposure will take place upstream from the target KP.

c: The data in the "Area in Future Conditions" column has not been updated with the results of the changes to the weir at KP 223.

Source: RP17- answer to question 223.

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 eight breeding pairs (PD7). 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, with 71% of losses involving the common merganser. There will be a population increase for six species: 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 also affect 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. Migrators should be only slightly affected; in 2002, migrators primarily used stretches that will be influenced by a weir.

Mitigation and environmental monitoring 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 development to encourage goose hunting in the bay 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.

The proponent will monitor the populations of waterfowl that use the Rupert River sector. The monitoring will take place over four years and 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 Quebec, 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 Northern Quebec (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. Nevertheless, the highest concentrations of broods of all species of diving ducks were observed on undeveloped rivers. The same applies to non-breeding adults.

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 Quebec, 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 increased area of swamp 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 (two to three 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.

Panel 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 monitoring of 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.

The Panel notes that waterfowl populations that use the Rupert River habitats should not be greatly affected by the project. It believes that monitoring to assess the density of waterfowl along the reduced-flow reach of the Rupert River and monitoring wildlife developments 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 four 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 Quebec.

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 three 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, particularly along 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 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 monitoring riparian vegetation along the Rupert River in 2012, 2014, 2017 and 2021 (DCAP15, p. 106).

5.3 Rupert Bay and Rupert Estuary section

5.3.1 Fish

Baseline

Over the past fifteen years, inventories conducted in Rupert Bay and the estuaries of its main tributaries indicate that there are 40 species of fish in the bay as a whole 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 indicates that abundance varies in accordance with 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, which exceeds that 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 has a large freshwater area, so that species both tolerant and intolerant of salt water can thrive there. 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 serve as a nursery colony.

Seasonal movement was also noted for the salmonid, the longnose sucker and the walleye. The greatest movement in terms of abundance was undoubtedly 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 generally remain at the mouth of the tributaries and do not swim further up. 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 largely remain 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, but do not swim 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, given that they are based on a limited number of catches.

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 goldeneye, 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 m^3/s and the autumn flow 372 m^3/s. The first set of rapids from KP 4 to KP 5.5, which are known spawning grounds, 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. 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, downstream from the first set of rapids, for the winter 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 fish and their 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 following 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.

Panel analysis

The Panel 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 extensive, 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 km^2. 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, the Panel believes that the project will not affect the uniqueness or representativeness of the Waskaganish Biodiversity Reserve.

At the public hearings, Fisheries and Oceans Canada 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 Fisheries and Oceans Canada, and it was agreed that it 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). The Panel considers this a worthwhile measure, insofar as more global monitoring of the current, salinity and water levels is undertaken for all the sectors of Rupert Bay. However, the Panel finds that monitoring the growth of the longnose sucker cannot, of itself, as an indicator of productivity in Rupert Bay. For example, growth of the longnose sucker could increase following a reduction in intra- and interspecies competition caused by reductions in fish numbers, which would not have any relation to aquatic productivity. The growth of the longnose sucker should thus be interpreted, at the very least, in conjunction with variations in abundance (catch per unit effort) of fish species in this sector, if it is to be used in the context of productivity.

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 monitoring will continue after the diversion of the river to check on the survival of these species in the river (VAP22).According to the Panel, the monitoring 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. the Panel reiterated its conclusion regarding the involvement of the Cree community in the planning, execution and distribution of information of the biophysical environment Monitoring 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. The Panel agrees with the proponent's assessment.

5.3.3 Birds

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 conducted 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, accounting for over 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 west 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 Figure 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, Boyd Lake 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 during the fall hunting season..

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, has increased substantially over the past few years, 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.

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 were the three 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 six other species are classified migratory and breeding birds. The others are passage migrants, which are rare in Quebec. Among the species inventoried in 2002, 19 are considered in decline in Canada, of which nine are considered in strong decline in Quebec. 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 Quebec 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 Quebec.

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 monitor the riparian vegetation in Rupert Bay over a period of 10 years after the beginning of the operation phase. No monitoring of waterfowl is planned in the Rupert Bay sector.

Panel analysis

It appears that the bird habitat rather than the birds themselves 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. The dominant species of vegetation, the common three-square, should not be affected by this change in salinity because it tolerates freshwater to slightly brackish water environments (see Figure 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, the Panel 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 birds.

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 the public hearings held in Cree communities, a number of intervenors expressed concern regarding the apparent decrease in Canada geese populations along the James Bay coastline and in Rupert Bay since the construction of the La Grande Complex. They pointed out that the geese are now using the inland reservoirs during their stopovers. A certain number of geese no doubt used the thawed bodies of water located inland, without necessarily forming large flocks in those areas. With the creation of reservoirs and diversion lakes inland, it appears that large flocks began to use these new water bodies. Telemetry technology and monitoring have recently made it possible to identify two migratory corridors used by the geese: one on the coast, and another farther inland.

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, mainly because of flow velocity. 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 equinoctal 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 three 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.

Analysing 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 Figure 2-12).

Eelgrass

Research into eelgrass in Rupert Bay has shown that the species either does not exist there 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

Owing 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. Therefore, 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. It should be noted that no impact is anticipated on the dominant species, the common three square, since it grows both in fresh and slightly brackish water. Companion species that prefer 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 monitor coastal vegetation in the bay. Monitoring activities will take place every four years between the first and tenth year of operation.

Panel analysis

The Panel finds 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. The monitoring conducted by the proponent will make it possible to determine the validity of the predictions.

None of the 20 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 to the north and its fish community is similar to that 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 be moving toward 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 fish or their habitat.

Panel analysis

The Panel 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 fish or their 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 being in the north section of the Opinaca Reservoir. That same area is also home to, in descending order of abundance: 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 conditions, 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 allowed for a comparison between populations of Acipenser fulvescens in the increased flow section (Eastmain River, Opinaca River and Boyd Lake) and 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, owing 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 Figure 5-3).When the Eastmain-1-A powerhouse is commissioned, there will be an opportunity to gather the five years of data that is needed to establish the baselines and continue monitoring it 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, thus, 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 in the 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.

Panel analysis

In view of the particular situation that occurs when baselines are conditions that have yet to occur, it is difficult for the Panel 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 consider 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 provides for the telemetric monitoring of sturgeons, an evaluation of larval drift and a monitoring of the physical integrity of the utilization of the spawning areas 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 Panel believes that it is important that the monitoring 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 monitoring programs. As regards the monitoring of the success of the lake sturgeon spawning grounds, the Panel 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 Panel 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 Rupert River Acipenser fulvescens introduce themselves into the Eastmain-Opinaca system, the presence of the OA-05 dike, which serves to divert the water from the Opinaca River toward 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, based 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 have 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 spawning 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 the section's good spawning potential. The spawning of other species, however, was confirmed. According to Environmental Monitoring Network 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 tailrace canal will be lost at construction. Even though these spawning areas are returned to the water with the start of operations, they are considered permanently lost, owing to disturbances to the bed and considerable changes in flow conditions.

In order to offset these permanent spawning habitat losses, the proponent is planning for 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.

Panel analysis

The Panel is of the opinion that mitigation measures taken 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, as for 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.

The Panel 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 Eastmain-1 powerhouse, without 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 Table 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.

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 lake whitefish and longnose sucker will be 3 to 4 times higher than concentrations measured in the reservoir, owing to changes in their diet. In fact, these species will become piscivorous, owing to the high availability of small fish, more vulnerable to predation during their passage in the turbines. PIKE

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.

Panel analysis

The Panel 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 magnified by dietary changes of non- piscivorous species is permanent, and must be included in a mercury concentration monitoring program following the commissioning of all elements of the project. The monitoring of fish mercury concentrations in the diversion bays must therefore

Table 5-8 **Eastmain 1 reservoir, maximum total mercury concentrations forecast for the main fish species (baselines and future conditions)**

Parameter	Lake whitefish (400 mm)		Northern pike (700 mm)		Walleye (400 mm)		Lake trout (600 mm)	
Initial value (mg/kg)	**Baseline conditions[a]**	**Future conditions**	**Baseline conditions**	**Future conditions**	**Baseline conditions**	**Future conditions**	**Baseline conditions**	**Future conditions**
Maximum value (mg/kg)	0.11	0.11	0.61	0.61	0.57	0.57	0.69	0.69
Maximum value (mg/kg)	0.45	0.49	3.45	3.77	2.69	2.92	2.2	2.39
Maximum increase factor	4.1	4.5	5.7	6.2	4.7	5.1	3.2	3.5
Time to reach the maximum value (years)[b]	4	5	10	10	10	10	7	7
Time to return within the range of natural values (years)	13	14	24	25	21	22	23	24

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

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, owing 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. The Panel is of the opinion that the mercury concentration monitoring program must also include the stations downstream from these structures. As discussed previously, the Panel 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, the Boyd-Sakami diversion system and the Robert-Bourassa and La Grande-1 reservoirs will remain within the range of current fluctuations, even though they are generally located in the upper section of that range. 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 strip around the lakes is nearly twice as high as on the shores. Density is low on the edge of these bodies of water, since the areas have not supported 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 range. This impact will be felt for a few 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.

The Panel is of the opinion that there will not be any significant impact on the land and semiaquatic animals in this section, since the modifications to the area are limited 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, many Canada geese were also observed in the same sections of peaty bogs 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 geese. 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 greenwinged 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, a resident subspecies (which nests and winters in the same location), and are from the northern 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. According to the proponent, 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 planting 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 plan 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.

Panel analysis

The Panel 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 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, 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 Aboriginal 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, without, however, 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 (PAP25).

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 the Panel 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

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, owing 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 George station). The La Grande-1 station was sampled in 1994, 1996 and 2000, and the Fort George 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 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 George 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 16ºC to 11ºC, 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 spawn or 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 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 range 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 River 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.

Panel analysis

The Panel thinks that the proponent's conclusion 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, is reasonable in view of the fact that the ensuing hydrologic modifications fall within the range of current flow fluctuations. The final provision on hydraulic change was considered acceptable by one of the experts consulted by the review bodies (EOD3).

5.5.2 Marine mammals

Baseline

The issue of marine mammals was raised only in Chapter 12 of the impact study (Rupert Bay sector). The proponent based its choice in section 9.3.2.3 of the impact study on the fact that the La Grande Rivière estuary and coastal waters around James Bay are not areas where beluga and seal gather and these mammals were never mentioned as a concern by Chisasibi Cree during phases I and II of the La Grande Complex.

The proponent reports that inventories carried out in 1993 and 2001 demonstrate that beluga mainly frequent the west coast and centre of James Bay and seldom go to Rupert Bay. In James Bay, beluga are concentrated in two areas: north of Akimiski Island and along the northwest shore of the bay. During the inventories mentioned by the proponent, no belugas was found in Rupert Bay and only one to the south and one to the east of Charleton Island in 1993. The beluga population in James Bay was estimated at 3,141 animals in 1993 and 7,901 in 2001[10] (RP12, question 242). The eastern Hudson Bay population – also known as the Eastmain population – and the Ungava Bay population are considered to be endangered by the Committee on the Status of Endangered Wildlife in Canada.

10 Panel note: Given that the error in estimating abundance is generally very high (i.e., standard error of 1,744 in the 2001 estimate) figures should be interpreted with caution. In addition, no measurement for the error in the 1993 estimates is provided in the answer to question 242.

Proponent's assessment of future conditions

In its response to question 259, the proponent concluded that, in light of available data and the review of the literature dating from 2005, the Rupert diversion would not have any measurable impact on the physical properties of James and Hudson's Bays beyond the limits of the plume of the La Grande Rivière. It therefore concluded that the project would not have any impact on their biological environment.

Panel analysis

The Panel finds that the issue of marine mammals remains relevant in the La Grande Rivière estuary and along the shore of James Bay. The issue was, moreover, raised with regard to this sector in the submission of Fisheries and Oceans Canada in the supplement to the promoter's Environmental Impact Statement (Question 242) as well as at the public hearings.

In its submission, Fisheries and Oceans Canada states that work in the field and observations by the Inuit have shown that the estuaries of the Nastapoka River and the Petite rivière à la Baleine are regularly frequented by beluga. It is also highly likely, according to Fisheries and Oceans Canada scientists, that the estuaries of a number of large rivers close to the concentrations observed are also used by beluga. In addition, openings in the ice between islands in James Bay are a wintering site for an undetermined number of beluga. Any forecast or observation of a change in the ice cover could thus impact the use of this wintering site. Fisheries and Oceans Canada is of the opinion that the impact of the project on beluga would probably be small and localized and would not harm populations or efforts to re-establish the population in eastern James Bay.

With regard to the walrus, Fisheries and Oceans Canada's submission states that there is no report on or monitoring of their abundance in the Rupert Bay area or the mouth of the La Grande Rivière, but that the latter is known to have been used by a relatively large number of walrus in the 1960s. The habitat of the walrus consists of a sea-floor where the substrate allows for the maintenance of a productive bivalve community. Fisheries and Oceans Canada considers that forecasts of the impact of the project on benthic invertebrate communities, especially bivalves, and on changes in ice cover near these communities would be necessary to evaluate the possible effects of the project on walrus habitat. Although impact on the habitat could compromise the re-establishment of the walrus in James Bay, Fisheries and Oceans Canada feels that the impact of the project would be localized, as in the case of the beluga.

The Panel is aware of the lack of data on the biological components of James Bay and looks at this aspect again in the chapter on cumulative impact. With regard to the beluga, the Panel agrees with the conclusions of the proponent and Fisheries and Oceans Canada that the impacts of the project would probably be limited and localized, given that the species is concentrated mainly north of Akimiski Island and along the northwest shore of James Bay. In the case of the walrus, which tends to frequent the mouth of the La Grande Rivière, it is also likely that the impacts of diversion of the Rupert would be limited and localized, given the subsequent hydraulic changes will be within current flow fluctuations.

5.5.3 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. Like 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. Eelgrass, in particular, 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 along the coast between Kakassituq and Attikuan points (see Figure 5-4). They are not found in the mouth of the main rivers, owing 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 goose hunting activities of the Cree. This prompted the *SEBJ* to monitor the eelgrass beds on the east coast of James Bay, in the plume zone of the La Grande Rivière, from Dead Duck Bay to Attikuan Point (OED29 OED10) , between 1988 and 2000. 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 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 micro-organism (*Labyrinthula zostera*), stimulated by abnormally high summer temperatures, which would have reduced the resistance of eelgrass to this micro-organism (OED10). The proponent also mentioned that in 1999 and 2000, the eelgrass showed signs of recovery, since new shoots 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 eelgrass since 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 the La Grande Rivière to Kakassituq Point, in 70% of the grass beds, eelgrass was comparable in abundance to conditions that existed prior to the decline (1998-1999). 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, immediately south of the La Grande Rivière, between its mouth and Tees Bay, all of the grass beds were comparable to their state prior to the decline (see Figure 5-4).

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 at the Chisasibi public hearings (PAP120) the proponent concluded that the operation of the La Grande Complex generating stations had had no 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 the La 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 the La Grande Rivière, less conducive to the proliferation of *Labyrinthula*, would have served to protect the eelgrass;
- in the Many Islands Bay, located north of the La Grande Rivière, most of the grass beds were restored by 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 the commissioning of the Rupert diversion. In this estuary, fluctuations to hydrologic and hydraulics parameters that may affect vegetation will remain within the ranges of current fluctuations.

In the river stretch, riparian and aquatic vegetation will retain the same level of instability owing 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 commissioned. Lastly, the significant fluctuations to hydrologic and hydraulic 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 costal environment, modification of the plume area of the La Grande Rivière constitutes the sole potential source of impact. Since the anticipated 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.

Panel Analysis

The La Grande Rivière estuary

The Panel agrees with the proponent's findings as regards vegetation development in the La Grande Rivière estuary. It is probable that fluctuations to hydrologic and hydraulic parameters that could affect vegetation will remain within the ranges 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, owing to daily fluctuations in the hydraulic parameters. It is likely that the project will not change or accentuate this state of affairs, for the same reasons as for that part of the estuary affected by tides.

East coast of James Bay

Owing 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.

However, the proponent's studies indicate a serious decline in eelgrass beds on the east coast of James Bay since 1998. The climate and the isostatic rebound strongly impact eelgrass (DCAP3). The influence of climate can result in strong annual variations in the production of eelgrass and, as a result of isostatic rebound, it may gradually disappear from shallow water, only to reappear at deeper levels.

One of the experts consulted by the review bodies (EOD6) was of the opinion that determination of the factors influencing the eelgrass habitat remains a complex problem: "Conditions related to salinity, temperature and ice in the La Grande Rivière plume area have changed over the past 30 years, owing to commissioning of the La Grande Complex. The size and seasonal variations of the flow, and related variables, have also changed considerably. The isostatic rebound and the impact of atmospheric conditions changed during the same period and have also affected the eelgrass environment. Comparative work in sectors not affected by hydrologic change, could shed light on the relative importance of these factors" (EOD6)

Based on studies conducted by the proponent (EOD10), the opinion of two independent specialists (EOD3 and EOD6)), briefs and lengthy testimony during public hearings, the Panel arrived at the following conclusions with regard to the project's impact on eelgrass:

- 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. The proponent is basing its interpretation on the fact that a large share of the eelgrass beds in areas adjacent to the mouth of the La Grande Rivière were found, in 2004, to be comparable in abundance to before the decline. However, the eelgrass beds north and south of this area remained less abundant in 2004 compared to the period before the decline. Given the dynamics of the current in James Bay, there is nothing to indicate that the state of the eelgrass beds was not caused by changes in the hydraulic regime since the building of the La Grande Complex. We cannot rule out the possibility that any impact on the eelgrass caused by commissioning of the La Grande Complex could extend beyond the periphery of the La Grande Rivière;
- the observations made by the Cree (M92, a report submitted by Chief Rupert on June 9, 2006) indicate that there is no sign that the eelgrass beds have rebounded since their decline in 1998.

The Panel is of the opinion that the Rupert diversion should not alter the current condition of eelgrass on the east coast of James Bay, in view of the fact that the hydraulic modifications that will occur will fall within the range of current fluctuation. Taking into account observations made by the Crees (M92), the Panel is, however, of the opinion that the proponent should conduct, together with the Crees, long-term monitoring of 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.

5.5.4 Birds

Birds are not dealt with in the impact study or in the answers to additional questions for the La Grande Rivière estuary or the coast of James Bay. Nevertheless, eelgrass beds are of vital importance for a number of species of migratory bird, especially the Canada goose and the brant during migration (EOD10). As mentioned in sections 5.5.3 and 5.4.3, a number of stakeholders associated the decline in eelgrass with a decline in geese in this area. In addition, the issue of declining goose populations on the east coast of James Bay was raised in the documents submitted during the evaluation process (C17 and M92) and at the public hearings. At the hearings, the proponent reported an increase in the number of geese in the reservoir sector. It also suggested that the apparent decline in goose populations on the east coast of James Bay could have been caused by a change in migration corridors, but that has not been studied.

5.6 Sections 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 led to a finding 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 streams, which were 4 or more metres wide.

Fifteen 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 a biological characterization of the streams. It assumes that the fish species found should be the same ones 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 m^2. 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 m^2 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 m^2. A walleye spawning ground was identified 160 metres south of the future bridge site. However, the pillars will not encroach on this spawning ground. It should be mentioned that the culverts and fill making up the current river crossing point will be respectively removed and excavated, and a spawning ground of 2,800 m^2 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 road that leads to the Sarcelle regulation structure, as well as the planned route of the Muskeg-Eastmain-1. These access ways will be used in preference to any others in order to disturb the natural environment as little as possible, especially 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 140 creeks, six 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 22-m bridge 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. Renovation of the superstructure of an existing bridge over the Opinaca River will not require any work on the infrastructure, which includes two abutments and two pillars in the water.

Lastly, a variety of existing routes will be used in 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 the impact of crossings on fish habitat by applying the *Règlement sur les normes d'intervention dans les forêts du domaine de l'État*. 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.

Panel analysis

The Panel recognizes that the impacts on the aquatic environment will be primarily associated with the temporary and permanent roads 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 *Règlement sur les normes d'intervention dans les forêts du domaine de l'État* and applying the proponent's standardized environmental clauses, any impacts should be sufficiently mitigated during construction. At the public hearings, the Fisheries and Oceans Canada submitted a brief in

which it expressed concerns about the free movement of fish in the areas affected by the structures and related activities. The *Règlement sur les normes d'intervention dans les forêts du domaine de l'État* are a good planning tool, but do not always guarantee the free movement of fish. Since this brief was submitted, the proponent has had ongoing discussions with Fisheries and Oceans Canada and an agreement was reached on setting up a monitoring 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 a waterway free of obstacles to fish movement.

5.6.2 Land and semi-aquatic wildlife

Baseline

This section describes the impacts of on the four species being targeted: caribou, moose, black bear and beaver, of setting up workcamps, the Sarcelle-Eastmain-1 315 kV transmission line, the Muskeg-Eastmain-1 road and access roads leading to the diversion bay.

Caribou

Along the routes leading to the diversion bays and the site for setting up the Rupert workcamp, a single network of caribou trails was seen. Overall, the habitats found are of limited or medium suitability and calving potential is average in most of the corridors studied. No caribou trail network has been found in the Muskeg-Eastmain-1 corridor.

In the corridor under study at the Sarcelle-Eastmain-1 line, the southern part of which follows the route of the Muskeg- Eastmain-1 road, the proponent has indicated the overall quality of the habitat as low due to the scarcity of suitable winter habitat for woodland caribou. No caribou trail network was found.

Moose

In the corridor leading to the diversion bays and the site for setting up the Rupert workcamp, no moose trail has been inventoried by the proponent. Approximately 49% of the area of these corridors represents low suitability habitats.

The study of the Muskeg-Eastmain-1 route 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 by non-Aboriginals is prohibited.

In the Sarcelle-Eastmain-1 line corridor, a high concentration of wintering grounds has been observed in the southern portion of the corridor, which is in the same sector where the Muskeg-Eastmain-1 road is to be built. The proponent specifies that the wintering grounds may be relatively remote from year to year (RP12).

Black Bear

Some 75% of the area of the route leading to the diversion bays and the site for setting up the Rupert workcamp has a medium to high potential for black bear. Despite the presence of habitats suitable for this species, the bear harvest index is zero in the trapline where the Muskeg-Eastmain-1 road is located. Habit quality is high in the northern part of the Sarcelle-Eastmain-1 line corridor.

Beaver

The proponent has inventoried 15 beaver colonies in the corridor leading to the diversion bays and the future site of 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 road corridor. According to the proponent, beaver density is low in the Sarcelle-Eastmain-1 line corridor.

Future Conditions Evaluated by the Proponent

During development of the Sarcelle-Eastmain-1 line, construction of roads and setting up of the workcamps, the main impacts will be related to deforestation, management of 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 the operating period, the transmission line and permanent roads will have the most impact on the species found in the area.

The proponent feels that the transmission line and Muskeg-Eastmain-1 road will have very little impact on the moose inventoried in this sector, since suitable habitats are found on the fringe of these infrastructures (RP12).As well, only slight impact is foreseen on the caribou, black bear and beaver.

The proponent has not planned for any specific monitoring of land and semi-aquatic wildlife in the sectors affected by the project transmission line and roads.

Panel analysis

The Panel finds that the impacts on land and semi-aquatic wildlife in the sector where the Sarcelle- Eastmain-1

transmission line and project roads are limited. However, given the increased movements following the disruption that large wildlife will experience in the sector of the Muskeg-Eastmain-1 road 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 Birds

The deforestation planned for the construction of roads, workcamps, transmission lines and borrow pits will affect bird 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 roads of the diversion bay section and the Muskeg-Eastmain-1 road to be approximately 478 ha (402 ha for access roads to the diversion bays and 76 ha for the Muskeg-Eastmain-1 road). The areas required for the construction of the workcamps 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 roads, and approximately 400 breeding pairs could be affected by the deforestation for the workcamps. 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 workcamps and access roads 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 (3,400 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.

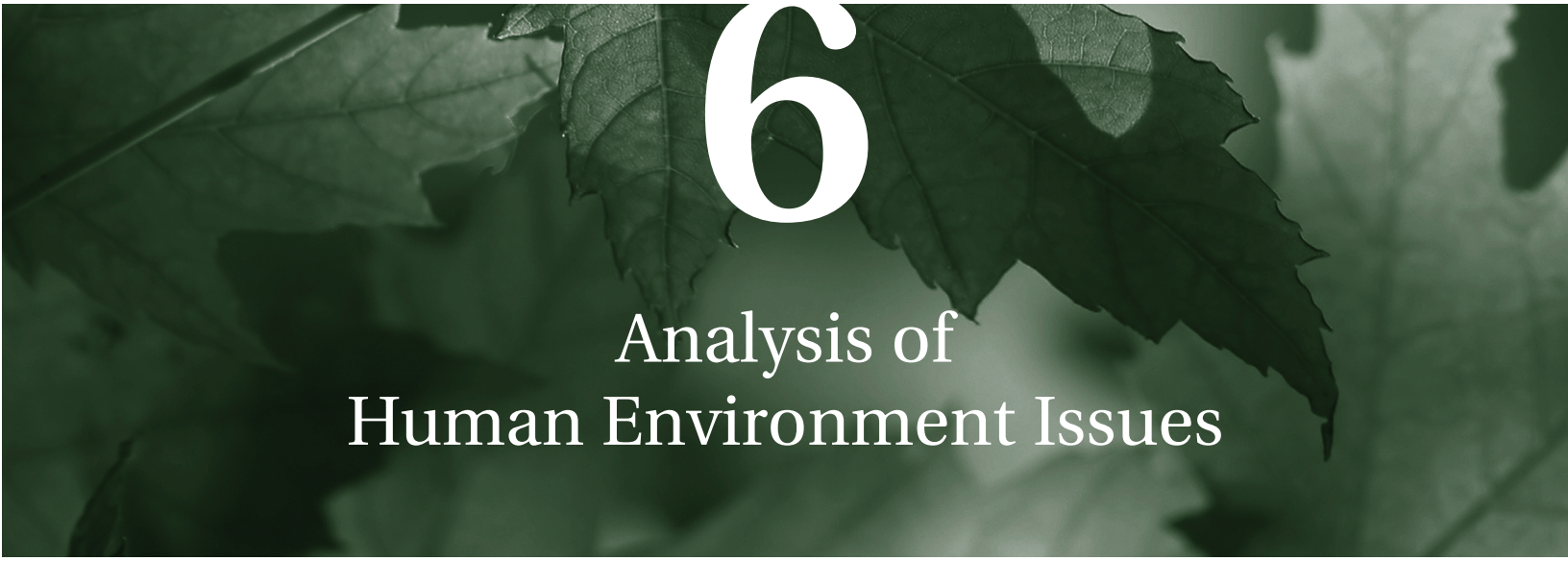
The deforested areas required for the construction of transmission lines have not been included in the calculations, since these spaces are quickly colonized by low vegetation, which will serve as bird habitats.

Only two raptor nests were found inside the road 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.

The Panel 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 inventoried either at the site for setting up the Rupert River workcamp, in the Muskeg-Eastmain-1 road corridor, in the road 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. ANALYSIS OF HUMAN ENVIRONMENT ISSUES

This chapter deals with the main social, cultural and economic issues related to the project. They are examined by community—Cree or Jamesian—or user group. The impacts of the project on navigation are presented by project sector, i.e. in the Rupert diversion bays, reduced-flow stretch of the Rupert River and Bay, and the increased-flow section, including the La Grande Rivière estuary and James Bay.

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, marked the start of the transition.

In the mid-20th century, the increasing 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 signalled the start of the Crees' adjustment to new economic and social conditions.

The Crees live in a remote part of Quebec. There were nine Cree communities, with a population of approximately 5,000, and probably fewer than 100 non-Aboriginals, 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 region. 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 hydroelectric power project, that the Crees became organized, setting up the GCC of Quebec, 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 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 forest area, and major hydroelectric power 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 led to the construction of cabins and hunting camps by non-Aboriginals.

The events during this period led to the signing of the JBNQA. In 1975, after two years of negotiations, the Crees signed this Agreement with Canada, Quebec, the Inuit of northern Quebec and certain Quebec government agencies, including Hydro-Québec, given its hydroelectric power development projects. According to the Crees, signing the JBNQA radically changed their lifestyle (RP 25, p. 8). 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, communities and territory. A more detailed version of this vision can be found in the *Paix des braves* Agreement, signed between the Crees and Quebec 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 Quebec and Canada an environmental and social protection regime. The JBNQA set the conditions for forestry and mining operations and a description of the hydroelectric power projects planned for 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 Quebec 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* 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 region, 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. Owing in part to improvements in health services and social conditions, the Cree population grew to almost 14,000 by 2003. In 2000, the Cree School Board, the CBHSSJB, 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.


Camp at Smokey Hill

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. Parents who previously spent all their time hunting, began working 9 to 5. To acquire experience in the forest, children must often rely on the extended family or on special school programs. All these changes are beginning to redefine relationships within extended families. Gradually, as people become more financially well-off and the community grows, family relationships change and social solidarity becomes more haphazard. For example, there is less reliance on family relations for organizing marriages.

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, motorboats and snowmobiles to ensure rapid access to hunting opportunities in their free time.

The members of the community who devote 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 traplines, 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 better 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: hydroelectricity, 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. It was not until after the First World War, more specifically in the 1920s and 1930s, that permanent communities became established in the southwest portion of the territory: The parishes of Beaucanton, Val Paradis and Villebois were founded following the Quebec 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 in the region. Later, the development of the forest industry helped to populate the region. In the 1970s and 1980s, the major hydroelectric power projects at the La Grande Complex consolidated, on a broad, structured basis, the presence of non-Aboriginals.

In 1971, the Quebec government created the *MBJ*, whose territory overlapped that of the JBNQA south of the 55th parallel north. This agency shares the municipal management of category II land with the CRA, while being responsible for the municipal administration of category III land. The administration of category I land 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 Quebec. In order to fully implement its administrative tasks and planning, and to promote development of the region, the *MBJ* set up several local and regional development agencies.

After the 1980s, the end of the major hydroelectric power projects, the decline of the mining industry and, more recently, the forest industry, led to a significant drop in the number of Jamesians. There were more than 26,000 in 1981; their numbers dropped to about 16,000 in 2001, a decline of 37%. Conversely, the Cree population, during the same period, increased by 70%.

As a reading of the 2004–2009 five-year development plan of the *CREBJ* will show, the economic prosperity of the Jamesians, like that of the Aboriginal population (M24.2), depends on the development of all of the region's resources: hydroelectric power, forestry, mining, tourism.

6.3 General health condition of the Crees

6.3.1 General health

6.3.1.1 Current conditions

Under the JBNQA, the responsibility for health and social programs was transferred from Canada to Quebec, with the goal of granting administrative control to the Crees (ES37.1, pp. 55-60). This agreement is unique, since on other Aboriginal reserves, health care and social services remain the responsibility of the federal government. It was further to several health care and social services reforms in Quebec in the 1970s that the CBHSSJB was created as a health care institution. However, it was only in 1985 that the CBHSSJB became a cohesive system of clinics and social services under the *Loi sur le 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 local community service centres 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 for 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 solely on the basis of personal characteristics (deficits and disabilities). According to the World Health Organization (WHO), 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 that the Crees' concept of health also includes spiritual health (M3, p. 5). Accordingly, between 1970 and 2003, the health of the Crees improved as a result of 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 the Quebec average. The difference between the Crees and other Quebecers 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 Cree territory climbed significantly between 1983 and 2003, from 1.9% to 13%. This health problem appears particularly serious among the Crees when compared with the rest of Quebec. In 2000, the prevalence of diabetes in people aged 20 or over was 12.8% for the Cree population and 5.1% for the rest of Quebec. It should be noted that almost half (43%) of all cases of diabetes diagnosed in Cree territory were people under age 40 at the time of diagnosis. Given that over half of diabetics will have serious complications during their lifetime, the Cree population is also at risk for other major health problems related to diabetes.

Closely related to the problem of diabetes, obesity 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 in the region were overweight or obese. According to several stakeholders, the two main factors contributing to the increased proportion of overweight adults are dietary changes and physical inactivity (M47, p. 11). The construction of roads in the region, as part of the development projects implemented in recent decades, greatly 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, pp. 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 in Cree communities than elsewhere in Quebec. For example, the respiratory diseases mortality and hospitalization rates, standardized for age, are three times higher in Cree territory than the Quebec average. The most widespread respiratory problems are pneumonia and flu, with young children and the elderly being most at risk. It should be noted that smoking and overcrowding in Cree housing are often linked to respiratory problems. The rate of Cree smokers is higher than the Canadian average, i.e. 37% versus 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 estimated that the number of people per housing unit among the Crees is twice as high as for the rest of Quebec (RP13, p. 46). Problems of mould and air pollution inside houses, mainly in Chisasibi (ES38, pp. 11-12), have been reported.

Prevalence rates for other diseases have evolved since the early 1980s, and now more closely resemble those currently seen in the rest of Quebec. 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 Quebec average. However, recent data show that cardiovascular mortality rates are almost identical to those for the rest of Quebec.

Social problems

According to the information presented in the impact assessment, a significant increase in social problems, such as family violence and child neglect, was noted in the early 1980s. These problems may be due to the stress associated with internal changes to Cree culture, acculturation, unemployment, and the use of alcohol and other substances.

The proponent also indicates that the Cree communities in the region 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 changes in culture and values, 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 in Cree territory is a relatively new phenomenon and has been greatly 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.

At 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 that of other First Nations of Canada (27.9% in 1999). However, these statistics do not take into account 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 five hours a 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 the section dealing with the economy, 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-Aboriginal 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 some Cree workers were neglecting their families by visiting less often, even when 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, some 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 many personal, family and community problems. Some of

them feel that the best, albeit draconian, 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-Aboriginal workers during the construction of the Eastmain-1 hydroelectric power development project (RTP19, pp. 58-60; RP25, p. 25). Some Cree workers also said they were made to feel inferior by their non-Aboriginal colleagues, while 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.

6.3.1.2 Anticipated impact

General health

Besides the problem of eating fish contaminated with mercury, which is discussed later in this section, 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, stating that the project will result in numerous losses for the Crees and will have psychological repercussions (M3, p. 5). Health Canada estimates that the project could worsen current health problems (M47, p. 1). 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 hydroelectric power 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, some 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 in 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 to be one of the indicators for assessing the psychological well-being of a given 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, together with higher salaries, could lead some 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 and vandalism, especially 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 Panel 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. This is discussed in greater detail in the section dealing with the project's economic issues.

Mitigation measures

With regard to 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. The measures applied to the development of Eastmain-1 and planned for the project under study are as follows:

- 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 rules 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 will result in 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, pp. 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 is planning 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, Aboriginal days, shows by Aboriginal 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 indicated that health services in work camps must be better tailored 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 should 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.

Monitoring programs

The proponent suggests implementing two monitoring programs (DCAP15, pp. 110-111). The first would address relationships between Cree villages and work camps. It would involve identifying problems and evaluating the effectiveness of support measures. The second monitoring program 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 programs to monitor the health determinants of the six Cree communities affected by the project during the operation phase. In this context, the CBHSSJB (M3, p. 10) and Health Canada (M47, p. 2) suggest that the proponent develop and implement a monitoring program to evaluate the effects of the project on key determinants of health: income and social status; employment and working conditions, relationships and social support; institutions; services; education; and personal behaviour. Given the ongoing uncertainty as to the project's actual influence on these determinants, this monitoring program would make it possible to track their evolution. It would 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 determine which health impacts on the public are directly linked to a project and which are attributable to other causes. The Panel nevertheless feels that the proponent should give the CBHSSJB its full collaboration so that the latter can document the project's effect on certain aspects of Cree health by targeting indicators pertinent to the project's effects. In this context, the Panel would like the proponent, in partnership

with the CBHSSJB, to implement a monitoring program to evaluate the effects of the project on some health determinants.

Considering the various measures that the proponent undertakes to implement to prevent alcohol abuse on construction sites, the Panel 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. To this end, it would be advisable for the proponent to hire qualified personnel to intervene with Cree workers when they encounter psychological or social difficulties, such as alcohol consumption and difficulty integrating into the worksites.

6.3.2 Mercury and health

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 hydroelectric power resources were developed in the region. 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 from 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 region. 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, 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 posting 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 disease. 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. The new road network makes regular hunting and fishing activities more accessible and greatly facilitates the transportation and distribution of the harvest.

The increase in paid work in the communities has meant that a growing proportion of the population is able to take advantage of another choice in their primary diet and no longer has to depend primarily on hunting and fishing to meet 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, no matter where it comes from.

Over the years, individuals participating the most actively in information campaigns and mercury level measures for the Cree living in the region have been the CBHSSJB, responsible for managing public health in Cree communities, the CRA and Hydro-Québec. The proponent has acquired data on mercury contamination levels in fish and developed an information guide on frequency of consumption by fishing site and species captured. The proponent has 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 break down consumption frequency, depending on whether the species consumed was 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 childbearing age and 30 ppm for other adults, to advise them with regard to fish consumption. The conclusion was that the negative aspect of these informational programs had discouraged people from eating fish and that the problem should also have been considered in a more inclusive context, in which consumption of fish figured as 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 sport fishers in Matagami and James Bay reveal that the average values for mercury in the hair were 2.1 and 3.6 ppm respectively (PAP62).

Panel analysis

From 1986 to 1996, the CRA and the CBHSSJB participated in implementing the first Mercury Agreement. Under this Agreement, the mercury exposure of most pregnant women was monitored and fish consumption during pregnancy was discouraged. Certain groups of adults who had been identified as active fishers 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 sport fishers. Species targeted are lake trout, northern pike, and walleye, three species known to have high body burdens of mercury. Faced with these apparent contradictions, the Panel 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. The Panel observes, however, that the proponent has, in the past, made decisions in the field of public health, although it is 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 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 hydroelectric power projects, but for all Cree communities.

At public hearings held in Montréal, it became apparent that there were differences in opinion between the proponent and Health Canada with regard to the threshold values used in calculating the frequency of fish consumption in order to protect public health. Health Canada recommends an acceptable daily intake that takes into account the uncertainties regarding the typical quantity and speed of assimilation of methyl mercury, which differ for each population group studied, and the subtle effects of this contamination in newborns. It recommends a daily mercury intake of 0.2 µg/kg, which would ensure that there were no harmful effects. The proponent believes that limiting adult men and menopausal women or those not planning a pregnancy to a daily intake of methyl mercury estimated on the basis of foetal toxicity could lead to declining fish consumption by these sub-groups. Based on this fact, it estimates that there could be a “very real” risk of an increase in cardiovascular disease, particularly among adults over 50. Hydro-Québec prefers to concur with the opinion of the WHO which, as of 2003, recommended a daily intake of methyl mercury of 0.47.4g/kg of body weight for adults in general. It recognizes, however, the value of the WHO recommendation of a daily intake of

0.23 µg/kg of body weight for pregnant women or those planning a pregnancy, given that the foetus sub-group is the one most sensitive to mercury (PAP64, pp. 9-10).

For pregnant women, the proponent plans to come up with recommendations for a level "quite a bit lower" and in line with the new WHO recommendations, together with the CBHSSJB, which is responsible for public health for the Cree and the *Conseil régional de la santé et des services sociaux de la Baie James* (CRSSSBJ), with is responsible for non-Aboriginals (RP12, p. 171). At the request of Health Canada, Hydro-Québec presented hypothetical impacts of the project on the consumption of fish for women of child-bearing age and those who are nursing. The proponent specified, however, that definitive recommendations for these vulnerable groups would be drawn up later with the CBHSSJB, based on the monitoring of changes in mercury levels in fish (PAP64, Tables 1 and 2, pp. 16 to19). As stated by Health Canada, these scenarios are useful in understanding the extent of the impact for these sub-groups and the need to plan effective communication measures.

The Panel finds that, from the standpoint of protecting public health, it would be desirable to establish a long-term co-operative effort between the proponent, the CBHSSJB and the CRSSSBJ, to include a sharing of duties based on the jurisdictions and responsibilities of each group. The health organizations would analyse the problem of fish consumption and settle on the most effective communication methods for informing the public. In order to ensure the success of this approach, it must be clearly agreed that the promoter has an obligation to conduct monitoring studies, provide data in a timely manner on changes in mercury levels in fish and provide Cree authorities with technical and scientific support.

Impact of the project on fish consumption and communication management

According to the proponent, 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.

As is the case with other hydroelectric power 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 GCC 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 monitoring 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 monitoring 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 dietary changes. The signing of this agreement, which will last for 12 years, confirms that mercury contamination is now seen as both an environmental and a sociocultural problem.

In its impact assessment, the proponent presents new restrictions on the consumption of various species of special interest for adults in general 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 restrictions will be valid for a period of four to thirteen years, depending on the species and fishing site. For the lake whitefish, the lake sturgeon, the brook trout and the long-nosed sucker, the recommendation goes from "unlimited", that is 12 meals or more a month, to "regular", or eight meals a month for a period of 10 years. There is no change in current recommendations for the Rupert River downstream from the dam or the Lemare River for piscivorous fish. For other species a five-to-eight-year restriction of eight meals a month is proposed for the Lemare River. For the Nemiscau River, the recommendations vary from one to eight meals per month over periods of three to 11 years, depending on species. Because of the high levels of mercury, the project will thus involve limits on fish consumption for adults in general in the communities of Mistissini and Nemaska. For Eastmain, the cumulative effect of the Eastmain-1 and Eastmain-1-A projects was taken into

consideration by the proponent and will add one year to the restrictions on fish consumption already provided for the walleye and lake trout in the Eastmain-1 reservoir.

The proponent also indicated that specific consumption limits will be proposed as part of the recommendations established in concert with the CBHSSJB to avoid a possible overexposure of the foetus to methylmercury. These restrictions are important for women of childbearing age, especially with regard to piscivorous species, going all the way up to a recommendation not to eat the fish at all, especially those from the bays. For the lake whitefish, the recommendations drop from eight to four meals a month for the Rupert, Lemare and Nemiscau Rivers downstream from the closure points and for Lake Nemiscau. For the Eastmain-1 reservoir, the restrictions drop from four to two meals. The duration of the recommendations is more restrictive for piscivorous species, depending on location. For the lake trout downstream from the Nemiscau closure point, the restriction drops from two meals a month to a non-recommendation for durations from zero to 16 years. For the walleye, the duration would be 13 to 28 years in the Rupert tailbay (PAP64, Tables 1 and 2, pp. 16 to 19). For vulnerable groups, restrictions on eating fish would affect the communities of Mistissini, Nemaska and Eastmain.

It is also clear that the negative impression some Crees have with regard to mercury contamination in fish must be considered as an impact of hydroelectric development in the region. According to a poll taken in 1996, Crees seem to have gained quite extensive knowledge of the problems of mercury as a result of an information campaign. However, this is not reflected in fishing habits. If fishing habits have changed, it is more because of economic consideration, such as the cost of boats, motors, gasoline and fishing equipment, than owing to health concerns. The increase in the number of full-time jobs has also reduced opportunities and time available for fishing (PAP64, p. 14). This must be taken into consideration in communications orientations and programs of the organizations responsible for protecting public health.

Panel analysis

The Panel fully recognizes the extent of the issue, which exists naturally and is exacerbated by hydroelectric power development projects. It is also aware of the difficult adjustments and the dietary changes imposed on neighbouring Aboriginal 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 through management, planning, monitoring and communication, with support resources and the cooperation of all stakeholders.

The specific formula for consumption recommendations and the schedule for updates must be established in concert with CBHSSJB management, who will also be responsible for its distribution.

For the Panel, the ultimate objective that the organizations responsible for public health must pursue is maintaining the practice of traditional activities. The Panel recognizes that it would be important and necessary to correctly inform the Crees, 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 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 undertaken to monitor changes in mercury concentration in fish in the various zones being studied. The Panel 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 Crees, 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 Panel finds that the duration of the new Mercury Agreement is much shorter than the period for mercury levels in fish in reservoirs to drop 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 changes in mercury levels. This would make it possible to determine whether the agreement should be renewed, as well as the direction it should take.

The Panel 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 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 low in phosphorous and organic matter, highly transparent, with little color, 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 anticipated by the proponent

In general, the proponent believes that the modifications to the water characteristics of the rivers affected by the project will allow for the preservation of 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 leaching of flooded soil, 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 stretch 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 stretch 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 northeast, is similar to type B, and marks the contribution of the Nemiscau River.

The proponent expects that the construction of a hydraulic structure at the outlet of Nemiscau Lake, at KP 170, will 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 about 9 days. 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 at a plant in the village.

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 turbulence. The proponent does not expect any increase in the erosion rate or 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 than before the diversion, as well as slightly less coloured 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 rapids 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 monitor turbidity and suspended matter in the reduced-flow section of the Rupert River, between KP 5 and 170. The proponent also proposes to monitor turbidity and suspended matter in the estuary of the La Grande Rivière during the installation of the granular blankets and following the diversion of the Rupert River. In this case, the monitoring efforts will be concentrated along the left shore of the estuary and near the Chisasibi water intake.

Concerns of 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 expressed 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.

Panel 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 the project.

Two variables, turbidity and colour, are involved in Cree standards with regard to water quantity. Changes in these two factors could cause a decline in use. Turbidity is caused by the presence of suspended matter and the color is related to the decomposition of organic matter. Changes in water color may also be noted as a result of water flowing from tributaries that drain environments rich in fulvic and humic acids. Colour

changes and a gradual increase in average turbidity in the main segment of the Rupert downstream from Lake Nemiscau have meant that turbidity values are similar to those that currently characterize the downstream segments of the Broadback and Nottaway rivers.

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, monitor the quality of the water and transmit the pertinent information to local authorities.

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 m^3 per day and its reserve capacity is 460 m^3.

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 m^3 per day and the reserve to 800 m^3 (RP14, pp. 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 193m^3/s,will be amply sufficient to satisfy the maximum demand of 3,600m^3 per day, namely 0.04 m^3/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*.

The Panel 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.

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 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 at 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 substantial 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 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 hydroelectric activities.

Fewer and fewer people choose to live solely in keeping with the traditional Cree lifestyle. Nevertheless, many people work on a seasonal basis and spend weeks and even months in the forest. Moreover, many 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 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 land.

The territory was divided into traplines 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 region. Consequently, the traplines are generally defined in terms of the hydrographic network. The borders of certain traplines are, however, still the subject of discussion among tallymen. As part of the project, 36 traplines 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 Figures 6-1 to 6-6).

The tallymen ensure the proper management of wildlife resources on each of the traplines. 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 methods (RTP19).

Hunting, fishing and trapping activities are practiced throughout the year. Moose and geese hunting 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 know 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 traplines 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 Route de la Baie-James, the Nemiscau-Eastmain-1, Waskaganish and Nemaska roads, the power transmission lines, Albanel and Nemiscau substations, 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 trapline on category II land, 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 round out the existing infrastructures in this sector. It should be noted that the village of Mistissini is outside the study zone.

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 hydroelectric 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 Route de la Baie-James, the Nemiscau-Eastmain-1 road, the road for the Sarcelle control structure, Transtaïga Highway and the Chemin de Chisasibi. 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 proportion of the equipment used for the La Grande Complex structures is concentrated in the of the Chisasibi community sector.

Proponent's 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 traplines and the members of their families who use these traplines. 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 picture of how the Cree have been using the territory since the start of hydroelectric power development in the region.

The interviews with 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 trapline, methods of moving about on the territory, permanent and temporary camps, hunting, fishing and trapping activities and 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 traplines affected for each community, although the traplines that will be most 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 traplines 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 adjust to new environments 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.



Fishing spot at Smokey Hill

In the increased flow sector, the residual impact on the traplines 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 traplines. Flow modifications will, nevertheless, affect most of the users who will have to adjust 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 adjust 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 traplines 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 traplines used by the community of Chisasibi resulting in transportation and traffic annoyances.

The proponent plans to monitor various aspects of hunting, fishing and trapping activities with the users of the territory. The monitoring will specifically concern

the use of the traplines and camps and wildlife resources, ways of accessing the camps, the exploration of new environments and assessment of the mitigation and compensation measures. Monitoring will continue throughout the construction and diversion activities and for ten years after operations start.

The tables of Appendix 3 provide details about the existing infrastructures, potential infrastructures and borrow pits included in the project, anticipated impacts on the biophysical and human environments, and the mitigation measures and monitoring activities specific to each of the hunting areas planned by the proponent, on each of the traplines.

6.4.1.2 Future management of resources (ability of users to adjust during construction and operation)

One of the issues considered among the most important by the Cree is the risk that the project will change their traditional way of life. At 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 on 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 adjust. 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 traplines affected.

Mistissini

The traplines affected by the creation of the Rupert diversion bays will experience the most important impacts of this project and traplines 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 line, its maintenance road and permanent and temporary Cree camps. Trapline M25 will undergo the most important modifications. Just over 15% (214.9 km^2) 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. Almost 5% (56.4 km^2) 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 (about 30 on trapline M25) and goose hunting sites, as well as the edges of certain moose hunting areas, will be affected by the modification of the environment. Since all of the traplines are considered good for 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[11] (including a community camp north-west of Arques Lake), numerous burial and birth sites, and a vast travel 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 trapline M25. The proponent estimates that a total of 35 families regularly use this territory, about a dozen of them ISP recipients. According to the proponent's estimates, a Cree nuclear family includes an average of four people (RP13, Table 16-2, p. 42). To these may be added guests and hunting partners and residents of Mistissini and Nemaska who also use the four areas studied.

The presence of new bodies of water will involve changes to the travel 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 the Mesgouez Lake sector, the Rupert River has characteristics similar to those expected in the upstream bay, which does not prevent the users of trapline M33 from traveling about by boat there. In the tailbay, the navigation conditions should be favourable, except at the northern extremity of the bay, between KPs 40 and 20, where current speed will be faster, and in the immediate vicinity of the spillway crest upstream from the transfer tunnel and the instream flow release structure. Moreover, according to the proponent, the land clearing program to be undertaken to build navigation

11 The concept of "duration in the term "temporary camp" leads to confusion. These are usually potential camps that could be used during hunting, fishing or trapping expeditions, although these sites do not usually have any permanent structures.

corridors should facilitate boat travel in the bays. In areas where clearing is limited, some routes, like the Nemiscau River, will be preferable.

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 KP 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 during some winters, particularly downstream from the transfer canal, north of Arques Lake and near the crossing of the 735 kV line (7059).

In addition to the flooding of the territory, the users of the traplines 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 trapline 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, trapline 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 this new access will facilitate travel on the traplines, it could also give more people access to sectors which would otherwise be accessible only by boat or snowmobile. This improved access will have pros and cons, which are discussed in more detail in the section increased access to the territory.

Traplines M33 and M26 will be much less affected. Slightly over 2% (15.8 km^2) 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 for approximately 20 km. The proponent has planned no infrastructure for this trapline. A small percentage of trapline M33 will be flooded (1.5% or 34.8 km^2). 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 traplines M33 and M26 will also have to adjust 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 alter their consumption of fish caught in the diversion bays. Restrictions with respect to consuming certain types of fish for adults in general should keep most fishers away from the bays for about 15 years, 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. Restrictions are more stringent for vulnerable groups such as women of childbearing age. The restrictions vary from less than one meal a month to a recommendation not to eat piscivorous fish with the exception of lake trout from the forebay, which can be eaten once a month. The duration of these recommendations varies from four to 28 years.

Mitigation measures and environmental monitoring

The proponent has specified many 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 no sturgeons are currently found in the lakes of the Rupert diversion bay section, the proponent expects that the latter may gradually colonize the diversion bays. Setting up a multi-species spawning ground downstream from canal S-73 could also serve as a spawning area for lake sturgeon. Furthermore, the proponent agrees to monitor the mercury levels in the main fish species fished in the diversion bays, until consumption restrictions return to values comparable to those prevailing at present. 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 20 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). 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. The Boumhounan Agreement provides funding for a wide range of requests from Cree users in Eastmain, Mistissini, Nemaska and Waskaganish directly affected by the project. The $32-million Boumhounan Remedial Works Fund is available during a period of 15 years, can be used for studies, work, environmental mitigation and remedial programs, with the exception of work and measures resulting from project permits or authorizations (M70, section 6.6). The Eenou Indohoun Fund is also available to promote traditional Cree activities in these communities and to mitigate the impact on users who are directly affected (section 8.1).

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 have also asked 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 access and the increased presence of workers on traplines will result in an increase in hunting and fishing pressure (RP17). To control the harvest by workers, the proponent agrees to recommend renewal 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 trapline. 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 clear the wood debris from navigation corridors and from around 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 traplines M25 and M18 will be reduced significantly. Owing 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 traplines. 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 tallymen should be conducted.

Nevertheless, all of these measures, including the possibility of bringing fishing and hunting back 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 the tallyman on trapline M25 also testified. This large family came to clearly state what they thought about the project, what they were choosing for the future of the Cree community. It is a big sacrifice to agree to abandon part of the land of ones ancestors, a land where still today, many people 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 traplines 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 adjust to the new conditions (RP17).

The proponent's project, according to the impact assessment and additional studies, respects the commitments undertaken in the Boumhounan Agreement. It has been agreed that Hydro-Québec will guarantee that the project will not have an impact on the levels or natural currents of Mistissini Lake or Woollett, Bellinger or Mesgouez lakes. The proponent also guarantees that the aquatic habitat upstream from all forebay limits in the project will not be affected.

The Panel acknowledges that the residual impact on traplines of the Mistissini community will be negative and significant, since there is no compensation for the loss of land area for hunting and trapping. However, the Panel cannot judge to what extent the impacts on traditional hunting, fishing and trapping activities by the community of Mistissini could be mitigated by the proponent's measures and compensated for by funding from the Boumhounan Agreement. The Panel is of the opinion that only the users are really in a position to judge the effectiveness of the proponent's measures and the financial assistance, which will be managed by the Niskamoon Corporation. It will be important to monitor the satisfaction of the tallymen.

Nemaska

The main repercussions of the project on most of the traplines in the Nemaska community 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. Owing 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.

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 adjust to a new environment for goose hunting. Nevertheless, waterfowl should continue to use the river. This report contains a section dealing specifically with 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 continue to be of interest for the trapping of other fur-bearing species, with the exception of beaver. 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.

Traplines R21 and N25, situated on either side of the Rupert River in the section of the closure point, will be

particularly affected by this project. They will be impacted by reduced water levels and by the flooding of Rupert River following the creation of diversion bays (1.68% or 11.53 km^2 on trapline R21 and 0.13% or 1.52 km^2 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 (trapline 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 at 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, 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.

The proponent believes that the hunting areas studied are used by about 45 extended families, about 30 of them ISP beneficiaries. To these regular users may be added other members of the Nemiscau community who frequent fishing sites and hunting areas in the area (EI1.4, p. 17-20). 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 go there for the 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 Route de la Baie-James 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 adjusted to 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 sturgeon fishing. 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 adjust their hunting and trapping activities to the new conditions.

Traplines N25, N24A, N24, N23, R17, R18 and R21 line the Rupert River on both sides, between the closure point at KP 314 and KP 94. On each of the traplines, valued sections will be affected by shore exposure or 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 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 purposes, 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 Route de la Baie-James and a sturgeon fishing site at KP 136. Most of the traditional activities of users of trapline N23 will not be affected by the changes in flow on the Rupert because they mainly occur within the trapline, on the Broadback River or in the Nemiscau Lake section. Nevertheless, users are concerned about the pressure on hunting and fishing caused by the presence of the camp at KM 257 (RP17, p. 132)

On the Rupert River, only one of the fishing sites identified by users of trapline 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.

Trapline 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 trapline R19 will also be flooded (4.86 km^2 or 0.39%) in the Caché Creek 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, there will be 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 Route de la Baie-James. 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 and 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 adjust 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 owing 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 slight 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 the Rupert River because their water inflows are from portions of the diversion bays located further downstream. The proponent expects consumption restrictions varying from five to eight years, depending on the species, for the lower portion of Lemare River, and restrictions from five to eleven years, depending on the species, for the lower portion of Nemiscau River. Consumption restrictions for fish from the diverted rivers, including the Rupert, will be more stringent for women of child-bearing age and children, varying from four meals a month to a recommendation of non-consumption for 0 to 24 years, depending on the species and where the fish was caught.

Mitigation measures and environmental monitoring

The proponent agrees to set up new spawning areas to compensate for spawning areas destroyed or disturbed by a structure. This is the case 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. It is also the case a walleye and sucker spawning area disturbed by the changes in flow downstream

from the dam on the Rupert. The proponent will monitor breeding success 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 fears at public hearings about the project harming this valued species. Furthermore, lake sturgeon fry will be stocked between KP 110 and 170 in the Rupert River to support the species in this segment. The proponent also agrees to landscape some of the tributaries of the 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 monitor fish mercury levels on the Nemiscau River and to share the results with users. It also agrees to publish a guide to 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 adjust their fishing activities will be able to apply to the various funds set up for this purpose by the Boumhounan Agreement (Boumhounan Fund for Remedial Work, Eenou Indohoun Fund and Eastmain-1-A/Rupert Mercury Fund).

During the first winter following impoundment, 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, which will be built the next year. An intensive beaver trapping or relocation program will be set up in collaboration with the Cree to prevent injury to beaver populations on the banks of the 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 diked to encourage goose hunting (RP17) and the proponent has proposed to the tallymen that some borrow pits used for the project be developed 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 its schedule and the nature of the work. At the request of users, security fences will be installed near the weirs at KP 170 and 223. The proponent will also inform all users of the dates for manoeuvring the Rupert River spillway (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 facilities 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. The proponent 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 Creek (north branch) will also be monitored in collaboration with the tallymen 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 monitor 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 the 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 adjust 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 useful 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, it agrees to monitor fish populations and spawning areas, prioritizing sturgeon spawning areas. The users may have access to various funds set up under the Boumhounan 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 useful 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 travel routes. Users whose traplines are located on either side 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 traplines in the community are along the Rupert River and many families use these traplines. Furthermore, relocation of the Old Nemaska community to Nemaska is still fresh in people's memory. At the public hearings, many members of the Nemaska community stated that they already feel apprehensive about the impacts of potential modifications to the Rupert and the resulting changes and that this affects them a great deal. The Rupert River is both a place 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 many 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 taken into account 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).

However, some 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 monitoring actions and would like to participate in all discussions and decisions relating to the implementation of these measures (VAP5).

The Panel feels that the residual impacts on traplines R21 and N25 are negative and significant, since these areas are immediately downstream from the Rupert dam. Territory R19 is doubly affected by the project under study, mainly from the impact of Eastmain-1. Two sites used by the communities will also be disrupted. For the other areas, we must depend on the proponent's mitigation measures. It will be important to monitor the satisfaction of the tallymen, since most of them will have to readjust to new travel and resource management conditions.

In addition, the Panel supports the request by the tallymen of trapline 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. With regard to the pressures created by the workers' camp at km 257, the Panel believes that, during the work period, the territory of Weh-Sees Indohoun should be expanded to the sectors surrounding the project camps located on Category III land, subject to the necessary consultation with wildlife management organizations.

Most of the tallymen have indicated that they will continue to use their traplines 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 the 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 Panel suggests that users of the territory participate in the implementation of the long-term monitoring programs for the biophysical environment, including water levels and flow, fish, mercury, waterfowl, land animals and riparian vegetation.

Waskaganish

The traplines of the Waskaganish community will also be affected by the waterflow 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 encourage 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 breeding 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 traplines located on the south bank of the river is facilitated by the Waskaganish road, while the Route de la Baie-James 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 adjust 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 traplines 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 spawning 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 or on its banks or the islands.

The drop in the water level in the bay will be nearly imperceptible to users. In winter, no changes in catch periods, thawing or freeze-up times 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 traplines 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 at rapids—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 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. The Asinii Kabasiganot site, already identified in the section on the impacts of the project on the Nemaska community's traplines, is another community use site. 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 adjust their fishing activities to the new conditions. A few of the tallymen also mentioned that many members of the Waskaganish community use boats on the river to fish and hunt geese.

Users of trapline R4, located on the north bank of the river, across from the village, will have to adjust 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 trapline 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 adjustment 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.

Trapline R11 encompasses the Smokey Hill site and is across from the 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 adjust 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 trapline 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 trapline 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 trapline 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). Snowmobile travel on these stretches, as well as on the stretch located upstream of the weir at KP 110.3, could also be more dangerous while construction is taking place.

Seven of the eight traplines of the Waskaganish community are category II land. The presence of workers at the Kauschiskach camp should not result in any increase in fishing or hunting pressure. However, the tallyman from trapline R13 is uneasy about the pressure on large game created by the easy access of the winter road for the construction of weir KP 85. According to the proponent, one section of this road was used for construction of the power line to Waskaganish. So the right-if-way for the line will already be accessible for snowmobile travel from the Route de la Baie-James (RP12, p. 220).

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. 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 cause 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 monitoring

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.

The fall in winter water level in stretches of river not subject to the influence of a weir, together with a temporary decline 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 used 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 monitoring program 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). Mitigation, compensation and remedial measures are provided for under the three funds of the Boumhounan Agreement, which also 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 discontinued. In this case, the proponent has warned them that it does not plan to maintain them. It should be pointed out that users of trapline N2 have already asked 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 monitor water quality in the Rupert between KP 5 and 170 with regard to turbidity and suspended matter, starting in the first year after diversion (DCAP15).

Lastly, the proponent, in collaboration with users of traplines, will monitor 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 monitor snowmobile routes and river crossing sites in collaboration with users (DCAP15).

Conclusion - Waskaganish

Two sections will be subject to exposure and users will have to adjust 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 be re-established in the years following replanting. As for fishing activity, three sections will probably become less attractive to users, or at least require some adjustment on their part. One of these sections stretches for almost 10 km, between KPs 5 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 during the summer.

Many tallymen in traplines 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.

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 rapids should undergo some changes, but these will not hinder the gathering 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. The Panel considers that the proponent must, in collaboration with the Crees, conduct monitoring 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, 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 traplines, 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 monitor changes in 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 monitoring program, the Panel considers that the proponent should develop means of ensuring safe navigation in the estuary and in the entrance to the bay. Measures to be taken in this regard are described in the section on navigation.

Furthermore, water quality and the risks of mercury in fish 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, or eat the 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 for the region's bodies of water.

Like many stakeholders at the public hearings, the Band Council of the Waskaganish First Nation spoke out against 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 from the traplines bordering the river came forward at the public hearings. One of them spoke out clearly against the project (VAP36, pp. 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, pp. 72-76; VAP34, p. 13-17). During interviews with the promoter, all the tallymen present indicated that they would continue to use their territory and would wait to see that the impact would be on their traplines, so as to evaluate the real impact on their activities. Some of them said that they might make more use of adjoining lands or those of their relatives to lessen the impact on their fishing harvest (RP17). The proponent has not evaluated the potential impact on neighbouring areas. The Panel feels that the uncertainty surrounding the exact nature of some conditions, which can only be confirmed after project monitoring, will add to the already considerable concern of users. It suggests that the promoter monitor the movement of users to other lands, in addition to monitoring use of traplines.

Members of the community of Waskaganish who spoke at 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. The Panel suggests that members of the community of Waskaganish be integrated into the various programs to monitor the biophysical environment (water levels and flows, fish, mercury, waterfowl, wildlife and vegetation), so that they can closely monitor the actual impact of the project and maintain their environmental expertise. They could also propose to the Niskamoon Corporation, with a notice to the CRA, the mitigation measures most appropriate to their new requirements.

Some tallymen questioned indicated that they would continue to use their territory and would wait to see that the impact would be on their traplines, so as to evaluate the real impact on their activities. Some of them said that they might make more use of adjoining lands or those of their relatives to lessen the impact on their fishing harvest (RP17). The proponent has not evaluated the potential impact on neighbouring areas.

Eastmain

Four traplines of the community of Eastmain lie within the project's increased flow section. These traplines 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 traplines 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 Route de la Baie-James, 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 traplines will be the change in the flow in the various bodies of water in addition to the presence of the new infrastructures. These traplines lie between 100 and 200 km from the village, on category III land. According to the proponent, about 70 people use these lands, including four ISP recipients. Most of them go to the sites during leave periods or between two jobs (EI1.4, pp. 17-49). The construction of roads has facilitated access to these areas, both for the tallymen and their families and for other members of the community. Some 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 trapline 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 adjusted.

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 observed in local bodies of water. Impoundment of the diversion bay and the Eastmain 1 Reservoir will not have additional impacts on the Opinaca Reservoir.

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 traplines 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 affect 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 Boyd Lake 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). It should be noted 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 travel on 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 adjustment 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 and will remain unpredictable.

Mitigation measures and environmental monitoring

In order to ensure that beavers on the periphery of the reservoirs and the resource that they represent are 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 using this trapline (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 offset by the establishment 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 Cree camps 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 monitor ice conditions at crossing points on the Opinaca Reservoir in collaboration with users. The monitoring will continue for two years following the start of operations in order to identify safe corridors for snowmobile traffic.

Conclusion – Eastmain

The project will not greatly affect hunting, fishing and trapping activities on the traplines 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 adjust 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.

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. The Panel finds that valued sites will not be much affected and that traditional activities could continue or be compensated for to the satisfaction of users.

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 increase 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.

The Panel suggests that the program to monitor 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 trapline 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. Even though In spite of all this, community members have adjusted to the changes and seem to accept them, looking toward the future and the future needs of the entire Cree community (VAP8, 9, 10).

Wemindji

Users of the traplines of the community of Wemindji 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 traplines, 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 Boyd Lake 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.

Four areas of Category III land will be affected. According to the proponent, these lands have at least 65 regular users, about 15 of whom are ISP participants. They are used during vacation periods or when users are not working (EI1.4, p 17-57).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 Transtaïga 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 operations inland and close to the Route de la Baie-James (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 Boyd Lake (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 naviga-

tion 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 east of the future powerhouse.

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 the large amount of floating debris and flooded trees. Instead, they operate in sections to the south and east of their trapline.

A weir 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. 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 Transtaïga Highway, which crosses the region from one end to the other. This highway is also frequently used by non-Aboriginals 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 adjust 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 Opinaca 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 house only a few workers and for a very short 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 monitoring

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 trapline 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 monitored. Although the water bodies on which these camps are located should not experience any increase in water levels, the proponent agrees to conduct these monitoring activities 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. 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 monitoring navigation conditions and snowmobile crossing points, in collaboration with trapline users, the proponent agrees to examine the proposal that a map of snowmobile navigation and traf-

fic conditions be created. It also agrees to take measures to clean up certain shoreline areas of the Boyd and Sakami Lakes (DCAP15).

Conclusion – Wemindji

The project's impacts on the traplines 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 disrupt 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 greater 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 weir 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.

The Panel recommends involving the Cree of Wemindji in monitoring water levels as planned by the proponent. This participation would keep them informed of measures taken by the proponent to make sure its predictions are met.

Some monitoring 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. The Panel 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 clean up shorelines that are littered with debris and therefore dangerous for travel. This program could be carried out by members of the community, creating both jobs and promoting the harvesting of abandoned areas by land users, all the more in that some hearing participants were asked about the fact that the community is not a signatory to the Boumhounan Agreement..

The Panel 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. The Panel feels, however, that true compensation for this community lies in construction of the Sarcelle powerhouse.

Chisasibi

The last part of the increased-flow section is located inside the lands of the community of Chisasibi. 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, a 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.

According to the proponent, the six land areas studied for this sector are intensely used by the members of tallymen's extended families and many community members. The number of regular uses is estimated at over 200, at least 15 of them ISP participants (EI1.4, pp. 17-64 and 17-65). Two community use areas were identified 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 few years, the old site of the village on Fort George Island has again 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 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 because of 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, which could increase traffic because of the transportation of materials on the Chemin de Chisasibi 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 on traplines 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 bank stabilization work will take place on trapline 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 Upichiwuun 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 17 borrow pits, 13 of them located on trapline CH35 (RP13, map 361-2). In addition to 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.

The rest of the granular material will come from four borrow pits situated on trapline CH35, directly to the east of trapline 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 monitoring

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 monitor bank erosion downstream of the La Grande-1 generating station and the effectiveness of the granular blanket. Finally, the proponent will monitor water quality, turbidity and suspended solids in the Grande Rivière estuary (DCAP15).

The proponent has agreed not to include, in its search for borrow pits, an area identified by the tallyman of trapline 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 trapline CH35, a road sign will be installed, indicating the presence of Cree

camps and advising drivers to slow down. The proponent agrees to monitor bank erosion in the area of the temporary camp and to move this shelter if it is threatened. As is the case for trapline CH33, the proponent has proposed to the tallyman of trapline CH35 that certain borrow pits be converted into goose-hunting ponds (DCAP15).

Conclusion – Chisasibi

The project's impacts will affect hunting, fishing and trapping activities on the traplines of the community of Chisasibi for only 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 the La Grande Rivière estuary, should not affect travel by boat or snowmobile since flow will be managed according to the current regime. Since navigation in the delta of the La Grande Rivière is already considered hazardous, some Cree expect an increase in difficulty navigating in the La Grande Rivière estuary and on James Bay owing to the increased sediment. This aspect is discussed in the section on navigation. The Panel recommends that members of the community of Chisasibi participate in bank erosion and water quality monitoring 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. At 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). The Panel even finds that the main impact for this community is that it is one more project added to all the changes already experienced and poorly assimilated.

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. In total, 180 km will be permanent highways and roads, the rest being temporary.

The proponent is also planning 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 increased access to the region, making it easier for 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.

Panel analysis

While the impact assessment does not contain any chapters or sections focusing specifically on the project's impact on increased access to the region, the subject was addressed in a number of different sections of the study and in additional documents. This issue has been an object of some concern among the Cree regarding land covered by the JBNQA, notably in the provisions of the *Paix des braves* Agreement (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 issues.

This increased accessibility stemming from 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 has made it easier for them to access the region. It has also lowered the costs associated with this access and facilitated the establishment of various camps along the main highways (RP12, p. 215). Before the construction of the road network in the James Bay region, numerous traplines could only be reached by floatplane or by long trips by 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-Aboriginal hunters and fishermen, which has lead to more competition for resources between Cree and non-Aboriginals and among Crees themselves. There has been a rise in poaching and increased pressure on all wildlife resources, mainly big game and fish species. Vandalism and equipment theft in camps is up, as is the abandonment of equipment, garbage and animal carcasses. There is also a loss of tranquility at sites when a road network is built (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 (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 (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 proponent 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 (RP12, p. 217). The proponent will study the feasibility of building or upgrading different access routes for cars, all-terrain vehicles or snowmobiles if needed to mitigate impact of the project. It should be noted that some of these access routes are fairly long, including the 20-km long access road to trapline M18 of the Mistissini community. The tallymen requested this access route so they could reach camps displaced because of the project and access new areas for practicing traditional activities following the loss of land stemming from the project.

At 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. At the public hearings, some Crees also asserted that 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 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 assess 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 the Panel believes that the project will increase access to the territory, facilitating the development of tourism activities, such as boating and sport hunting and fishing. Nevertheless, the construction of new roads and power lines could exacerbate the problems reported by the Cree. The Panel believes that the proponent and the tallymen concerned should agree on whether to decommission or maintain the project's temporary roads. In addition, 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, the Panel believes that in the medium and long term, increased access to the territory could affect competition for wildlife resources between non-Aboriginals and the Crees. Non-Aboriginal hunters and anglers will, however, be subject to harvest limits imposed by current regulations.

Increased access to the territory will have a spillover effect on other types of project, notably mining, forest and industrial development. While these activities may generate attractive economic spinoffs, 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 (RP12, p. 216).

6.4.3 Boating and other water activities

The construction of facilities that could impede boating on navigable waterways is subject to the *Navigable Waters Protection Act*, which is intended to protect the environment, conserve public rights to navigation and ensure the safety of boaters. When there are technical constraints, mitigation measures will have to be implemented, such as the development of portages, in order to maintain the existing navigable link.

This section deals with changes stemming from the project that will affect boating by the Crees and recreational boating by regional non-Aboriginals and 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 (EI1.4, Figure 18-1, p. 18-10). 6.4.3.1

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. A number of navigation routes are used.

During the diversion bay impoundment, existing bodies of water will be flooded, creating new bodies of water to which users will have to adjust. 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, with a maximum of 2 m. That of the tailbay is estimated at 0.8 m, with a maximum of 3.3 m in Arques Lake and a maximum of 1.5 m to 2 m in the Canal C section.

In the forebay, the increased water level will flood eight rapids between KP 314 and 333, which are located along a well-known canoe route. This fast-flowing water route will be transformed into a lacustrine route. A participant at the public hearings also expressed concerns regarding lower water levels near dike C-R-1-2-3.

In the tailbay, the original corridor of the Nemiscau River will be more conducive to navigation than other parts of the bay, since the proponent does not anticipate any major clear cutting in this section. The north portion of the tailbay between KP 40 and 20 will be less conducive to boating, mainly because of the high flow velocity and the presence of peatlands. 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.

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 has indicated that it will ensure users can safely bypass these areas during the work.

Prior to impoundment, the proponent will clear multifunctional areas and navigation corridors, in the bays, as established with the tallymen, to facilitate use of the flooded sections and passage between the bodies of water. A five-year program to remove wood debris will be implemented in the diversion bay section and will require the tallymen's participation (RP12, p. 267). 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.

Following discussions, the tallymen, the proponent and Jamesian stakeholders agreed on measures aimed at mitigating the impact of the diversion bay operation on navigation. The proponent undertakes to 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 dike, may also be redeveloped.

The proponent has also planned a navigation monitoring program in the diversion bay section, which will report on navigation conditions, particularly in the cleared navigation corridors (DCAP15, p. 99).

Conclusion

Although navigation conditions will change in the diversion bays, the Panel believes that the planned mitigation measures and the monitoring program will maintain a safe, navigable link on these waterways.

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 the portion of the river affected by the project (RP12). Forty-two of these rapids are Class I or II according to classification of the *Fédération québécoise du canot et du kayak* (*FQCK*) (RP12, p. 235). Of these, 24 can be navigated, but 18 have a portage alongside them and are deemed difficult to cross by most canoers. The rest of the rapids, class III, IV, V and VI, are deemed impassable and all have portages. Cree power boats and other users can navigate Class I and Class II rapids and go around the ones that are deemed to be too difficult. The Rupert River has approximately 49 portages (RTP13, p. 9-10; VRT9, p. 51). Although the average length of the portages is 250 m, five stretch over 1 km and three others are longer than 6 km (RP12, Table 293-2, pp. 251-252).

In the portion of the Rupert River between Lake Mistassini and the Route de la Baie-James, navigation is considered to be 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 Route de la Baie-James (KP 108) and the mouth of the Rupert River is considered to be difficult because of waterfalls and many difficult rapids. The flow is average and campsites are somewhat rare.

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, although there is a high season,

from late June to mid-September. In 2003, between 50 and 100 excursionists travelled the river on trips of varying lengths. Three companies offer canoe and kayak excursions. At least five Canadian or United States organizations have made expeditions on the Rupert River in the last few years (EI1.4, pp. 18-4 and 18-5). 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. The purpose of this activity is to relive the famous canoe brigades that punctuated the James Bay rivers during the fur trade era. 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 at high tide.

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, the impact varies depending on the stretch of river. Thus, in the stretches affected by a hydraulic structure, 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 Nemiscau River and over 2 km at the mouth of the Lemare River. Water levels will be maintained in the Rupert River in the Gravel Pit and the Nemiscau Lake sections. The flow velocity will fall between 58% and 75%, to levels found in lacustrine environments. The main tributaries of the Rupert, i.e. Rivière à la Marte and the 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 weir at KP 110.3 will, however, be flooded (RP12, p. 249).

In the eight stretches of the Rupert River not affected by a hydraulic structure, the impact on navigation is associated with a reduction in water levels. The drop in water level, from 1.1 m to 2.1 m, could affect powerboat travel. 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 drop diminishes 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. These stretches already have portages, however. In addition, the water level will drop in first section of these stretches only at both extremities of the navigable stretch. The second section currently cannot be navigated by canoe or power boat (RP12, pp. 258-259).

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 in August and September, in spite of the fact that 90% of the current wetted area of the Rupert River will be maintained. Gently sloping banks will be more exposed. This exposure will extend the distance between the boat landing and Cree camps and other sites along the bank. It will also increase the distance of some portages. According to the proponent, the project will not have a significant impact on the portages or boat landings near 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 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 narrowest part, the channel will be 54 m wide. The Crees already mark the estuary to avoid shoals at low tide.

With regard 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.

A number of Crees are concerned about new navigation conditions stemming from the diversion of the Rupert River. Most Crees said they use the Rupert River to access various traplines in the area. Some are concerned about the longer portages and distances between camps resulting from exposure of the river's banks. Others are apprehensive about increased difficulties in the estuary and navigation problems related to tides, winds and navigation channels.

At the public hearings, Transport Canada also raised the possibility of exceptional weather conditions that would force the proponent to release water downstream from the Rupert Dam. The department feels that the proponent must implement an information program aimed at informing users of a potential rapid rise in water (VAP23, pp. 202-203).

Mitigation measures and monitoring

The proponent has undertaken to implement navigation measures and to develop and maintain portages in order to preserve the navigability of the rivers affected by the project. In addition to the portage at Rupert Dam, the proponent plans to develop another to bypass the weir at KP 110.3 and redevelop two others at KP 85.0 and 95.7 and KP 223.5 and 271.3. Moreover, four portages will have to be extended, including two that are over 5 km between the Smokey Hill and Plum Pudding rapids and the Cat and the Fours rapids (RP12, Table 293-2, pp. 251-252). The proponent will assess the need to adapt the existing portages to the new bank conditions and to redevelop them if necessary. The proponent will install boat ramps on the Rupert River near KP 110 and 170. Other measures have been agreed upon with the tallymen, including extending the hydraulic structure road from KP 290 to KP 281 and construction of a boat ramp downstream of the rapids (EI1.4, pp. 18-25). The proponent will prepare a navigation map of the Rupert River using aerial photos to view 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.

The proponent will monitor various navigation conditions on the Rupert River and will pay special attention to stretches not controlled by a hydraulic structure (DCAP15, p. 100). This monitoring will enable the proponent to identify new navigation conditions (flows, water levels and depth) and determine the application of any 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, specifically in the 24 rapids not bypassed by portages. This will also make it possible to identify the necessary mitigation measures (RP12, p. 249).

The proponent has undertaken to monitor navigation conditions in specific locations on the Rupert River, for example at KP 131 and 132. The proponent will verify access to the tallyman camps from the banks and move these camps if necessary. Boat landing conditions downstream of Smokey Hill will be monitored to determine whether mitigation measures are required. Navigation will also be monitored on the rapids at 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, p. 247).

The monitoring program will also include an assessment of the navigation conditions in certain tributaries of the Rupert River, that is, those located at 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 Creek), located at the Route du Nord. Initial navigation conditions will be determined before the work begins. By monitoring navigation conditions after the Rupert River diversion, the proponent will be able to assess the navigability of tributaries and determine whether mitigation measures will be necessary.

Conclusion

The Panel is of the opinion that residual impact of the diversion on navigation will be moderate overall. In keeping with the proponent's assessment and planned

measures and monitoring, the Panel believes that the Rupert, Lemare and Nemiscau rivers will remain navigable. The proponent must, however, ensure that they remain so regardless of future hydraulic conditions. To this end, a minimum depth of 1.5 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. The Panel also believes that exceptional weather conditions would make it necessary to use the Rupert Dam's control structure. The proponent must implement an information program aimed at informing users of when water is released downstream from the dam and ensuring their safety. A program to monitor navigation conditions in the estuary and the Bay must also be implemented in collaboration with the Waskaganish community. The Crees already mark a navigation channel to avoid shoals at low tide, and this practice should continue at the proponent's expense.

With regard to recreational boating, 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 affect the number of recreational boaters. The Panel acknowledges that the popularity of canoeing and camping along the Rupert River could drop.

The proponent has undertaken to develop and maintain portages in order to preserve the navigability of the rivers affected by the project. The proponent should also improve the portages to make them safe and easily usable by all.

Moreover, the Panel considers that the proponent should implement a monitoring 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 whether new routes need to be found.

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 owing to currents and strong winds. The proponent, however, has identified a number of navigation routes for powerboats (EI1.4, pp. 18-14). Although the 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 dike. 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 under 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. Some Cree participants at the public hearings expressed their concerns regarding current dangerous conditions on Boyd and Sakami lakes and increased danger following the project. Others mentioned that some boat launches in this section were difficult to access because of the presence of wood debris (VAP12, p. 16).

According to the proponent, navigation conditions will improve over current conditions because of 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 a new access route 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 La Grande Rivière. Nevertheless, Cree from Chisasibi feel that navigation in the delta is hazardous. They expect more navigation difficulties in the La Grande Rivière estuary and James Bay owing to the increased transportation of sediments, which may create new sand pits. The proponent is of the opinion that, after the project is completed, the limit of the sedimentary cone will be located downstream from Governor Island (see Figure 6-7) and should not have an impact on current navigation conditions (PAP121).

The proponent has planned a navigation monitoring program for the increased-flow section that will identify

navigation conditions in Boyd and Sakami lakes (DCAP15, p. 100). This 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.

Conclusion

To facilitate navigation, the proponent should implement a program to pick up wood debris and map out and mark navigation corridors in the increased-flow section. To ensure the safety of users, it should be determined whether signage in the navigation corridors should include, other than the marking of the more difficult sections, the installation of booms, notably upstream from the Sarcelle facilities. As for the La Grande Rivière estuary, it would be advisable to identify, in collaboration with the Crees, developments that could make navigation safe.

In light of the scope of the project and large number of small waterways crossed by access roads leading to the planned work, Transport Canada agrees that most of these waterways are navigable in accordance with the law, except for those where temporary and permanent bridges are planned, that is, on the Rupert, Nemiscau and Lemare rivers (C10). It would be wise to monitor some of these waterways and those that will be crossed by the Muskeg-Eastmain-1 Road, such as the Acotago River, to be able to implement the measures needed to maintain their use.

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. 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, an expert resource body made up of Aboriginal and government representatives to review, mange, 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-Aboriginals in the region must respect the regulations of the *Ministère des Ressources naturelles et de la Faune* 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 Nadoshtin Agreement, during the Eastmain-1 development. Comprised of Crees and the proponent's representatives, its mission is to control non-Aboriginal access to fish and wildlife, propose measures to manage harvest and 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 km^2 and includes category III land, as well as category I and II land of the Nemaska community (see Figure 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 *Ministère des Ressources naturelles et de la Faune*. It should be noted that the downstream portion of KP 95 of the Rupert River crosses Waskaganish category I and II land, where non-Crees 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 Nemiscau 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 33 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 Highway and is not authorized in areas further south, where the project will be carried out.

With regard 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 fishers were tourists. In 2002, a survey conducted by the proponent among vacation leaseholders in the study area revealed that 93% were sport fishers (see EI1.4, pp. 17-77). Another survey conducted among users of Route du Nord showed that the most frequented fishing sites are those close to roads. According to the proponent, sport fishing along the Rupert River is relatively rare in the project area.

Proponent's analysis

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, owing to the Corporation's management and control rules and 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 fishers. According to the Crees, this competition stems primarily from the improved access to the territory as a result of new roads created as part of the project. Still, the proponent believes it unlikely that any increased sport fishing and hunting will compete with Cree activities.

The Crees are concerned by the incompetence and lack of preparation of non-Aboriginal hunters. In light of the poaching by some of these hunters, the Crees would like to see greater wildlife management and involvement by wildlife officers. To this end, the *Paix des braves* Agreement has made it possible to hire Cree wildlife officers in the region. However, these officers control both Cree and non-Aboriginal activities, a source of irritation for the tallymen (RP12, p. 216).

The proponent plans to monitor sport fishing and hunting as well as recreational tourism activities. The purpose of this 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.

Panel analysis

The Panel 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 land and that this should be subject to the required consultation with the wildlife management authorities involved.

The Panel also believes that the increased access resulting from the construction or rebuilding of roads will have impacts on sport hunting and fishing. 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 adjusted 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 Panel 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 inform the workers of the regulations and procedures to be followed in the area.

In addition, the Panel thinks it would be worthwhile for the proponent to conduct a satisfaction survey among the tallymen from the Weh-Sees Indohoun Corporation's area of activity regarding the results of the control work performed. The proponent could also, where appropriate, suggest ways to mitigate the disadvantages identified by the tallymen.

6.4.4.2 Development of recreation and tourism activities

Current conditions

Over the past 20 years, increased access to the region, mainly attributable to the Route de la Baie-James, the Route du Nord and the Transtaïga Highway and to the various access roads leading to the Cree villages, has significantly increased the extent to which the region is used and contributed to the development of recreation and tourism activities. Since the Route de la Baie-James 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, an increase of 40% (EI1.4, pp. 18-31). In addition, from January 1 to September 30, 2003, 85,259 people used the Route de la Baie-James, 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, pp. 8-6 and 8-7).

In its impact assessment, the proponent presents tourism data from the extended study area corresponding to the *MBJ* region. According to the information provided, the main services offered to tourists are related to sport hunting and fishing, visits to hydroelectric power facilities, culture and heritage, snowmobile activities, recreational boating, bed-and-breakfasts and hotels, campgrounds with services, rest stops and wilderness campgrounds (Table 1). Food and lodging services are concentrated in the towns in the southern portion of the *MBJ* region (Chibougamau, Lebel-sur-Quévillon and 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 Route de la Baie-James, the most popular summer tourism activities are sport fishing, visits to the La Grande Complex and discovering the scenery (ES1, pp. 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, pp. 8-18 and 8-19). In fact, James Bay Tourism estimates that hydroelectric power 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 Transtaïga 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 (EI1.4, pp. 18-33 to 18-35).

A survey by the tourism chair has established that most of those questioned came from the Greater Montréal region and that the average length of their stay was about 6.6 days and 5.4 days in winter (ES1, p. 8-14).

Cree businesses that offer tourism services focus mainly on sport hunting and fishing activities. These businesses also offer a wide range of tourism services in the Cree villages, including art shops and craft boutiques; lodging; transportation; shops and gas stations. There are 15 outfitters on the *MBJ* territory: ten in Chisasibi, two in Mistissini, two in Oujé-Bougoumou and one in Eastmain. There are seven adventure tourism and guided tour businesses, including three in Oujé-Bougoumou and one in each of Mistassini, Eastmain, Wemindji and Waswanipi. They offer snowmobile, snowshoe and cross-country ski trips in the winter and canoe, kayak, hiking and mountain bike excursions in the summer (RP12, Table 307-2, p. 276). The proportion

Table 6-1 **Principal tourism products and services in the James Bay region**

Type of service	Products offered
Sport hunting and fishing	Close to 45 sport hunting and fishing outfitters, including 32 belonging to Cree contractors
Visits to Hydropower facilities	Guided tours, interpretation panels and coach services mainly to the Robert-Bourassa, La Grande-2-A and La Grande-1 generating stations and Radisson substation
Culture, heritage, landscape and crafts	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
Snowmobiling	Snowmobile trails developed, marked and maintained by the Fédération des clubs de motoneigistes du Québec Snowmobile rentals and packages offered by private companies
Recreational boating (canoeing and kayaking)	Canoe and kayak rentals and expedition packages offered by private companies
Bed and breakfasts and hotels	Food and lodging services are concentrated in the towns in the southern portion of the region, including Chibougamau, Lebel-sur-Quévillon and Matagami 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 Société des établissements de plein air du Québec has lodging facilities in the southern part of the Albanel-Mistassini-and-Waconichi-Lakes Wildlife Sanctuary
Campgrounds with services	There are two campgrounds with services at either end of the Route de la Baie-James, i.e. the Camping du Lac Matagami, at KM 37, and the Camping Radisson, at KM 624
Rest stops and wilderness campgrounds	The MBJ has set up over 25 rest stops along the Route de la Baie-James, 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

Source: EI1.4, Tables 18-11, 18-12 and 18-13, pp. 18-34 and 18-36.

of the Cree population that is employed in tourism is 15.8% in Waskaganish and 7.7% in Oujé-Bougoumou. Of the total Cree labour aged between 16 and 64, 4.5% are employed in tourism in the extended study area (RP12, Table 307-1, p. 274). The Crees would like to develop tourism products, such as canoe brigades on the Rupert River and trips to Smokey Hill (RP12, p. 275). Two projects promoting culture and nature tourism are planned, one along the Rupert River near KP 300 and the other at km 221 on the Route du Nord. A third project has been planned to redevelop the existing facilities at km 257 on the Route de la Baie-James (EI1.4, p. 18-34).

Information provided by the proponent 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, that is, south of Matagami and Chibougamau (EI1.4, p. 18-37). The other vacation leases are grouped together in small concentrations near the La Grande Complex, north of Sakami Lake 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 vacation leases north of the 50th parallel in the James Bay region. Given the concentration of the sam-

pling north of the 50th parallel, it was possible to exclude the resort vacationers located near urban centres in the James Bay region and to focus on the project sector. Findings from the 46 questionnaires completed indicate that the primary concern 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 potential impact of the project (ES1, pp. 8-25 and 8-26).

Anticipated impact

Other than the recreational boating and sport hunting and fishing activities mentioned earlier, the proponent's analysis of the anticipated impact during the construction phase shows that tourism 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 owing to the noise, dust and jobsite traffic. The impact can be limited by applying common mitigation measures, such as imposing a speed limit and installing appropriate signs on the highways and access roads.

During the operation phase, flow management of regulated bodies of water is not expected to disrupt existing tourism 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 tourism sites that have until now been inaccessible, in particular for sport fishing.

Following a request by the COTA, the proponent organized a workshop on October 3 and 4, 2005 on the impact of the hydroelectric power development projects on Cree tourism. This workshop demonstrated that tourism development is an important issue for the Cree community and that it is an emerging industry (RP12, p. 279). Several communities proposed an introduction to their traditional activities that goes beyond recreational activities and includes the Cree cultural environment. Lake cisco fishing in Smokey Hill, canoe brigades and the training of young people in traditional activities by tallymen are anticipated to have good tourism potential; however, according to the proponent, these activities are not offered to the general public yet (RP12, p. 280). Some outfitters are worried about the negative image projected by the project on their clients. According to the COTA, both the area's tourism potential and fish, the Crees "main attraction", must be protected (RP12, p. 279). The Crees have asked the proponent for increased cooperation to promote their tourism activities (RP12, p. 279).

During the public hearings in 2006, 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). It reiterated its concerns regarding the chances for success of activities currently existing or under development on the Rupert River. According to the COTA, the promotion of these activities and projects has already been affected by the announcement of the river's diversion. The COTA is requesting that the proponent provide a $1 million equivalent in duration to that of the *Paix des braves* Agreement. The fund would be used to set up a program to mitigate the impact caused by the project in terms of lost or affected opportunities (VAP31, pp. 121 to 127). In addition, the CNACA has emphasized the need to cooperate with the proponent to avoid impacting the development of its arts and crafts products (MC19, p. 5). The Chief of the Waskaganish Nation also fears that the project will kill this emerging industry (Robert Weistche, D6, p. 10).

For the *CREBJ*, the various recreational activities in the Nord-du-Québec region represent direct spinoffs totalling $34 million a year, which means the creation or maintenance of 300 jobs that provide services for 37,000 fishers, 11,800 hunters and 8,300 wildlife observers (VAP16, p. 31; M24, p. 18). These data, from the *Ministère des Ressources naturelles et de la Faune*, indicate that administrative region 10 is also visited by 22,247 outdoor lovers who engage in such activities as camping, hiking, canoeing, kayaking and snowmobiling. In this case, however, spending figures are not available (www.faunenaturechiffres.gouv.qc.ca).

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 tourism 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

organization set an initial objective of attracting over 100,000 tourists by 2009. It hopes to diversify its clientele, which, between 1999 and 2003, was 91% made up of Quebecers (M66.1, pp. 43-44). Two of its priority areas focus on the development of tourism roads, such as the Route de la Baie-James, the Route du Nord and winter adventure or tourism roads for snowmobilers, and on growth-generating projects designed to consolidate the various attraction centres in the *MBJ* region. These attraction centres are Chibougamau/Chapais/ Oujé-Bougoumou, Radisson-Chisasibi, Matagami, Lebel-sur-Quévillon and Val-Paradis/Villebois/ Beaucanton (M66.1, pp. 35 to 40). In its brief submitted at the public hearings, the Association is asking 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 identified partners to create a $1.7 million fund needed to implement its master plan (VAP28, p. 32).

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 hydroelectric power development projects on Cree tourism, the proponent has committed to implementing specific measures designed to take into consideration the public's concerns regarding the project and its impact 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 visits to the region (RP12, p. 280).

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 that impact on tourism activities. The proponent is also committed to working with the COTA during the development of its monitoring 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 intends to participate in updating rest stop interpretation panels with a view to improving the understanding of the hydraulic structures built along the Rupert River and to promote the inventories carried out during the project. The proponent plans to install interpretation panels and navigation charts at the three boat launch ramps built in the diversion bays and set up four boat launch ramps and a lookout on the Rupert River, as well as a lookout at La Sarcelle (DCAP15, p. 70; VAP15, p. 172).

Monitoring program

The proponent has planned a monitoring 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 monitoring will mainly focus on use of the region, road traffic and the types of activities practiced.

Panel analysis

At the public hearings, various stakeholders asked that the development of tourism in the region be considered as an economic alternative to the project (RTP19, p. 97; VAP36, pp. 49-51). According to the CBHSSJB, the creation of a conservation park to preserve the natural character of the Rupert River could be a growth-generating for the Cree and James Bay community. Many participants emphasized the cultural, historical and spiritual importance of the Rupert River and the interest in preserving its natural and wild character. UQCN-Nature Québec is critical of the fact that the economic value of the river's ecosystem was not analysed. As for the Chief of Waskaganish, he feels that the tourism potential of the Rupert River should be assessed before the project is approved (VAP43, p. 17).

Other participants feel that tourism should be considered as value-added for the regional economy, based on the use of natural resources, which include mines, forests and hydroelectric power. Tourism must increasingly be seen as a complementary aspect of hydroelectric power projects so as to diversify the local economy (VAP25, p. 93). Many proposals have been tabled in this regard. Some encourage Hydro-Québec to invest and get involved in improving current tourism products and developing new products that might help increase the number of visitors and tourist spending (VAP28, p. 13). Others feel the project is an asset to industrial and natural tourism, as it would add new attractions (VAP22, p. 100 and VAP15, p. 107). Specific requests have been made in this regard, including the development of boat ramps on the Rupert River for fishers and nature lovers, the construction and maintenance of lookouts to observe caribou or facilitate access to new waterways created by the Rupert River's diversion, the installation in Chibougamau of an interpre-

tation centre showcasing all of Hydro-Québec's hydroelectric facilities in James Bay and the creation of packages that would include a visit to the La Grande Complex and other attractions in the area, such as a safari expedition to photograph caribou on the Route du Nord (VAP15, p. 80 and VAP28, p. 22). Hydro-Québec nevertheless seems to want to limit its involvement to the measures it has already proposed (VAP15, p. 172).

Quebec's tourism policy bases international promotion on four main components: Quebec's cities, the St. Lawrence River, tourism and recreation, and the outdoors. To specialists, James Bay is an excellent outdoors destination and, to some extent, is compatible with the third component (M66.1, p. 15). They agree that the region has remarkable attractions; however, there are major challenges in terms of development given its remoteness, the infrastructure needed to obtain a high-quality product and the high cost of entering the markets.

In the Matagami region, 99.5% of economic spinoffs related to the tourism industry is generated by outfitting. This market, however, is suffering because its clientele is ageing and there is a lack of renewal (VAP, pp. 91-92 and 94). Ecotourism and adventure tourism are in their infancy, and the potential market share seems to be relatively small for these types of activities, including canoeing and kayaking on the Rupert River, mainly owing to the short season when these activities are carried out, distances and transportation costs (VAP28, pp. 25-27). In addition, a major influx of visitors would call into question the very nature of this type of tourism. For the same reasons, the region attracts only a low percentage of non-harvesting wildlife enthusiasts such as photographers, wildlife and landscape observers, campers and forest hikers.

Nevertheless, for James Bay Tourism, there are many products that could attract new customers, such as cultural visits to Cree villages and the observation of caribou herds and migratory birds. These tourism products are currently expanding. In the long winter season with high snowfall rates, national and international customers could be attracted to winter adventuring and tourist roads for snowmobilers which would be set up with themes, markers and signage depending on the experience to be provided (VAP28, pp. 31-32; M66.1, p. 38).

The extended study area also includes managed conservation and protection areas where harvesting regimes vary depending on the applicable provisions of the *Loi sur la conservation du patrimoine naturel, Loi sur les parcs* and JBNQA. First of all, there are two wildlife preserves that are accessible from the Route du Nord: the Assinaca and Albanel-Mistassini-and-Waconichi-Lakes wildlife sanctuaries. Covering 25,285 km^2, these territories are dedicated to conservation, although hunting, fishing and outdoor activities may be practiced. (EI1.4, pp. 17-71 and 17-72). The *MBJ* territory also includes the Albanel-Témiscamie-Otish national park project, which represents the boreal forest and is intended to protect natural, historical and cultural heritage. Nature and outdoor observation activities are planned: hiking, dog sledding, canoeing and kayaking and sport fishing (OED6, pp. 30-33). Furthermore, the Quebec government intends to create five biodiversity preserves in the southwestern portion of the study area: the Missisicabi Plain preserve, the Muskuchii Hills preserve and, in the project section, the Boatswain Bay, Waskaganish and Ministikawatin Peninsula preserves. The purpose of these preserves is to maintain biodiversity and conserve representative and remarkable elements of Quebec's natural heritage. They have already received provisional authorization. Aside from outdoor activities, the tourism products these preserves could offer include non-harvesting wildlife activities, such as the observation of migratory birds and discovery of wetlands (ES1, p. 8-27; RP12, pp. 62 to 70).

Upon review of all the documents submitted so far to the review bodies, a picture of tourism activities in the *MBJ* territory is emerging. There are four main concentrations of tourism activities that are currently existing and that have a promising development potential:

- The La Grande Rivière corridor, focusing on the great outdoors with caribou hunting, Cree cultural and historical tourism in Radisson/Chisasibi and visits to the La Grande Complex;
- The Rupert River corridor, with visits to historical sites in Old Nemaska and rock-painting site at Nemiscau Lake; nature observation at the Smokey Hill, Oatmeal and Gorge rapids; wildlife observation activities at the planned biodiversity preserves of Waskaganish, Boatswain Bay and Ministikawatin Peninsula and the planned Albanel-Témiscamie-Otish national park project; harvesting activities at the Assinica and Albanel-Mistassini-and-Waconichi-Lakes wildlife sanctuaries; recreational navigation on the Rupert River; Rupert trout fishing and cultural tourism in the communities of Waskaganish and Mistissini at both ends of the river;
- The urban centres in the south (Chibougamau/Chapais/Oujé-Bougoumou, Matagami, Lebel-sur-Quévillon and Val-Paradis/Villebois/Beaucanton),

with a varied recreational potential including tourism, hunting, fishing, snowmobiling, and cultural and sports tourism (amateur tournaments);

- Tourist networks that link these centres, including the Transtaïga Highway, the Route de la Baie-James, the Route du Nord and their rest areas, wilderness camping, lookouts and boat ramps for landscape observation, and seasonal recreation, such as hunting, fishing, canoeing, kayaking, swimming and camping, as well as winter tourist roads between the urban centres and regions for snowmobilers.

To ensure that the project does not adversely affect tourism development in the region, the Panel has approached two experts for their advice. Their mandate included the assessment of three aspects: anticipated impact of the project on tourism development of the Rupert River, the realistic nature of development proposals for the Nord-du-Québec region and tourism as a long-term alternative to the project under study. Both experts agree and emphasize the existence of specific elements or real assets that could be consolidated or developed, such as nature tourism with caribou herds, cultural or Native tourism including arts and crafts products, the cultural frontier experience, and sport fishing for Rupert giant trout.

Both analyses confirm that there is a desire to diversify the natural resource extraction economy with the tourism industry, with all the major challenges involved with respect to the development of infrastructures and access services, investments in lodging to guarantee a high-quality product and the high cost of advertising to conquer foreign markets. The positive aspect of increasing access to the territory owing to the development of natural resources has been confirmed, as well as the absence of impact on most existing outfitters, which are located outside the immediate area of the project. However, both experts brought up the difficulty of getting local populations interested in investing in this service industry and the different, sometimes even opposed, visions of local tourism development organizations. The cost-effectiveness of the tourism potential, particularly in the immediate vicinity of the project, was raised, since tourism jobs are precarious and often seasonal and this sector is the first to be affected by an economic slowdown. Nevertheless, the analyses do differ greatly in some respects when the issue of tourism being an alternative to the project is raised.

According to the first study (C25, pp. 1-4), tourism should be viewed to complement the use of the region's natural resources, and these two economic industries should learn to co-exist together. Although the Rupert River has beautiful lookout points, it is only a stopover. It is neither a destination nor an attraction. Offering a product to lake rather than river kayakers should be assessed. Financially, it is obvious that this sector cannot substitute for hydroelectric power generation. However, the development of a local residential policy for Hydro-Québec employees and contractors would support the local economy, and this population would need to be provided with recreational activities.

According to the second study (OED14, pp. 3 and 5-10), the project could adversely affect development opportunities in the immediate vicinity of the project, since tourists come to see a tumultuous river, not a series of lakes. Since some canoe and kayak enthusiasts have already indicated they would avoid the area because of the diversion of the Rupert River, the biggest challenge is to challenge negative perceptions and avoid limiting the diversification of products to be offered. In addition, while it is true that the La Grande Complex attracts many visitors, there are no indications that the same would be true of the Eastmain-1/Eastmain-1-A complex. Furthermore, the proponent leaves marginal room for canoe descents on the Rupert River, a tourism activity it looks at from a navigation perspective, proposing that new conditions need to be monitored and expressing the need to adjust portages. The study challenges the effectiveness of measures to be taken once the diversion is carried out. It also emphasizes that outfitting and sport fishing are the basic products offered by the Crees. On the other hand, the area already has other known attractions, including its landscapes, unique culture and canoe and kayak trips. The Albanel-Témiscamie-Otish national park project would also be an important asset to tourism development of the Rupert River. It would therefore be worthwhile to diversify these products and acknowledge the growing demand for Aboriginal tourism, arts and crafts, outdoor activities and winter tourism. This would crate a potential for the long-term development of careers in tourism in this area, which may be called into question if the projects goes ahead.

Conclusion

The Panel believes that tourism in the James Bay area will survive in spite of the project, since there are many attractions in the area outside the section that will be directly affected. The Panel is of the opinion that

tourism will make a significant contribution to the local economy, provided the various organizations and stakeholders work together. With respect to the COTA's interest in working with the proponent to promote the tourism activities offered by Cree businesses in the James Bay region, the Panel believes that the proponent should develop, in cooperation with this association, various promotional strategies to attract tourists who visit the facilities each year. The Panel 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 existing leases are already located, it is difficult for the Panel to comment on the impact of the project with respect to a possible increase in vacation lease applications. Furthermore, according to the *Paix des braves* Agreement (R5, Article 3.13.2), 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 plans are approved.

The Panel wonders about the success of a local emerging and expanding tourist industry following the project. For example, a visit to the Eastmain complex will definitely not be as appealing as a tour of the La Grande Complex, with its "giant staircase" and the largest underground generator in the world. While noting the current limited number of visitors, the Panel has doubts as to the interest that lake kayaking might generate, as there are destinations close to major urban centres. Although sport fishing will hardly be affected, expansion attempts in the section downstream from the Rupert dam will be in direct competition with the survival of subsistence fishing.

The Panel recognizes the diversity of tourism products in the Rupert River corridor and the possibility that specific upscale products could be promoted. However, there are too many unknowns to determine their success. Most activities are outside the area that is directly affected by the project, except for those related to the Rupert River. Waskaganish is the Cree community with the highest percentage of jobs related to tourism, but it is impossible to determine how much damage the project would cause to the reputation of current products. It is also impossible to evaluate the economic value of products that are being expanded or developed and their success in terms of job creation, since, in the analysis, there was a lack of in-depth knowledge of competing products and the needs and expectations of prospective consumers. In addition, there is a risk that the project will have a negative impact on current assets and that expansion opportunities in the project area will have to be rethought.

There are two types of developments that can be considered. On the one hand, there is tourism related to sport hunting and fishing combined with visits to the La Grande Complex. These activities are barely affected by the project. In financial terms, it is clear that, in the short and medium term, hydroelectric power will be more advantageous, and the Panel agrees with the conclusion that tourism cannot replace the project from an economic perspective, but, rather, it would complement it. The Crees would be responsible for exploiting this complementarity to the maximum. On the other hand, there is the possibility of gambling on an emerging, expanding sector, i.e. tourism of the great outdoors and cultural tourism in the Rupert River corridor. However, this development would require feasibility studies that are more in depth.

6.5 Archaeology, burial sites and heritage

6.5.1 Preservation of archaeological sites

The archaeological process in Quebec 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 with archaeological potential on the site. This involves the visual inspection of all the areas with archaeological potential, as well as the carrying out of underground soundings. All archaeological remains are noted, enabling the archaeologist to identify the areas in which

digs are to be conducted so as to delimit the archaeological sites and appraise their components. The last stage involves data interpretation, in which findings are evaluated and knowledge acquired is summarized, with the ultimate goal of stressing the importance of the past and taking a fresh look at human evolution.

Proponent's studies

Given the limited amount of archaeological research previously carried out in the region, the proponent carried out several archaeological projects. The proponent first identified close to 1,250 potential areas in the project's study area (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; and the corridors of the Muskeg-Eastmain-1 Road and 315 kV transmission line of the Sarcelle-Eastmain-1 facility. The assessment of the implementation sites 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 with archaeological potential will be directly affected by the construction of facilities and permanent roads, clearing, the use of borrow pits, material deposit sites, erosion, flooding and hydraulic management of the waterways (RP13, p. 28).

To obtain the as much information as possible on the sites that will be destroyed, the proponent has implemented an inventory and archaeological dig program. Between 2002 and 2005, the proponent conducted an inventory of 330 areas with archaeological potential. The proponent also carried out eight digs, two of which have not been completed yet: the EjFt-03 and EjFt-01 sites (PA81, pp. 215 and 251). The proponent's consultants recommended that digs be carried out as a priority on roughly 30 other archaeological sites that were discovered when inventories were taken. An inventory of approximately 210 other areas is expected to be carried out in 2006, and the proponent intends to complete the inventory of all areas 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 according to the judgment of the archaeologists. The completed inventories were carried out in cooperation with the Cree communities involved, and traditional knowledge was integrated into the archaeological studies.

The archaeological program also allowed for the discovery in 2004 of the EjFt-03 site (see Figure 6-1), a major site in terms of both its size (1,600 m2) and artifactual density, since there are artefacts and structures from prehistoric (prior to 1534), historic (1535-1900), modern (1900-1950) and contemporary (1950 to now) times spanning over 2000 years. It is located at a low point barring the Kamistikawesich River (Mistikawesich), nearly 400 m north of where this river meets the Rupert River (PAP80, p. 55; PAP81, p. 227). Its function is related to sturgeon fishing activities and waterfowl hunting. An intersection halfway between Nemiscau Lake and Lake Mistassini, the site saw a great deal of traffic by historic and prehistoric populations. Digs of many areas are to be completed (PA81, p. 501). According to the proponent, the chronology of occupation of this site could serve as a reference for the interpretation of other inventoried sites (RP13, p. 30). Areas that were densely occupied in the past were also located on the Lemare, Rupert and Nemiscau rivers.

Impact analysis

The work related to the construction of the facilities as well as the diversion bay impoundment will result in the disappearance of some archaeological sites. The proponent must complete the inventory of areas with archaeological potential affected by the project and then carry out the archaeological digs on the identified sites before the construction work begins. In the operation period, 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. According to the proponent, the flooding of banks due to the implementation of hydraulic structures on the Rupert River is not expected to have an impact on the archaeological sites of the reduced-flow section. The proponent stated that the Eastmain-1 Reservoir section is covered by the inventory and digs program of the Eastmain-1 development project and that erosion would be slight (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 project and that a visual inspection of potential 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 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 impacted by the work involved in installing the blankets. The proponent therefore recommends that the digs be conducted on the site before beginning any work (RP13, p. 170).

The Boumhounan Agreement provides for the creation of an Archaeological and Burial Sites Fund. The $2.5 million fund will be managed by the Niskamoon Corporation. It will primarily be used to finance various archaeological research projects, including inventories and archaeological digs, as well as related studies used to analyse 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 approval 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.

At 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 the next. 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 Quebec. However, with respect to the preservation of the remains, agreements can be made with the Ministère regarding lending and conservation terms.

Conclusion

To gain a general understanding of human occupation of the area affected by the project and to preserve some elements of the past, the Panel feels it is essential that proponent complete the proposed inventory and digs program before facilities are built or, at the very least, before impoundment of the diversion bays. The same should apply to digs that may be recommended following the 2006 and 2007 inventories. Although recognized as an archaeological site, Smokey Hill is not included in the proponent's inventory program because no work is planned on its banks. It would nevertheless be interesting to look into its occupation history, since this site risks losing its function as a fishing site, its landscape value and possibly its traditional attractiveness if the project is carried out.

The archaeological program and its findings are major works for the Cree. They must be valued by the proponent with respect to the Cree and the Quebec community. The proponent is expected to provide reports of archaeological inventories and digs and to actively participate in the preservation of artefacts that are discovered.

The Panel 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. This program could be a springboard to a new start for the Aanischaaukamikw Cree Cultural Institute, whose mandate is to ensure that Cree traditions, knowledge and values are transmitted from one generation to the next.

6.5.2 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 12 in the diversion bays section, 22 along the Rupert River and one close to the access road to the facility at KP 290 on the Lemare River. The most ancient dates back 250 years, and the most recent to less than 30 years (EI1.4, p. 20-10).

Impact analysis

Among the burial sites discovered so far, eleven are in the diversion bays, two are located near the access road leading to the weir at KP 290 on the Rupert River and another is located near the weir at KP 33. They will all be affected during the construction period (EI1.4, p. 20-13). 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, coordinated and carried out by the Niskamoon Corporation and must comply with the provisions of the Nadoshtin Agreement, signed as part of the Eastmain-1 hydroelectric power development project. This fund will support 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 be taken 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 (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 Crees expressed their sadness at the public hearings. Owing to modifications to the area, some cultural sites will be transformed. These sites bear witness to events from Cree mythology and aspects of human history. They are valued by the Cree. The Panel feels that the proponent, in cooperation with the Cree, should develop a cultural and immaterial heritage file, which would involve photographing these sites and accompanying the pictures with accounts told by Cree historians. In each case, appropriate measures would have to be found to commemorate these events either by erecting monuments or helping the Cree School Board to prepare educational documents. Cooperation with the Cree School Board should also include a program to preserve the results of archaeological surveys carried out by the proponent for Cree and Quebec elementary and secondary schools.

Conclusion

The Boumhounan Archaeological and Burial Sites Fund provides for the implementation of measures for the disposal of sites affected by the project and to agree on action to be taken with the families. In spite of these measures, the Panel considers that loss of territory and burial sites should be recognized through the geographical designation of facilities using the names of Cree families that are directly affected by the project. In addition, a procedure was established for the impoundment of the Eastmain-1 Reservoir, which Hydro-Québec intends to follow for Eastmain-1-A. However, since some Crees have complained about the lack of information concerning this latest flooding of territory, methods of communication should be improved.

6.5.3 Preservation of heritage elements

Close to 140 sites valued by the Crees were inventoried 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. Four heritage sites received the proponent's attention: Old Nemaska; the Nemiscau Lake rock-painting site; the former Hudson Bay Company trading post in Waskaganish, or Rupert House; and Noodamessehanan, or Smokey Hill.

Smokey Hill is very important to the Cree of Waskaganish, as they traditionally use the site as a community meeting point. Located at KP 24, on the north shore of the Rupert River and along spectacular rapids, it is an important site for dip-net fishing of lake cisco. Community members go there in large numbers during the cisco spawning period, from late August to late September. There is also a cultural camp with facilities that are used to initiate young people to the traditional way of life.

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, when a trading post was established by the French in 1695. In 1672, Father Albanel came, marking the beginning of a friendly relationship between the Crees and French. This site, valued for its historic and cultural aspects, is the former site of the community of Nemaska, which was moved to Champion Lake. It is now used as a community gathering place in the summer.

The rock-painting site (EiGf-2) at Lake Nemiscau will not be affected by the project. The site, which is called Kaapehpeshapischinikanuuch in Cree, is the only known site of its kind in Cree territory and the northernmost Algonquian rock-painting site in Quebec. It is also the second most important site of its kind in the province owing to its size and graphical content, which includes some 100 red ochre images painted with fingers (EI1.4, p. 20-11).

In 1668, a trading post was set up by Radisson and Desgroseillers at the site of the village of Waskaganish, at the mouth of the Rupert River. Since their expedition was remarkable in terms of the fur they traded, the Hudson's Bay Company was founded in 1670, which was the beginning of this trading activity and European settlement in northern Quebec. Today, only a few remains in the village serve as historical reminders of that time (EI1.4, p. 20-12).

To these four sites of interest, the proponent has added the Rupert River as one of the most important components of the major Saguenay-Lake Mistassini-James Bay networks which link the St. Lawrence basin to the James Bay basin (EI1.4, p. 20-12). In fact, the Rupert River, one of the waterways used most by explorers and for the transportation of commercial goods, specifically for fur trading, is a historical navigation channel. The GCC and CRA consider the river to be very important. They have been using it for generations and is a major element of their culture and lifestyle (EI1.4, p. 20-12). It is also recognized by the *Fédération québécoise du canot*

et du kayak as a remarkable river (EI1.4, p. 18-53). It has over 110 rapids, some of which are spectacular, including the Gorge rapids (KP 309) at the rest area located at km 238 on the Route du Nord, the Oatmeal rapids (KP 108), located at a rest area across from the lodging facilities at km 257 on the Route de la Baie-James, and the Fours, the Cat, the Bear (Kapeshi), Plum Pudding and Smokey Hill, located on a downstream stretch of the river (EI1.4, pp. 18-3 and 18-4).

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, Gorge and Smokey Hill rapids, the proponent will carry out, a follow-up landscape study during the operation phase in order to assess the real impact of flow reduction. This study 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.

Impact analysis

According to the proponent, if the water level of Nemiscau Lake is maintained, Old Nemaska 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, it will be accessible for recreational and traditional activities. The proponent stated that the historic stretch of the Rupert River will be modified by the transformation of the stretch between Mesgouez Lake and Rupert dam into a lacustrine area and by the lowering of the water level downstream from the dam. However, the proponent considers that the Rupert River will continue to be accessible and have historical significance. Since the impact of this project on the heritage element is irreversible and permanent, the proponents believes it is moderate (EI1.4, p. 20-15).

According to the Ministère de la Culture et des Communications du Québec, the project's study area does not include any heritage sites classified or recognized in accordance with provincial or federal legislation. However, it does include some heritage sites such as Old Nemaska; the Native rock-painting site of Nemiscau Lake and the former Hudson Bay Company trading post in Waskaganish, or Rupert House; Smokey Hill and the Rupert River. According to the provincial department, these last two sites will be affected. It believes it is vital that these two historical sites be protected and has expressed its desire to be involved in the establishment of mitigation measures needed to preserve their heritage value (AV7, p. 2).

There are others sites (Figure 6-2) that are culturally important to the Cree along the Rupert River. These include Asinii Kabasiganot, on the big island in the middle of the Oatmeal Rapids (KP 108); Mendiwdawkoask, near KP 253 and 255, on the north shore of the river; and the sites on both sides of the river downstream from the big rapids at Chenaamii, east of Nemiscau Lake and between KP 215 and 218. At KP 218, two prehistoric sites with a contemporary component have been identified: EiGd-02 and EiGd-01. Archaeological activities at the first site date back to 1973 and 1987-1988. For the second site, inventoried in 2005, the proponent recommends an archaeological dig, as it is threatened by the construction of a weir (PA81, pp. 81 and 501). These three sections will be affected by drops in the water level, since they are located downstream from weirs planned on the Rupert River (KP 110.3 and 218) or in an area not affected by the facilities (KP 253 and 255).

Given their great attachment to the Rupert River, many Crees said at the public hearings that they felt great sadness and dismay as well as deep pain and a sense of loss when they considered the impacts of the project on the river. Residents of Waskaganish mentioned that they were worried that the project would permanently destroy several fishing sites, including the Smokey Hill site, considered by the Crees to be a very important traditional fishing site from both a historic and cultural perspective. The hearings also revealed how the river is part of a way of life on not only for subsistence activities, but also recreational activities, such as swimming and picnics on the shore. It is also a site where the Crees go to recharge.

The environmental organization *Révérence Rupert* was specifically established 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 Quebec's heritage (VAP15, p. 143). Other participants at the hearings expressed the opinion that a park should be created to protect the entire Rupert River. The Chief of Waskaganish spoke about the protection status of a heritage river that could be granted by the federal government or a protection mechanism that would recognize the historical national importance of the Rupert River, such as registration on UNESCO's world heritage list (VAP43, pp. 16-17).

Conclusion

Subject to the proposed improvements in this section, the Panel believes that the proponent's analysis, actions and commitments with respect to the archaeological and burial sites are acceptable.

Given the uncertainties surrounding the real impact of the project with respect to fishing activities at Smokey Hill, the Panel is unable to come to a definitive conclusion regarding conditions that will prevail. The monitoring program and measures taken following the initial findings of the program are therefore of vital importance. During the construction on the Rupert River and the development of Smokey Hill, the proponent must help the Waskaganish community use alternate sites, such as Apitawasha, north of Pointe du peuplier where cisco is fished; Nuskanish at Lemoine Island, where there is a resource centre; and the valued fishing site of Kachikachak, on the Nottaway River. However, there is a possibility that the Smokey Hill site will have to be relocated elsewhere. Should this site have to be abandoned, the Panel feels that the proponent, in collaboration with the Cree, should redevelop alternate sites used during the construction.

The Panel has doubts as to the usefulness of the landscape monitoring study aimed at assessing the impact of reduced flow on the Gorge Rapids and determining potential mitigation measures to maintain the landscape and preserve the tourism aspect of these rapids. This proposal is interesting in principle. However, the Gorge Rapids are located at KP 309 of the Rupert River and, therefore, in an area where the residual flow of the river will average 28% of its actual flow. The Panel believes that it will be difficult to maintain the turbulence of the backwaters that are there now. Attempting to channel the flow into a main artery, as proposed by the proponent, would take away the wild character of the area.

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 Economic aspects in the region

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-Aboriginal population calls the area the James Bay region. These two groups have different economic development profiles and have expressed distinct aspirations for their future development.

Eeyou Istchee

Cree society has evolved very rapidly in the last 30 years owing to the declining importance of the traditional economy and the establishment of a mixed economy, for the most attributable to the acceleration effect of major hydroelectric power projects in the area. During this period, when the communities were modernized, the labour force grew by 307% from 1976 to 2001, compared with 34% for Quebec as a whole. In actual figures, the population mushroomed from 4,758 people in 1971 to 13,768 in 2003 (RP13, p. 38). Today, the vast majority of the population (60%) is under the age of 25 (M46).

Most of the communities of Eeyou Istchee have experienced major economic development since 1975. According to the 2001 Census, the average income of Cree households was slightly higher than that of other Quebec households. However, these figures are subject to interpretation, as Cree households comprise twice as many people as the average and occasionally more than one family is obliged to share the same dwelling. This situation is attributable to a housing shortage.

During this growth 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. As a result, income from waged-based employment has largely exceeded that derived from hunting, fishing and trapping activities. The percentage of Crees enrolled in the ISP, relative to the population in general, fell from 21% to 16% from 2000 to 2005, a significant decline from 39% in 1985 (DAP14). At the hearings, Dr. Ted Moses, former Grand Chief of the Crees, noted that 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 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 have a high unemployment rate of almost 25%; the rate is double for the 15-to-24 age group. In addition, the body mentioned that employment is a central issue in Cree communities, as the number of people who enter the labour market increases 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 from 1970 to 2001, the rate of graduation, particularly from university, is one third of that of Quebec 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 hydroelectric power 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* Agreement, the Crees hoped to take charge of their development and become more involved in the economic development activities in the territory governed by the JBNQA. According to Dr. Ted Moses, the Crees then decided to take on the challenge of development (M62).

According to their testimonials at the hearings, 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 and GCC note the crucial importance of the large hydroelectric power development projects such as Eastmain-1 and Eastmain-1-A for the Crees, in a context of partnership and controlled development.

The Crees 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-Aboriginal 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 which fosters such opportunities. The popularity of this program and the Eastmain-1 project increase hiring opportunities for the Crees in the region. The Crees also want to increase their involvement in private companies at both the local and regional levels, but the venture capital needed for such opportunities and joint enterprises are still unavailable or difficult to access.

The Eastmain-1 experience

The Nadoshtin Agreement is intended to ensure protection of the rights of Crees and to guarantee them concrete spinoffs from the implementation of the Eastmain-1 project. According to the Cree managers of this agreement, nearly $380 million in contracts has been granted to over 20 Cree businesses since the start of the project in April 2002, and about 1,000 Crees were hired to work on its implementation. These results exceed the initial objective of $300 million in contracts, and jobs represent a minimum of $42 million in salaries.

The CRA made the following observations regarding hiring as part of this project (DAP6):

- A large number of Crees were hired;
- A large number of them 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 budget provided in the Nadoshtin Agreement for the training of Cree workers was used.

In the CRA's view, special attention should be paid to training in all future development. It also noted that the Cree Human Ressource Development Agency has invested nearly $2 million from other sources to train workers for the Eastmain-1 project (OED19). The CRA is dismayed that Canada ended the Territorial Program managed by the Cree Human Ressource Development Agency without prior notice.

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 that will enable them apply for other jobs.

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 resources. 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 forest sector was also hampered by a number of external factors and continues to deal with major structural changes. 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 Quebec as a whole). This apparent contradiction may be partly explained by the exodus of workers looking for stable jobs in other regions of Quebec and Canada.

The average *MBJ* household income in 2001 was $54,110, nearly $5,000 more than the Quebec average. The education rate is comparable to the rest of Quebec. 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 ranked in second to last place in Quebec in 2004 (R11, p. 94).

Development according to the Jamesians

The hydroelectric power sector dominates the economy of this region, which produces 50% of Quebec's electricity. However, it has been recognized that the viability of the James Bay Region depends on the harmonious development of all the resources in the territory.

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 James Bay (M24.2).

Jamesians and Eastmain-1

During the implementation of the Eastmain-1 project, Hydro-Québec Production implemented a series of measures intended to maximize regional economic spinoffs, including:

- 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 *Commission de la construction du Québec* (*CCQ*) does not manage a pool of workers specific to this region;
- Regional businesses have a limited capacity to respond to calls for tenders for projects of this scope;
- The pool of qualified labour is insufficient for the region to fully benefit from this type of development.

Comments expressed at public hearings

The Cree authorities told the review bodies that, in spite of their feelings of sadness and sacrifice stemming from the transformation of a valued river and flooding of their ancestors' hunting grounds, there is a need for job creation to promote the well-being of their communities, particularly owing to the large influx of youth on the job market following a demographic boom in the last quarter century. At the same time, they criticized the profound changes to their culture, expressed regret at the decrease in traditional activities and said they wanted to be able to reconcile these aspects with the development. Others clearly stated that the development was not worth so many sacrifices, without addressing the economic aspects. More than one participant said they regretted the fact that the project had an negative impact on the development of a local tourism industry on the Rupert River.

Some raised the problem of the temporary nature of jobs in construction and the under-representation of Crees at the proponent's jobsites, whereas others mentioned the need for adequate training programs to allow Crees to eventually hold skilled, permanent jobs in businesses in the territory.

The Crees mentioned the need to be better informed of the proponent's criteria concerning the awarding of contracts and insisted that the proponent favour the tallymen affected by the project. Several people that worked on Hydro-Québec's jobsites raised the problem of access to jobs and integration on the jobsites because of the language of work, the need to obtain competency cards from the *CCQ* and life on the jobsites, which is incompatible with that of the Cree society, mainly owing to a prolonged separation from their families.

At public hearings in Chibougamau and Montréal, many briefs and testimonials were presented in support of the implementation of the project, mainly owing to its significant economic spinoffs. For these stakeholders, it is essential to harness renewable energy to make it an

engine of development and diversification of the regional economy and that of Quebec as a whole.

Maintaining stable and well-paid technical jobs, along with the need to ensure their attractiveness to youth, was also mentioned. The importance of preserving and developing expertise in the field of hydroelectric power was also stressed by business managers, as this is one of the recognized advantages of Quebec, which exports its know-how around the world.

Regional development officials proposed means to maximize regional spinoffs, including:

- The permanent presence of Hydro-Québec decision makers and workers in the region;
- The reduction of the minimum amounts of contracts reserved for the region to enable small businesses to participate;
- The inclusion of preferential clauses in contracts for the region.

Another advantage is the positive impact that the project could have on the increase in the number of tourists that come to visit the dams, because this will contribute to the improvement of infrastructures and roads.

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 Quebec overall. These include direct, indirect and induced 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.

The proponent estimates that the implementation of the project should generate jobs equivalent to over 27,000 person-years during the construction period.

For the Cree communities

The Boumhounan Agreement provides 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 (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 1,052 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. The project includes works over the whole territory, from the Rupert River to La Grande Rivière, which should allow distribution of jobs over a larger number of communities.

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 classroom and on-the-job training;
- Representations with the *CCQ* to facilitate employment for these workers;
- Hiring of a Cree job counsellor.

The Boumhounan Agreement also provides for funds

Table 6-2 **Breakdown of economic spinoffs by region**

Beneficiaries	Value (in million $)	Percent
Nord-du-Québec	211.60	9
• Crees	104.90	4
• Jamesians	106.71	5
Abitibi-Témiscamingue	133.80	6
Saguenay–Lac-Saint-Jean	186.00	8
Other Québec regions	1,822.40	77
Québec as a whole	2,353.80	100

Source: EI1.4.

Table 6-3 Breakdown of person-years by region

Region	Person-years	Percentage
Nord-du-Québec	2,241	8
• Crees	1,052	4
• Jamesians	1,189	4
Abitibi-Témiscamingue	1,389	5
Saguenay–Lac-Saint-Jean	2,209	8
Other Québec regions	21,189	78
Québec as a whole	27,028	100

Source: EI1.4.

Table 6-4 Estimated proportion of Cree jobholders

Year	Cree workers	Proportion of Cree workers	Total number of workers
2005	1	0.8	125
2006	204	16.7	1,224
2007	460	11.9	3,582
2008	805	13.4	5,990
2009	757	14.1	5,361
2010	346	12.6	2,754
2011	28	12.6	223

Source: based on Figure 331-1, RP13, p. 93.

Table 6-5 Funds from the Boumhounan Agreement

Fund	Budget (in million $)
Wildlife Management Plan (Weh-Sees Indohoun Corporation)	0.75
Boumhounan Remedial Works Fund (over 15 years)	32.00
Boumhounan Archaeological and Burial Sites Fund	2.50
Eenou Indohoun Fund	3.90
Training fund (mentioned above)	1.50
Eastmain-1-A/Rupert Mercury Fund	3.00
Total	43.65

Source: EI1.4.

totalling $43.65 million, which will have positive repercussions on economic activity and job creation in Cree communities, both during and after construction (Table 6-5). Some of these funds, including the Boumhounan Remedial Works Fund, should extend over 15 years.

Other spinoffs

At the Sarcelle site, the Boumhounan Agreement offers the Crees the choice between maintaining the existing control structure or participating in the construction and operation of a new hydropower generating station. The Crees have chosen the second option. According to information obtained at the hearings, the conditions of a business partnership for the La Sarcelle powerhouse are still under discussion between 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 land use conditions for hunting, fishing and trapping.

The *Paix des braves* Agreement provides indexing of the annual amount paid by Quebec. 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 8.5 TWh. This increase should improve the indexing factor of the annual amount paid by Quebec 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), provides for 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 must facilitate the integration of wind-generated power Hydro-Québec will purchase, which may open the door to wind-generated power proposed by the Crees.

Lastly, marketable timber recovered during land clearing activities, which will be sent to Nabakatuk Forest Products in Waswanipi at the proponent's expense, represents a major advantage for this Cree business.

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 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

At 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 (RP13, p. 99 to 103). According to current forecasts, the project will create 1,052 person-years for the Cree over five years (Table 6.4). However, the number of jobs should decrease significantly starting in the sixth year of the construction.

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 also mentioned its commitment to allocate $45 million in contracts to Cree businesses during the operating phase of the project, including to maintain roads.

Aside from the above measures, the key to stabilizing economic cycles level is the use Crees will collectively and individually make of cash influx in the local economy during the project implementation phase and, thereafter, during the terms of the agreements stemming from the development. The *Paix des braves* Agreement provides Cree authorities with the financial means to support the long-term development of their communities. It enables the Crees to diversify their areas of activities by encouraging them to become more involved in forestry and mining development.

Lastly, the expertise acquired by Cree businesses and workers working on the project, along with the improvement in the various training programs, should increase their competitiveness and enable them to obtain contracts and jobs in the future and stimulate the development of small local businesses.

Follow-up by the proponent

The proponent plans to monitor the economic spinoffs of the project annually during construction. This follow-up will cover contracts awarded to Cree and Jamesian businesses, the hiring of regional workers, the availability of labour in the communities and the efficiency of the optimization measures in the region. It will also conduct a follow-up during the operating phase of the project.

6.6.3 Analysis

The economic advantages of the project in Quebec and the local community have been demonstrated. Nevertheless, to optimize these benefits for the Cree Nation and Jamesians, the proponent and leaders of these two communities will have to team up to tackle the problems raised in this section of the report.

Flexibility and openness will be needed to facilitate the inclusion and integration of Cree workers on jobsites. Potential solutions include intensive French courses provided immediately in the communities for those who intend to work for the proponent, French courses on CDs that would be distributed to those who want them, the insertion of Cree workers in teams where a certain level of bilingualism is assured, the development of a reference booklet that contains standard site terminology in French and English or the identification of a designated co-worker who can be quickly relied on in case of communication problems.

The availability of qualified labour is a major element that helps a region to benefit from economic spinoffs stemming from development. The Cree School Board and Cree Human Resources Development Agency have an important role to play in preparing workers for the labour market and entrepreneurship. They will have to adjust and diversify training programs in keeping with the forecast demand and develop effective career orientation programs to help young people make wise career decisions. These organizations should double their efforts to disseminate relevant information and increase the promotion of professional training and entrepreneurship programs that are available to the members of their communities. They will have to use their imagination to vigorously tackle the school drop-out problem. They will also have to emphasize the importance of learning French so that the Crees are prepared to enter the Quebec Labour Market. Lastly, they will be responsible for making full use of the various training funds and programs offered by the proponent.

The hiring of a Cree counsellor by the proponent was very effective on the Eastmain-1 site. The distribution of the Eastmain-1-A and Rupert diversion project over a vast area, on which about eight work camps have been planned, could make work difficult for the sole counsellor to be hired by the proponent. The proponent should therefore hire more than one to ensure better guidance for Cree workers.

The issue of competence cards is a major stumbling block to employment for Cree workers. The proponent's commitment to negotiate a solution with the *CCQ*, which does not have a permanent labour pool for the region, should relax the rules owing to the specific situation of Cree society.

In spite of its many efforts, the Panel still has not been able to obtain specific information on the status of discussions between Hydro-Québec and the Crees concerning the agreement on the Sarcelle power station. As a result, the Panel was therefore unable to assess the potential economic impact that might stem from this component of the project. The Panel is of the opinion that a partnership related to this power station could represent an opportunity for the Crees benefit even more from economic spinoffs, if such a partnership can be negotiated. Furthermore, the availability of 893 MW of additional power from the project under study, part of which will be used to incorporate wind energy into the network, could be a negotiation element for the Crees if they decide to invest in wind projects in the future.

Both the Crees and Jamesians feel that tourism is one of the pillars of local economic diversification. Some Cree stakeholders have even suggested that the economic advantages of tourism could exceed those of the

project in the long term. The Panel believes that the cost-effectiveness of such a proposal remains to be determined. It believes, rather, that the construction of 121 km of roads, the gradual improvement of tourism facilities, an improved advertising program on regional attractions and the showcasing of local history and hydropower facilities will promote the expansion of the tourism industry, for the benefit of both communities. With a view to harmonious development, it hopes that the Crees and Jamesians learn to better recognize their mutual interests and cooperate to avoid duplication and agree on complementary and productive investments. Nevertheless, the Panel is of the opinion that the image of a transformed wild river will adversely affect opportunities for the development of a local tourism industry downstream from the Rupert dam that would attract outdoors enthusiasts, canoeists and kayakers and sport anglers.

At the hearings, many businesses and organizations proudly spoke of Quebec expertise in the hydropower sector and its expansion internationally. They nevertheless expressed concerns regarding the risk of seeing this expertise diminish in importance, scope and value if the hiatus between major projects is too long. The project under study will maintain and develop this expertise and should make Quebec firms more competitive in world markets.

Conclusion

The advantages and economic spinoffs of the project for the proponent, the area in question and Quebec as a whole are evident, in spite of the high cost of measures the proponent will need to take to mitigate the anticipated negative impact on the environment and society. In addition to the direct impact and multiplier effect of spending by the proponent during the project's construction phase, revenue anticipated during the operating phase will be a major added value for the Quebec economy.

At the regional level, it will be up to the two communities that share the territory to cooperate and work with the proponent to transform spinoffs into a growth-generating economy in the long term.



7

Safety of Facilities and People

7. SAFETY OF FACILITIES AND PEOPLE

Legal aspects

In Quebec, the *Loi sur la sécurité des barrages* and related regulations are the authority in this regard. The Act provides for the design, construction, repair, surveillance and operation of all structures over 1 m in height intended to divert or retain water in a waterway or reservoir.

Under the Act (R.S.Q., c. S-3.1.01) a proponent cannot undertake a project to build or modify a dam in Quebec without prior authorization. It must submit to the *Centre d'expertise hydrique du Québec* (CEHQ), a body of the *Ministère du Développement durable, de l'Environnement et des Parcs*, plans and specification of the water retaining structures, along with technical reports from hydrological, hydraulics and stability studies. 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, particularly in terms of resistance to floods and earthquakes. 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.

Following analysis of the works in question by the CEHQ, the minister decides whether to approve the project. The Act and Regulations apply throughout Quebec, including in the territory of the JBNQA. For projects located in JBNQA territory south of the 55th parallel, the CEHQ analyses project structures after they have been approved by the provincial administrator.

Sizing of facilities

The project includes implementation of four earthfill 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 m^3/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 m^3/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 m^3/s and has a maximum capacity of 88 m^3/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 394 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 de 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 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 Quebec 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 *Règlement sur la sécurité des barrages*.

Monitoring of facilities

The *Règlement sur la sécurité des barrages* 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, p. 8). 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).

At present, 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 measures

For its existing facilities, Hydro-Québec has established emergency response plans for all possible disaster situations (RP19, p. 8). Equivalent emergency measures 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 begin, 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 analysis and commitment

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 *Règlement sur la sécurité des barrages*. 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 assessment is intended only for emergency planning, and in no way implies that the events will occur or are even feared.

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.

Table 7-1 provides an abridged version of information on checkpoints in the Rupert watershed, some of the camps close by and the villages that will be impacted.

The proponent 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 its 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.

In regard to earthquakes, the existing facilities of the La Grande Complex are located 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, the *SEBJ* and the Crees of Eeyou Istchee, signed in March 2004, notably by the Chisasibi Cree Nation (R13), stipulates obligations to ensure the safety of this community. These obligations include monitoring of hydroelectric power facilities, communication

Table 7-1 **Hypothetical Failure of Rupert Dam (C-1) Maximum Flooded Area and Failure Wavefront Data**

Rupert River Valley				
KP[1]		**Increase in water level (m)**	**Wavefront arrival time (hours)**	**Time to maximum level (hours)**
314	Rupert dam	0.00	0.00	0.00
309.80	Route du Nord/735 kV lines	17.51	0.5	2.6
292.50	Lemare River and first camps	19.59	1.9	11.3
196.20	Entrance to Nemiscau Lake and camps	4.37	15.8	39.3
188.60	Village of Old Nemaska	4.27	16.5	39.9
170.40	Nemiscau River	3.84	17.5	40.4
107.99	Route de la Baie-James and camps	4.17	30.5	55.8
21.35	Gravel Pit and camps	4.32	42.6	63.9
5.00	Waskaganish water intake	2.88	45.4	65.5
0.00	Village of Waskaganish	1.61	46.9	66.0
Overflow Area				
	Entrance to Champion Lake	2.78	21.2	48.2
	Village of Nemaska	2.76	22.8	48.1

1: This table uses kilometre points (KP) for the Rupert River starting in way of the village of Waskaganish in accordance with the convention used for the draft design study.

with the Crees and the creation of a high ground park. Although monitoring of the facilities is required by the *Règlement sur la sécurité des barrages*, the proponent has restated its commitment to the Crees by specifying in the agreement that it would set up monitoring programs at its facilities, dikes, generating stations and retaining structures of the La Grande Complex in order to be able to evaluate their behaviour and stability at all times.

The proponent has also pledged to inform the Crees of the nature, scope 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 Chisasibi community to prepare and update its emergency measures plan. Moreover, 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 water bodies 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.

Analysis

Given the rigorous framework for the application of the Dam Safety Act, maximum levels of safety and overdimensioning are included in the design, construction and monitoring of large dams. Furthermore, the scope of the disaster recovery plans provides assurance that authorities are prepared to take necessary measures in the event of an emergency and that the population will be protected in a satisfactory manner. It would be unrealistic to claim that there are no risks associated with these facilities; however, the Panel considers that the risks in Quebec are clearly defined and well managed.

The dam failure study presented by the proponent shows that, in the worst-case scenario, i.e. a sudden and complete rupture of the Rupert dam, the communities of Nemaska and Waskaganish would have 22 and 46 hours respectively before the arrival of the wave front to react to the situation and implement the evacuation measures set out in the established contingency plan. Assuming that the evacuation plan is well-structured and that the inhabitants of the communities are familiar with it, we believe that the inhabitants will have sufficient time to get to a safe location. However, communication mechanisms will have to be set up to inform the public of what to do in the event of a disaster.

Risk calculations and the ensuing safety measures are based on the worst-case scenario. In our opinion, the possibility of a sudden, cataclysmic event that would result in the immediate and complete rupture of a dam this size is highly unlikely. In reality, an opening in the dam followed by a progressive disintegration of the facility would be a much more plausible possibility following a major natural event or damage resulting from an act of mischief. In this type of situation, it would take longer for the impact of the event to become apparent and, as a result, the authorities and the public would have more time to react to the emergency.

However, the proponent's plans take all these possibilities into consideration, even if there is little likelihood of a major event occurring. Measures to address this possibility, albeit minimal, have been incorporated into the dam design process. As for acts of terrorism, although it is difficult to determine the probability of an event taking place, the proponent has nevertheless

taken this threat seriously and has recently stepped up its monitoring activities.

As concerns the facilities at the La Grande Complex, the diverted waters of the Rupert will drive the turbines as soon as they arrive. There is therefore very little possibility of seeing an increase in the risks that already exist in terms of the safety of these facilities, given that there will be no additional accumulation and that current drawdown levels will be maintained. It should also be remembered that the Rupert dam control structure has an additional security valve in the event of problems at the La Grande Complex.

For all these reasons, the Panel has not found any factors that would lead it to believe that the concerns expressed by participants at public hearings can be justified in objective terms. This having been said, it is clear that these concerns are real and profoundly felt by the Cree community, and it is up to use to attempt to determine the cause.

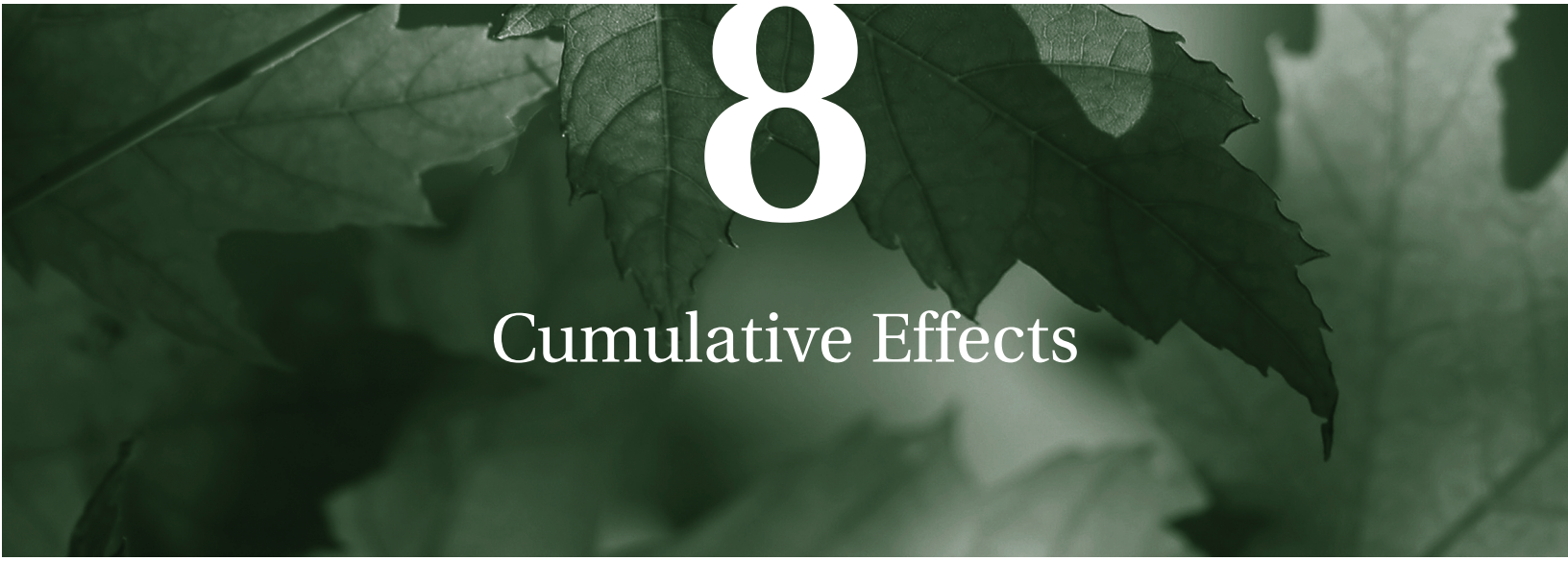
Having been present at the hearings when the proponent's team tried to offer explanations, the Panel believes that a large part of the problem basically comes down to communication. This problem was apparent on a number of occasions during the hearings, when the proponent's team, despite its good intentions and desire to reassure the participants, was unable to bring itself to the audience's level in order get its message across.

The proponent, therefore, needs to review its communication strategy and the way it presents this information to the Cree community. For the proponent, this does not mean changing its methods of reporting and communicating with experts as part of the regulatory process, but rather extracting from this complex technical information observations and conclusions that are useful to the public and putting them into simple and concise terms that are easily understood in order to convey reassuring messages to all those who may have concerns. To this end, the proponent should promote the use of oral and visual communication tools rather than relying solely on written texts, and should make better use of community radio. The proponent should also consider adding one or two Cree members to its inspection teams in order to facilitate the dissemination of relevant information within the communities.

Finally, the Panel believes that Cree community leaders should not count exclusively on the proponent to solve this type of problem, but should take the initiative by providing the proponent with advice on the type of information that would be the most useful in terms of reassuring their peoples, and the most effective communication tools to be put in place. These leaders are responsible for helping the proponent present and disseminate this information in their communities in the interest of their fellow citizens.

Conclusions

- Quebec's dam safety plan includes all of the elements necessary to ensure public trust in the integrity and safety of the structures.
- The requirements of the Regulation in terms of emergency measures plans in the event of a disaster are sufficient to ensure the safety of the public.
- The proponent's claims that the safety of its facilities is of paramount importance and that it intends to fully comply with the requirements of the Act and Regulation are credible and acceptable.
- There is nothing in the objective analysis of the facts that would lead one to believe that the fears expressed by the Cree population regarding the safety of the dams and the contingency plans could be justified.
- The Panel attributes the fact that such a large number of Cree people have serious misgivings about the safety of Hydro-Québec's facilities to a lack of communication, and concludes that an in-depth review of this matter is required.
- The Panel believes that Cree community leaders have an important role to play in defining the type of information the proponent should make available to the public in order to reassure people about safety issues, and that they should help disseminate this information within their communities.



8

Cumulative Effects

8. CUMULATIVE EFFECTS

Section 16(1) of the CEAA states that the environmental assessment of a project must include the project's cumulative impact. In its guidelines for the preparation of the impact assessment, the Evaluating Committee (COMEV), in co-operation with the Canadian Environmental Assessment Agency, states that the proponent must evaluate the project's environmental and social impacts "combined with the effects of other existing works or activities that have been carried out over the past 30 years, or that are reasonably foreseeable over the next decade." (P3, p. 54) To this end, the guidelines include a list of valued ecosystem components (VECs) upon which the assessment is to focus, and the proponent is asked to propose a choice of projects and activities that are drivers of change within the community. The proponent is responsible for setting the temporal boundaries and geographical boundaries to be used in the analysis of the cumulative effects. These limits can vary from one valued component to another. The proponent is also required to describe the mitigation measures that are "technically and economically feasible." determine the significance of the cumulative impacts, and identify compensation measures and assess the effectiveness of these measures and their residual cumulative impacts. As concerns the implementation of measures outside of its areas of responsibility, the proponent is required, in its assessment, to identify these impacts and the parties that have the competence to act, and summarize any discussions that may take place with the parties. The proponent is also asked to consider implementing a follow-up program to "verify the accuracy of the assessment or to dispel the uncertainty concerning the assessment of certain cumulative aspects." (P3, p. 55)

During the impact study compliance analysis, the review bodies questioned the treatment of several subjects, mainly with respect to the factors used by the proponent to justify its choice of VECs and indicators of change. The public hearings brought these aspects to the forefront, particularly the environmental and social consequences of the La Grande Complex or projects added to it, the failings of the project-by-project analysis of cumulative and transborder effects, the consequences of hydroelectric development for the marine environment of James and Hudson bays and the limits of the analysis of cumulative effects.

In this chapter, the Panel compares the current practices and the decisions of the proponent. It examines the underlying reasons for the proponent's decisions to select or exclude data, VECs, indicators or drivers of change and the appropriateness of the temporal and spatial limits set. The Panel also assesses the extent to which these choices have limited the proponent's analysis and influenced the accuracy of its conclusions.

8.1 Proponent's analysis

According to the proponent, the general methodology used was inspired by the Canadian Environmental Assessment Agency's user guide (EI1.6, p. M24-5), published in February 1999. The proponent began with a determination of and rationale for the valued ecosystem components (VECs) and their spatial and temporal boundaries. The description of past, present and future projects, actions and events proposed by the proponent had a significant impact on the VECs selected. Finally, the proponent analyses the selected VECs by describing their historical trends, and determining the cumulative effects for each one, then validating the proposed mitigation and monitoring measures in order to determine whether there would be a residual cumulative impact.

8.1.1 The selection of analysis elements

The components that the proponent had to consider included, but were not limited to, the list of components provided in the directives. In making its final choice, the proponent analyzed each of these components on the basis of four criteria: the value of the component in the eyes of the communities concerned or the scientific community; the possibility of assessing the cumulative effects of 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. According to the proponent, only some of the components required by the directives met all of the criteria:

- The increase in water bodies with high fish mercury levels. The mercury levels in fish were selected for the water bodies modified by the La Grande Complex and the project.
- The quality of life and health of the Crees. Only mercury in terms of consumption recommendations was included in the analysis, since Hydro-Québec is of the view that the project should have no negative effects on the Crees' quality of life.

- Hunting grounds and their use by the Crees. The component was analyzed in terms of loss of accessibility and river segments used by the Crees, intensively or occasionally, for hunting, fishing or trapping.
- Recreational tourist activities, including hunting, fishing and whitewater boating. Hydro Québec is of the view that sport fishing and hunting activities will be largely unaffected and does not have historical data from before 1990. Only recreational canoeing and kayaking were selected.
- Other components were ruled out by the proponent for various reasons (EI1.4, p. 22 4, 2004):
- Wildlife and plant species at risk. The proponent does not have historical baseline data for this.
- 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. The proponent does not have historical baseline data for this. Hydro-Québec is of the view that this would be better addressed by Cree communities and that the Eenou Indohoun Fund was created for this purpose.
- Fish and their habitat, notably the lake sturgeon in the Eastmain and Rupert rivers, as well as the Smokey Hill lake cisco. Historical baseline data are incomplete or missing, since fish habitat changes for the La Grande Complex, Phase I, were not documented. In Phase II, fish were considered in terms of fish communities, not habitats.
- Birds and habitats, notably the harlequin duck and migrating birds. Analysis of cumulative effects is difficult for the migratory species in question because of the vast territory to be covered and because factors outside the study area could mask the true effects. However, Hydro-Québec says that its recent observations indicate that the reservoirs are used by waterfowl.
- Land animals and their habitats, notably woodland caribou. Data are incomplete or missing. Furthermore, large and small animals and lost or changed habitat areas can be determined, but they cannot be linked to decreases in population. Nevertheless, Hydro-Québec confirms that development at La Grande did not have any significant negative effects on the moose, caribou, beaver or hare population levels.

Therefore, the three VECs selected by the proponent for analysis were the following:

- fish mercury levels and consumption recommendations;
- hunting, fishing and trapping by Crees;
- recreational boating (canoe and kayak).

The directives also contained suggestions for projects and past, present and future activities that could have a significant impact on VECs. Hydro-Québec selected some of these elements in accordance with the same criteria used to choose its VECs:

- Development of the La Grande Complex and Eastmain-1 project. These activities were retained for the analysis of changes to the river system resulting from the La Grande Complex project, including Eastmain-1.
- Highway, road and transmission line corridors. The proponent examined the stretches of highway by category and construction period, and transmission lines by line length according to voltage and by construction period.
- Logging and forest fire regime. Logging was examined in a section including other activities affecting the territory and was not selected, because Hydro-Québec believes it is impossible to show the evolution of logged areas over the last 30 years. Give that the *Paix des braves* Agreement provides for an adaptation of the forest regime so as to protect trapping areas and sites of interest to Crees, the proponent chose to examine this element under the heading of "forest fires."
- Prospecting and mining. Mining activities were also assessed under the "other activities" section, and the proponent states that there are no available data for assessing the cumulative effects of the project on the selected VECs.
- Sport and subsistence hunting and fishing. The proponent examined sport hunting and fishing in the "other activities" section, and subsistence fishing and hunting under the conventions and agreements between the Crees and governments.
- Thus, Hydro-Quebec arrived at five categories of actions and activities not limited to the directives' suggestions (EI1.4, p. 22-20 to 22-24):
- changes in the river system, surface areas of the territory and flooded environments, as well as changes in the hydrology of affected rivers;
- development of the road and transmission line networks, in terms of opening up the territory;
- forest fires, in terms of animal and physical resources lost;

- the JBNQA, the *Paix des braves* and other agreements, in terms of the evolution of the Crees' right to develop wildlife resources and of support programs;
- other activities, such as sport hunting and fishing, logging and mining.

Five categories of actions, events and projects were used to assess the cumulative effects on the VEC related to hunting, fishing and trapping by Crees. The proponent selected the first three for recreational boating. As regards the mercury VEC, only changes in the river system, especially the creation of reservoirs for the La Grande Complex, were considered.

The proponent also had to set spatial boundaries. It therefore selected the territory of the *MBJ*, which corresponds to the extended study area of the impact study. For the analysis of the mercury VEC, the Caniapiscau River was added to this area. For recreational boating, the Koksoak and Caniapiscau rivers, part of the La Grande Complex, were also taken into account. As regards the VEC concerning hunting, fishing and trapping by the Crees, the boundaries of the nine trapping grounds from the limited study area were considered. Effects beyond this territory were deemed to be negligible or nil.

As regards temporal boundaries, the proponent went back to 1975, when the La Grande Complex was under construction, except for recreational boating. In that case the proponent selected 1973, the year the *FQCK* published its first guide. For the future, the proponent set the cut-off date at 2015 for hunting, fishing and trapping and for recreational boating. The period for the mercury VEC was set at 30 years, with 2030 as the cut-off year. (EI1.4, p. 22-5).

For the assessment of the cumulative effects of each VEC selected, the proponent identified a series of indicators presented in Table 8-1.

In the case of hunting, fishing and trapping by the Crees, the proponent concluded that the flooding of the rivers and the traplines, which would affect 0.1% of the total project area, compared with 3.8% for La Grande, would not significantly increase the cumulative impact of the La Grande Complex on these activities. The same would be true for the road network, since the new roads would give access to currently accessible lands, and since the construction of the Muskeg–Eastmain-1 road is provided for under the Boumhounan Agreement. The proponent is of the view that traditional activities will still be possible along 80% of the length of rivers assessed and that the project will flood only 1.5% of these rivers. The Crees will have to adapt to new navigation conditions on stretches of the Rupert River not influenced by hydraulic structures, but the instream flow, projected mitigation measures and the Eenou Indohoun Fund of the Boumhounan Agreement will permit and support the practice of hunting, fishing and trapping activities in the project region. Therefore, the proponent is of the opinion that the project will not compromise the pursuit of traditional activities by Crees and that this component does not require mitigation measures or monitoring apart from those already provided for under the project (EI1.4, p. 22-24 to 22-36).

Regarding the fish mercury and consumption recommendations component, Hydro-Québec is of the view that the increase in mercury is more particularly associated with the creation of reservoirs for the La Grande Complex. The cumulative effects attributable to the project must therefore be considered in this historical context, as no other hydroelectric project is planned in the study area for the next 10 years. Mercury levels observed in the bays and reservoirs and downstream from them (in six new water bodies) increased by factors ranging between 3 and 6.2 relative to the natural environment, and have not yet been verified. The cumulative effects for this component are expressed in additional restrictions on fish consumption for adults in general, the duration of these restrictions and the number of areas where these restrictions apply. Thus, in the first summer following the implementation of the Rupert River diversion, the fish consumption recommendations for areas modified by the La Grande Complex, except for the Eastmain-1 reservoir, the Rupert bays and the Nemiscau and Lemare rivers, will generally be the same as those for natural lakes in the region. The project will extend the additional restrictions proposed for the Eastmain-1 reservoir by one year. Additional restrictions will have to be applied to the Rupert bays and the Nemiscau and Lemare rivers, but not in the lower reaches of the Rupert.

Specific recommendations for pregnant women and for children will be determined afterward in consultation with the CBHSSJB. According to the proponent, variations will return to natural levels for all species and environments in 2028. This cumulative effect is mitigated and monitored on the basis of the Mercury Agreement, 2001, which will end in 2031 or when funds allotted for mercury have been exhausted. (EI1.4, p. 22-36 to 22 47).

With regard to recreational boating, out of a total of 34 rivers in the study area, the Rupert diversion will bring the number of rivers affected by hydroelectric

Table 8-1 List of Selection Criteria and Indicators for Each VEC Analyzed by the Proponent

Mercury in Fish and Consumption Guidelines Temporal boundary: 1975 to 2030	
Criteria	Public health is valued by the consumers and government bodies concerned Cumulative effects possible and measurable, sufficient data available
Indicators	Heightened restrictions on fish consumption for adults in general, based on changes in the average mercury level at consumption length [duration] for four species Duration of the heightened restrictions on fish consumption Number of areas where there is a heightened restriction on fish consumption
Cree Hunting, Fishing and Trapping Temporal boundary: 1975 to 2015	
Criteria	Highly valued by the Crees Cumulative effects possible and measurable, sufficient data available
Indicators	Area of traplines available Length of intact rivers Length of modified rivers Length of rivers with reduced or increased flow Changes in support programs Changes in wildlife harvesting rights (types of species and land area reserved)
Recreational Boating Temporal boundary: 1973 to 2015	
Criteria	Valued by people who engage in recreational canoeing and kayaking Cumulative effects possible and measurable, sufficient data available
Indicators	Length of intact canoeing rivers Length of modified canoeing rivers Length of reduced-flow or increased-flow canoeing rivers Length of canoeing rivers deemed not navigable

Source: EI1.4, Table 22-2 and p. 22-24, 22-36 and 22-55.

development from 7 to 8. The developed portion of these eight rivers would rise from 45.6% in 2004 to 57.2% in 2015. The total length of rivers deemed unsuitable for canoeing and kayaking by the *FQCK* would rise from 16% to 18%, including 19 km upstream from the Rupert dam. The percentage of the total length of canoeing rivers still available would remain at 82%, according to the proponent, since the impact study shows that the lower reaches of the Rupert River after its diversion will still be navigable by canoes and kayaks. Hydro Québec, however, acknowledges that paddlers who prefer natural rivers will find rivers affected by hydroelectric development less attractive. Such paddlers would nevertheless be able to find alternative routes elsewhere in the study area. The proponent, through its monitoring, will ensure that that the planned mitigation measures for maintaining conditions favourable to navigation are effective and that the river continues to be used by canoeing and kayaking enthusiasts (EI1.4, p. 22-47 to 22-58).

8.2 Assessment of cumulative effects

In the following sections, the Panel will analyze the assessment of cumulative effects by the proponent and raise the various problems stemming from the choices

the proponent made and from the constraints it imposed on itself.

8.2.1 Data quality

According to the guide (R14), a cumulative effects assessment must determine if the project will have an effect on the selected VECs, if the effect acts cumulatively with the effects of other actions or if the effect of the project, in combination with other past, present or future effects, may cause a significant change, now or in the future, in the selected VECs (R14, p. 10). It is therefore important to be able to accurately describe the baselines and historical backgrounds of these VECs and actions in order to be able to adequately assess the consequences of a project.

8.2.1.1 Availability of data

Several VECs imposed in the directives were ruled out by the proponent because of missing historical baseline data, particularly data for endangered animal and plant species and for fish and land animals and their habitats. The review bodies raised this issue at a technical meeting with the proponent and in the impact study compliance analysis, emphasizing the existence of numerous anthropological studies on the region and the traditional knowledge passed on for generations. Disregarding such information would have the effect of eliminating the results obtained to date by anthropologists who base their studies on verbal or linguistic information. The proponent confirmed that its choice of VECs and analysis indicators relied, among other things, on the availability of quantifiable data from documents that it had already published and can thus be verified by third parties (VRT3, p. 42; RP13, p. 147). Its assessment of cumulative effects thus relies on the availability of measurable quantities from its own data.

The Panel is of the view that this approach is restrictive and limiting. The guide provides for a prudent approach and suggests empirical methods for remedying these shortcomings, such as drawing conservative conclusions, creating a file indicating the reliability of and gaps in data and setting mitigation measures with mechanisms for verifying their effectiveness. The proponent did not have to limit itself to its own published data for its analysis. The inclusion of existing data, including the Crees' traditional knowledge and knowledge of the environment, would certainly have allowed the analysis to be expanded to situations closer to the realities and life experiences of the populations affected. This would not necessarily allow adequate assessment of cumulative effects, but it would have met the requirements set out in the directives.

The proponent's assessment was also limited to data for a spatial area whose boundaries were established by the proponent. For example, Hydro-Québec is of the view that the analysis of cumulative effects is difficult for migratory species, since data for factors outside of the study area are missing. The proponent states that it can quantify the losses of or changes in habitats in the *MBJ*, but their real impact on the population levels of birds may be masked by external factors. Hydro-Québec, however, says that recent observations indicate that the reservoirs are used by waterfowl. The changes observed with respect to migrations of geese, which are being found less on the coast and more on inland reservoirs, were noted by the Crees at the hearings. This highlights the advantages of using traditional data and knowledge of the environment to complement the proponent's studies. The issue of spatial boundaries set by the proponent is dealt with at greater length in a subsequent section.

8.2.1.2 Traditional knowledge

The VEC related to the transfer and usefulness of traditional knowledge of the Crees concerning rivers in the territory, subsequent to the diversion of numerous rivers over the last 30 years, was excluded by the proponent for several reasons: the proponent lacked historical baseline data, the transfer of this knowledge is a Cree responsibility under the Eenou Indohoun Fund, and the lessons from the monitoring of the use of the Eastmain and Opinaca river diversions in the area west of the La Grande Complex, as well as all of the mitigation measures for the project, demonstrate that the transfer of this knowledge would be assured (EI1.4, p. 22-4, 16.52; RP13, p. 149).

The hearings demonstrated that this traditional knowledge and the knowledge that people have of their environment are important for understanding the cumulative effects of river diversions. Middle-aged persons and elders testified about the changes in the diverted or flooded rivers, how these changes affected their lives and how they adapted. As the proponent stated, "If the sites are still being used, knowledge has likely been handed down within these families" (RP13, p. 149). However, the proponent should have assessed the effects of adding the project to the La Grande Complex on the VEC related to the transfer and usefulness of traditional Cree knowledge of rivers in the territory. This would have provided vaster knowledge of the adjustments the Cree communities decided to make following the diversion of several rivers over the last

30 years. The Panel notes this omission in the assessment of the project's cumulative effects, whereas that rest of the impact study was made with the co-operation of the tallymen.

Furthermore, monitoring of the east sector of La Grande was done in co-operation with the Chisasibi, Mistissini and Whapmagoostui nations. The proponent demonstrated an interest in working in close co-operation with the communities affected by hydroelectric development, as this provides an on-the-ground perspective of the effects of prime concern to the communities. Traditional knowledge is no substitute for scientific sampling, but it can act as a useful complement by helping to guide objectives and providing data collection resources.

8.2.2 Premises of the analysis

According to the Practitioners Guide, cumulative effects may occur in different ways, such as nibbling habitat loss, spatial and temporal crowding, growth-inducing potential or physical-chemical transport. In this respect, the identification of major concerns and of VECs does serve to give focus to the important issues of a project and makes the analysis of cumulative effects "manageable and practical" (R14, p. 11). The selection of VECs and analysis indicators is thus vitally important, the ultimate goal being to give decision makers indications of the significance of the effects of the project on the VECs, of the measures to be taken with respect to project approval and of the need for corrective measures.

8.2.2.1 Selection of VECs

The proponent's decision to exclude five VECs imposed by the directives was influenced not only by a lack of data, but also by the premises of its analysis. The five VECs in question are for the biophysical, fish, birds, land animals and habitat components. The social components, meanwhile, are linked to the quality of life and health of the Crees and to recreational tourist activities, including hunting, fishing and white-water boating, of which only recreational boating was selected.

The biophysical components

With regard to fish and their habitat, particularly yellow sturgeon in the Eastmain and Rupert rivers and Smokey Hill lake cisco, the proponent alleged that changes in fish habitat caused by the development of Phase I of the La Grande Complex are undocumented and that the impact studies for the projects under Phase II addressed the "fish" VEC in terms of fish communities, as opposed to fish habitats. The directives required the assessment of the cumulative effects on two distinct aspects: fish and their habitats. It is true that data for conducting an adequate analysis of the cumulative effects on fish habitats (spawning grounds, nursery areas, rearing habitats and feeding areas) were missing or incomplete. Nevertheless, the proponent could have used past and current data at its disposal (composition, abundance and biomass) to conduct a more refined analysis of the cumulative effects in terms of fish communities. The only conclusion the proponent drew in this regard was that the project would have a positive residual effect on the production capacity of fish habitats. This highly general conclusion applies only to the project and not to the cumulative effects relating to fish within the spatial boundaries of this analysis.

As regards birds and their habitat, particularly the harlequin duck and migratory birds, the proponent mentioned that the analysis of the cumulative effects was difficult for all migratory bird species because of the vast territory to be covered. Consideration would have to be given to the effect of actions, events and projects (past, present and future) on the entire ranges of these species, namely the wintering grounds in the south and the breeding grounds in the north. The proponent added that, even though it is possible to quantify the losses of or changes in habitats in the *MBJ*, their true impact on the population levels of birds is likely to be masked by factors outside the study area. It concluded that it is difficult to establish a cause-and-effect relationship with the project, especially since the data needed for a serious analysis are not available. The Panel does not entirely agree with the proponent's interpretation. As mentioned in Section 5.5, the relationship between wasting found in eelgrass beds and the possible associated decreases in the abundance of geese on the northeast coast of James Bay and the operation of the La Grande Complex generating stations has not been determined. Stations located outside the area of influence, from the beginning of the impact study, could have provided valid comparison points and allowed a determination of the impact of hydroelectric development on eelgrass beds, the importance of which as a resource for goose populations is recognized by biologists and Crees alike.

As regards large and small animals, the proponent mentioned that the areas of lost or changed habitat can be determined but cannot be linked to decreases in population. In this connection, the proponent stated that development of the La Grande Complex did not have any significant negative effects on the population

levels of moose, caribou, beavers or hares, because of their ability to adapt to changes in habitat, their mobility and their great resilience. However, this finding only accounts for "relative population levels", in number of individuals per km^2, not the "absolute density" supported by the study territory. Since the environment's carrying capacity has not changed with the development of the La Grande Complex's hydroelectric facilities, the relative density of individuals per unit of surface has remained unchanged in the long term, although in the short term, wildlife was displaced after impoundment of the reservoirs. In this context, the surface areas of flooded wildlife habitats represent net losses, which added up with the successive implementation of reservoirs for the La Grande Complex. Therefore, this represents a quantifiable cumulative effect that the proponent should have assessed in its analysis.

Social components

The exclusion of the VEC related to recreational tourist activities, including hunting, fishing and white-water boating, is examined in greater detail in the section on temporal boundaries. To set aside the VEC related to quality of life, Hydro-Québec followed the Practitioners Guide, which advises to select only components for which a negative impact has been declared (VRT3, p. 41). The proponent estimated that the project's residual effects on the elements selected to determine the quality of life and social cohesion would be positive or nil, as the case may be. It was the same for health, because the proponent considered that only the increase in fish mercury levels is likely to adversely affect the health of the Crees (RP13, p. 151).

The chiefs of the Nemaska, Chisasibi and Waskaganish communities disagree. They consider that Hydro-Québec failed in its task by failing to correctly assess the cumulative effects of the project and neglecting to consider the resulting social consequences (D5, p. 15). It is hard to deny the existence of cumulative effects on the quality of life of the Cree, despite the proposed mitigation measures, and this VEC should have been selected in the analysis. First, the proponent's environmental impact assessment concludes that, for the three communities that are most affected, namely, Mistissini, Nemaska and Waskaganish, the project's residual effects are of average importance (EI1.4, p. 17-20, 17-35 and 17-48). One just has to look at the impact of the Eastmain-1 project had on flooding of traplines to see that four tallymen, one from Mistissini, one from Nemaska and two from Eastmain, will be affected by the Eastmain-1 project and the project under study (OED36). Lastly, for the project's residual effects, changes caused by the La Grande Complex, which, unfortunately, have not yet been qualified, have to be taken into consideration. So, there are cumulative effects, but it is impossible to measure their scope.

As for the Chisasibi community, the term "negligible" used by the proponent for project's residual effects on this community can be called into question (EI1.4, p. 17-68). In this sense, the proponent estimates that the project will not have a negative effect on hunting, fishing and trapping or on the riparian uses of the La Grande Rivière. The greatest impact would be caused by a mitigation measure, that is, stabilization of the banks, respecting which the damage of the work is deemed negligible (EI1.4, p. 17-68). However, the psychological effects on the community of a further project in addition to the impacts already felt as a result of the La Grande Complex are tangible, and manifest themselves in the form of fear of dam failure and prolonged or increased social problems related to hydroelectric development, concerns about safe navigation in the mouth of the La Grande Rivière or anticipated consequences for the natural environment.

The Chisasibi community is alone in facing problems of a regional scope or associated with Hydro-Québec's northern facilities, such as road safety, alcohol consumption in Radisson and excessive gambling. Other problems include the absence of space for urban expansion, access to Fort George Island and the need for jobs. Solutions to these problems will require the co-operation of the community and various Cree entities, such as the School Board, the CBHSSJB, the CCG and the CRA, along with the governments.

In this regard, the Panel considers that solutions should be examined that would contribute to greater harmony in implementing the project, such as the development of improved access between Chisasibi and Fort George, which would allow those who want to resettle on the island to do so. In addition, to enable hunters to plan safer routes, the southern part of the coast should be connected to an adjacent island that they have already identified (OED39). Furthermore, the addition of this territory would give community leaders a chance to build an urban area, which is now limited by the instability of the surrounding soil.

According to the proponent, quality of life also includes social cohesion. To assess the project's impact on quality of life and social cohesion, the proponent

drew on lessons learned from the follow-up on the social impact of the La Grande Complex and selected elements deemed relevant. These elements include hunting, fishing and trapping, income, employment and education, housing, health and social cohesion. The latter element was analysed by looking at income distribution, social problems, mutual assistance and cultural identity from the perspective of sharing the same culture and language (EI1.4, p. 16-137). However, this cultural identity should have also been linked to the symbolic, identity-related and political aspects of the "territory" component (MC8, p. 10). Cultural identity also includes that which underpins this identity, not only in terms of language, but also in terms of heritage, loss of this heritage and loss of control over it. Without casting doubt on the indisputable benefits the various engines of territorial development will create for the quality of life of the Crees, the hearings demonstrated that certain basic elements were missing from the analysis of the cumulative effects of hydroelectric development. These reside in the acceptance or refusal to lose a heritage or dispose of a territory, in the balance of gains and losses and the need to adjust to new ways of meeting needs.

Further to a request for additional information, the proponent submitted data on the history of the Crees' reactions to other hydroelectric projects over the last 30 years, on their adaptation to these new realities and on the effects with regard to social cohesion. The results showed that quality of life is a VEC that should have been included in the analysis of cumulative effects, if only in terms of the adjustments made by tallymen affected by many projects, of the changes in characteristics of the hunting and fishing grounds and of the sense of loss and alienation for the community. A follow-up assessment of the social impact of the western sector of the La Grande Complex, analogous to the one conducted for the eastern sector, is now being discussed with the CRA. The results are expected within three to six years.

As for the results of the assessment of the eastern sector, they indicate the presence of unforeseen or underestimated effects, mostly regarding the need to supply new hunting grounds for the tallymen most affected, the problems of new resource management, safety problems associated with increased access to the region and decreased populations of certain wildlife species, particularly beaver and other fur-bearing animal populations. Given that the data for the western sector is not yet available and because of the above-mentioned arguments, it is hard to conclude that hydroelectric development over the last 30 years has had no cumulative effect, either negative or positive, on the quality of life of the Crees. It would have been interesting to see the scope of it and to determine what effect the addition of this project would have on those effects.

As for health, the proponent selected only fish mercury levels and related consumption recommendations. The hearings revealed that hydroelectric development of the North is perceived as having generated various problems related to the physical, mental and spiritual health of the Cree. Many stakeholders, mainly health organizations, estimate that diabetes, increased drug and alcohol use owing to the presence of construction sites and a growing rate of suicide attempts and suicides are partly due to this development. The reasons given include radical changes to the Cree diet, stress and depression resulting from the loss of their heritage and the loss of control over the development of their heritage. The CBHSSJB's technical report indicates that there are sufficient human and physical resources to deal with the social problems that could result from the project, but it does not provide any objective data on the expected scope. However, this organization suggests that any increase in existing problems would be unacceptable and, in this sense, the project should be rejected to give Cree society time to find solutions.

Was it enough, then, for the proponent to look only at aspects related to the presence of large construction sites? Are the proposed mitigation measures, including barring workers' access to the communities and education and information services, sufficient? A report on past experience in this regard could have been drawn up, not only concerning mitigation measures related to alcohol abuse, but also to increased cultural alienation created by the advent of modernity and the impact it has on the mental health of the Aboriginal population. It would also be important to examine whether the project would help magnify this problem, and what solutions could be found in the context of modernity and the transformation of the traditional economy.

Another health aspect was brought to light at the hearings. This concerns the project's effects on traditional food harvests. The proponent estimates that the construction work and the implementation of the project will not prevent users of the affected sites from continuing to hunt, fish and trap intensively (PSR) or intermittently (EI1.4, p. 16-149 and 16-151). The proponent underlined two important aspects, however:

- Hunting, fishing and trapping are still practised by

the majority of the population, albeit occasionally (EI1.4, p. 16-138);

- In consulting Tables 16-8 and 16-64 (EI1.4), it is obvious that the number of units (e.g. two adults and their children or one individual over 18 years of age) has not fluctuated much since 1976, while the number of persons per unit dropped from 4.1 to 2.1 during the same period, proportionally reducing the number of ISP recipients.

The hearings brought out the importance that Cree communities attach to the possibility of obtaining traditional food. It would be important to assess the effects of the projects over the past 30 years, including the project under study, on access to traditional food supplies, while considering the contribution of new technologies to travel and to hunting, fishing and trapping practices. The result of these changes is manifested in resource management issues, such as hunting from trapping grounds or villages, and redefines subsistence economy versus occasional harvesting activities.

For the Panel, the VEC related to the health of the Crees should therefore have been considered in a broader context, and not only in respect of restrictions on fish consumption.

Thus, for the hunting, fishing and trapping VEC, the quantified availability index is the area of available trapping grounds. The proponent also preferred to use a wildlife resource availability index rather than harvest indices, since it did not have sufficient data for the entire period (RP13, p. 139). There are, however, data from anthropological or other studies that could have been used, such as those on the harvesting of wildlife after the signing of the JBNQA used to establish guaranteed harvest levels. These data are also found in the data of the Cree Trapper's Association, particularly with regard to the harvesting of fur-bearing animals and moose. These data rely on declared harvesting levels, and the inherent uncertainty of this approach should be taken into account.

The proponent concluded that the modification of the river system means that Cree trapping grounds are reduced from 96.3% of the territory to 96.2%, which seems to be a minimal change. However, the Panel is of the view that an analysis using only this parameter does not bring the clarification needed to understand the extent of the effects on hunting grounds. It is not only the percentage of territory lost that counts, but also its quality with respect to hunting, fishing and trapping activities. The damage is more pronounced, for example, if the lands that are lost or become inaccessible or difficult to access include the majority of the useable part of the affected territory, such as riparian environments or highly productive trapping grounds, or if some of these lands are of significant value to the communities. Moreover, this assessment does not take into account demographic pressures on the territory. A qualitative appreciation could shed more light on the overall changes in the use of traditional food resources and of consequences attributable to development.

As for the choice of indicators related to lengths of rivers (Table 8.1), the proponent found that, after construction of the La Grande Complex, including Eastmain-1, the Crees were still able to practice traditional activities along 81% (6,753 km) of the 39 rivers that were studied, including 9 that were developed for hydroelectric power projects. The project's cumulative effects on the four rivers to be developed will reduce this percentage by only 1.5% (EI1.4, p. 22-27 to 22-30 and 22-34 to 22-35).

This assessment does not take into account lengths of rivers that have been or will be abandoned for various reasons, including variations or drops in water levels, potential changes in aquatic habitat productivity, increased portages or time required to reach a territory or camp because of bank exposure or increased travel risks for tallymen and their guests. It would therefore be necessary to compare the lengths of available rivers with lands considered to be of value that are used by tallymen and communities, and to assess the number of people who have been or will be financially affected over time.

The proponent also qualifies these indicators by citing agreements. It believes that the JBNQA, the *Paix des braves* Agreement and other agreements have been drivers of major, positive changes for the territory, which the Panel also recognizes. However, it will be necessary to determine whether the funds provided for in the Boumhounan Agreement are sufficient in practice, for example, and whether those of the Cree Development Corporation are adequate to meet the expectations they create. The proponent pointed out the complexity and problems involved in achieving the JBNQA objectives (EI1.4, p. 22-18). The *Paix des braves* Agreement remedied gaps in the achievement of JBNQA objectives. Moreover, making the Crees partners in mining, forestry and hydroelectric power development in the territory, along with all the resulting benefits, has also resulted in a transfer to them of part of the responsibility for the cumulative impacts generated by these industries.

As for the VEC related to recreational boating, the pro-

ponent studied 34 canoeing rivers and found that the percentage length of the canoeing rivers still available for recreational boating "in a natural or very slightly altered state," including the Rupert River, was 82% (EI1.4, p. 22-55). The length considered unsuitable for recreational boating, including the 19 km upstream from the Rupert dam, would increase from 16% to 18% (EI1.4, p. 23-35). The Panel finds that percentages of kilometres of lost rivers are not an indication of the repercussions on the boating experience on wild rivers, even if the proponent recognizes that it will have an impact, particularly on the Rupert River, and that enthusiasts will have to find replacement routes (EI1.4, p. 22-56). The proponent pointed out that, if it is possible to measure the changes to the river system in terms of navigability, it is more difficult to measure the actual cumulative impacts on the extent of use. However, the Panel believes that the loss of the intrinsic value of flooded or altered rivers for future generations, independent of their current or future frequency of use, must also be looked at. The proponent thinks it necessary to consider the qualities of the rivers or sections of rivers that are lost, altered or remain open to canoeists, and to recognize the historical and cultural loss, as the case may be.

For its analysis, the proponent created in Table 22.24 of the impact study a classification of canoeing rivers in the study area using *FQCK* landscape ratings (EI1.4, p. 22-57). The *FQCK* provides the following definitions for the classification of exceptional, remarkable or pleasant landscapes (R25, p.27):

> Exceptional******: Magnificent scenery, among the most beautiful in Quebec. Unforgettable trips that fascinate and generate respect for nature. They can be found in all types of ecosystems. The quality of the landscape is such that it alone may be the reason why travellers go there.
>
> Remarkable****: Remarkable landscape that usually generates interest and exclamations of awe. Human activities have had very little impact on the natural development of ecosystems and their original appearance. This quality is an asset for travellers choosing a place they would like to visit.
>
> Pleasant***: Pleasant landscape producing a feeling of harmony. Nature in all its simplicity can show traces of human activity (e.g. rural countryside). A landscape of this quality is a secondary consideration for travellers choosing a place they wish to visit.

A river must be classified as exceptional or remarkable in order for travellers to have reason to visit it, regardless of its location in Quebec. Table 8.2 provides additional details of the proponent's analysis. Because of the distances to be travelled to reach Northern Quebec rivers and the presence of many rivers in pleasant landscapes in southern Quebec, the Table only selects from Table 22-24 those *MBJ* rivers that are considered canoeing rivers and are found in landscapes classified as exceptional, remarkable or pleasant/remarkable along their entire lengths or at least along sections thereof.

Table 8.2 indicates that only 29% or 10 of the 34 rivers under study that are not affected by hydroelectric development feature landscapes that are classified as "remarkable" in at least one of their sections. Only eight canoeing rivers in the area under study have landscapes that are classified as "remarkable" over their entire stretch; five of these rivers, namely the À la Marte, Au Castor Est, À l'Eau froide, Au Castor and Rupert (the first four are tributaries) are entirely located in the *MBJ*. With respect to the Rivière au Castor, the *FQCK* indicates that it is of little interest to locals, owing to its low flow and short canoeing season (R25, p. 222). The Rupert River, which is 555.8 km long and is classified as "remarkable" over its entire stretch, is considered by some groups and stakeholders to be a provincial treasure, a pristine river that needs to be preserved.

Another shortcoming noted in the use of length indicators for modified canoeing rivers is the lack of an assessment of the possible loss of tourism potential and the loss of natural heritage. Although 6,471 km (77% of the total length of the 34 rivers) are still suitable for recreational boating, 23% of the total length of the rivers has already been modified (EI1.4, Table 22-6, p. 22–51). According to the proponent, the cumulative length of the 34 canoeing rivers selected for this assessment totals some 8,380 km; 23% of this natural heritage has been modified as follows:

- 834 km of rivers flooded (10% of the total)
- 57 km of rivers with increased flow (less than 1%)
- 1,018 km of rivers with reduced flow (12%).

Some of these changes have had the following consequences on Quebec's natural heritage. For instance:

- Before its diversion, the Eastmain River was one of Quebec's longest rivers. The river also has historical significance in that mica was discovered at its mouth in 1672 and it was marked on Louis Jolliet's map of 1679 (R18, p. 388).
- The La Grande Rivière, which stretched 779 km before the construction of the La Grande Complex,

Table 8-2 Characteristics of Canoeing Rivers in the Area Under Study

River	Landscape Rating[+]	Length[§] (km)	Comments
* Eastmain[++]	***** 1 of 2 sections	568[(1)]	Gorges in the dam section with weir
**Grande rivière de la Baleine	****	375 of 720	Unforgettable tundra and taiga landscapes
À la Marte	****	174.9	Good fishing, wild; tributary of the Rupert
*Rupert[+++]	****	555.8	Beautiful lakes, canyon, spectacular rapids
Swampy Bay	****	310 of 325	Impressive waterfalls; tributary of the Caniapiscau
Témiscamie	****	98.8 of 171	Very wild, begins in Labrador
*Au Castor	****	114	Low flow, magnificent sites
Au Castor Est	****	69 of 105	Tributary of the Rivière au Castor; enchanting sites
À l'Eau froide	****	206	Tributary of the Eastmain; beautiful sites
Caniapiscau[++]	****	310[(2)]	Gorge, waterfalls and canyons
*La Grande Rivière[++]	****	257[(3)]	The unaffected part is the most beautiful section in the region
Koksoak[++]	****	138[(4)]	Average width of 2 km, flows into Ungava Bay
Sakami[++]	****	410[(5)]	Big series of stepped waterfalls
*Broadback	**** 1 of 3 sections	340 of 455	Rich in vegetation; rapids, weirs and spectacular waterfalls
Kitchigama	***/****	181.1	Tributary of the Nottaway
*Nottaway	***/****	246	Majestic; part of a select club of big rivers
Kanaaupscow[++]	***/****	300[(6)]	Very popular with locals, many rapids
Opinaca[++]	***/****	126[(7)]	What is left is lovely; tributary of the Eastmain
*Harricana	***/**** 1 of 2 sections	466.1	Beauty, power of James Bay plateau fractures

Table 8-2 (continued) Characteristics of Canoeing Rivers in the Area Under Study

*: Flows into James Bay. **: Flows into Hudson Bay.
+: Landscape classification by the FQCK over the entire stretch or otherwise specified:
*****: exceptional; ****: outstanding; ***/****: pleasant/outstanding
++: Modified by hydroelectric development. +++: Hydroelectric project.
§: Length of canoeing sections.
(1): 728 km before the diversion to the LG-2 Complex.
(2): Length of 460 km before the head diversion to the La Grande Rivière; outside of the area under study – affected by the La Grande Complex.
(3): Length of 779 km; construction of the La Grande Complex affects the last 522 km.
(4): Reduced flow over its entire course, 70% of residual flow at the mouth; outside of the area under study – affected by the La Grande Complex.
(5): Reduced flow over 147 km, 58% of residual flow at the mouth (EI1.4, p. 22–50 and 22-51).
(6): 399 km before the 112 km impoundment (EI1.4, p. 22–50).
(7): 327 km before the diversion, 12% of residual flow at the mouth (EI1.4, p. 22–50, Table 22.21).

Source: EI1.4, tables 18-14 and 22-24, p. 22–47 and 22–51; FQCK, 2000, p. 216, 214, 192, 198, 238, 201, 222, 232, 223, 240, 224, 182-183, 190, 194, 223, 224, 188.

now has three reservoirs and five hydroelectric power stations along its last 522 km (R18, p. 395).

- The Caniapiscau River was once the longest river in the Ungava basin, at 800 km. Its waterfalls and canyons are no longer as spectacular as they once were, owing to the reduction of its flow. In 1985, the Eaton Canyon was one of 27 sites in Northern Quebec recognized by the former Quebec Department of Recreation, Hunting and Fisheries as one of the most likely areas to be of major interest to the conservation of the natural and cultural heritage of this part of the province (R18, p. 404).
- The Koksoak now has a reduced flow over its entire stretch; it is a major river in that it is 1.5 to 5 times wider than the St. Lawrence River near Quebec City (R18, p. 412).
- With respect to the Rupert River's future, the proponent recognizes that, despite its commitment to monitoring navigation on the river and marking portages, losses resulting from the flooding of sections of white water or rapids will not be compensated by the restoration of similar environments. Although the proponent notes that proposed mitigation measures will make it possible to navigate on all sections of the river that are currently navigable, it admits that the boating experience will no longer be the same and that whitewater enthusiasts will have to resort to other locations; the conditions of this major river will therefore change. Despite instream flow and the construction of hydraulic structures along its course, the river will lose part of what makes it "remarkable" and could eventually be classified as simply "pleasant."

A number of stakeholders deplore the transformation of this major river and feel it is a major blow to Quebec's natural heritage. In the wake of this testimony, the Panel had to reflect on the cumulative impact of the loss of natural heritage and to question, without necessarily coming up with answers, the possibility of imposing limits on the development of rivers, as part of a renewed social debate.

8.2.3 Driving forces of change in the area

Figure 8.1 shows changes that have occurred on the territory over the last 30 years. It is clear that changes to the hydrographic network and the development of the road network and power transmission system have marked the region. Hydro-Québec states that no other projects are planned on the territory for the next 10 years. In this context, the proponent had to assess how the cumulative impact of the Rupert diversion project would compound major changes that have already occurred. A number of public hearing participants criticized the approach adopted by the proponent in this respect, drawing attention to the lack of an overall appreciation of all of these developments or the impacts of projects that were dismissed (e.g. mining and tourism). The proponent's assessment of the impacts of

the driving forces of change drew the Panel's attention, as it raises particular analysis and interpretation issues.

8.2.3.1 The sum of effects

The CBHSSJB expressed its opinion on the cumulative impacts of Northern development on the physical and mental health of Crees; the real impact of Northern development consists in the sum of all of these impacts (VAP23, p. 139). In this respect, the GCC raised the importance of reviewing the project's cumulative impacts, considering the social and environmental consequences of the La Grande Complex that the Crees have had to endure. Although they are aware of some of the elements of the social and environmental impacts, they are not aware of their magnitude. Some stakeholders are concerned about the impacts of future projects that will compound those of the Rupert diversion. However, the proponent feels that there are no residual cumulative impacts on the VEC related to hunting, fishing and trapping by the Crees, only on those related to mercury in fish and recreational boating, which will be mitigated through monitoring measures.

While it may be true that the cumulative impacts of a project are often minimal in terms of the scope of the changes caused by a series of modifications on a territory and various factors (the project under study is a good example of this), to say that the consequences of a new project are trivial is a conclusion that raises doubts for the communities who have had to live with all these changes. The testimony given in Cree communities in this respect, especially in Waskaganish and Chisasibi, was significant. Although the project's effects are minimal in the overall context, communities will feel all of the effects nonetheless.

It should be noted that the Eeyou Istchee community has been subject to an accelerated modernization process brought about by various factors, including the decline in the importance of the fur trade, the development of communities and public institutions that have contributed to local job growth, hydroelectric, mining and forest development, the impact of ISP on tallymen, the growing presence of mass media (e.g. radio, television and Internet) and road construction. The advent of a modern way of life has changed values, lifestyles (e.g. sedentarization) and how land is used. Consequently, when we try to assess the cumulative impacts of a project that involves the flooding of an area equivalent to 0.1% of the area that has already been flooded, we cannot accurately distinguish the effects attributable to the project under study from those caused by the many factors mentioned above.

8.2.3.2 Environmental assessment on a project-by-project basis

At the public hearings, the proponent was criticized for only having assessed the impacts of the project without taking into account the effects other projects have had. The proponent nevertheless considered lessons learned from La Grande, including Eastmain-1, in its proposed mitigation and monitoring measures and in the assessment of the cumulative impacts on mercury in fish and recreational boating. A Federal Court ruling confirmed that the Eastmain-1 project is part of the La Grande Complex and, as a result, there was no need to subject it to the federal environmental assessment process with public consultation (Eastmain Band v. Canada [1993] 1 FC. 501) (F.C.A., p. 13). This suggests that there was a total lack of information on the social impact of this project. On the contrary, the preliminary project assessment prepared by Hydro-Québec summarized the impacts on the human environment; this summary could have been used more effectively in preparing the impact assessment of the project under study (Project Draft Design Study 1991, parts 7 to 10). Furthermore, the review bodies also noted at the hearings that the cumulative impacts of the La Grande Complex, combined with the impacts of the increased flow of the Rupert River, were not taken into account for the Eastmain, Wemindji and Chisasibi communities. For instance, the review bodies feel it would be important to have more information on the impacts of Eastmain-1 with respect to the project's impact on land doubly affected by the flooding and the presence of two major work sites. The review bodies learned about the project's contribution to the growing dangerousness of navigation for Crees in these sectors at the public hearings in Wemindji and Chisasibi and during a visit to Fort George. This subject is discussed below in the section on navigation.

8.2.3.3. The lack of thresholds

Figure 8-1 shows the magnitude of all existing and future projects and infrastructures. With respect to these changes to the hydrographic network, in addition to the development of the road network and energy transmission system, the impact of the project is minimal. But, if we assess the scope of the impact only on a project-by-project basis, the issue of the spatial and temporal boundaries of the development does not arise. The Panel notes that the proponent did not use thresholds in its assessment. At the very least, it could have explained

why it failed to do so.

The Canadian Environmental Assessment Agency Guide describes these thresholds as the "limits beyond which cumulative change becomes a concern" (R14, p. 58). The Guide recognizes that an objective technique for determining acceptable thresholds is not always available and that professional judgment usually has to be used. But, it provides solutions for cases where it would be impossible to establish the level of actual capacity. For example, the proponent can suggest an acceptable threshold in consultation with interested parties, government organizations and technical experts. It can also recognize the lack of thresholds, determine the residual effects and their magnitude and leave it up to the authorities responsible for the environmental assessment to decide whether they have been exceeded.

In this connection, three aspects should be examined. First, it would be important to immediately obtain data to determine to what extent a basin or a water body could bear other changes, prior to the carrying out of new projects, instead of relying on post-project follow-ups to determine the actual impact. This could address the concerns that the Cree expressed at the hearings when they asked about the apparent lack of limits with regard to hydroelectric development taking place on their land.

The second aspect relates to the impact of hydroelectric development on the traditional food resource. This issue was, moreover, raised during the hearings by a number of stakeholders. In this respect, the Panel is of the opinion that it would be important to examine the guaranteed harvest levels for all land covered by an agreement. The data could be presented in such a way as to ensure the confidentiality of harvest levels. The thresholds established in such a manner could justify the development potential or not and the situations when it would be necessary to redefine the territorial limits, with all the resulting consequences.

The third aspect concerns changes to the environment that are already under way, such as warming of the climate. It is important that Hydro-Québec be able to assess the impact of climate change in order to counteract the negative consequences or possibly benefit from it. The Canadian Regional Climate Model provides a window on the expected impact of climate change up to 2050. This model indicates that there will be more precipitation in winter, but that, owing to rising temperatures, there will be less accumulation of snow but more rain. This would result in a lower peak flood, which could come earlier. In the summer, water supplies would be lower owing to the phenomenon of increased evapotranspiration.

However, the proponent believes that the uncertainties of models found in simulations of the impact of climate change are so significant that it would be difficult to incorporate the impacts into Hydro-Québec's current practices in terms of planning, designing and developing its projects. The Panel agrees with this argument. The proponent actually repeated during the public hearings that it is a major partner in the OURANOS Consortium, precisely because it wants to take advantage as soon as possible of climate change forecasts.

8.2.4 Temporal boundaries

The directives stated that the proponent had to assess the "cumulative social and environmental impacts of the Project along with the impacts of other projects and activities that were being carried out, had been completed in the past 30 years or could be reasonably foreseen in the next decade" (P3, p. 47). This means that the proponent must assess its project, taking into consideration conditions that preceded any development, as well as current and future conditions, with or without Project activities included (R14, pp. 17-18). Table 8.1 shows the time limits chosen by the proponent for the VECs that were studied. A 30-year period was established for the past, a period corresponding to the construction of the La Grande Complex. As for the future, the proponent also established a 30-year limit for the mercury-related VEC. This limit would correspond to the time required to come back to the consumption restrictions of the reference conditions for adults in general. For the other two selected VECs, the proponent set a 10-year limit following submission of the impact study because it felt that the speculative nature of the predicted cumulative effects would increase according to the length of the period under consideration (EI1.4, p. 22-25).

The temporal boundaries imposed by the proponent are based on two considerations: the effect on communities of a negative impact extended over time that they expected to come to an end and the importance of studying the Project's cumulative impacts on future development in the region.

8.2.4.1 Effect of extension over time

For the VEC related to mercury in fish and the consumption recommendations, the proponent drew up a clear, realistic profile: "there will be an additional restriction [in terms of duration and waterways] on adult consumption beyond the baseline in five of the six

modified areas," except for the Rupert River immediately downstream from the closure point for the sixth area that was studied (EI1.4, p. 22-44). The issues raised at the hearings forced the proponent to explain the stiffer restrictions for women of child-bearing age and children (PAP64, Tables 1 and 32). With the impact coming to an end in Chisasibi, being extended for one year in Eastmain respecting restrictions already imposed by the Eastmain-1 Project and a factorial increase of between 3 and 5 in Nemaska and Mistissini compared with the baseline, there is a residual cumulative impact. Because the proposed solutions are additional consumption restrictions over a 29-year period and existing funds "to steer food harvesting activities towards fish and game species containing less mercury," the proponent made no statement about the importance of this cumulative impact (EI1.4, pp. 22-46 and 22-47). The hearings highlighted the fact that the Crees have reduced their fish consumption. For the CBHSSJB, the guide to fish consumption restrictions itself causes problems and is not a guarantee that consumption habits will change. The impact of the La Grande Complex has greatly affected the Chisasibi Crees. Given the predicted impacts along the Rupert River, they are fearful of a repeat situation (M3, p. 6-7).

Aware of the burden imposed by another new project in this region and the resulting additional adjustments, the Panel reviewed the science related to this issue and various solutions that could be considered. The Panel believes that, with the use of improved communications tools and access to other food sources, both traditional and modern, this impact can be successfully mitigated. Although the temporal limit on restrictions is set at 30 years, the Project's effects on methyl mercury contamination will come to an end and conditions will return to normal.

8.2.4.2 Future Projects

The analysis of cumulative effects should also include future activities and actions that could have an effect or possibly interact with the effects of the Project under review. These effects would include certain activities as well as reasonably foreseeable activities or effects that may arise, but for which there are continuing uncertainties (R14, p. 20). In that regard, the directives require that projects be reviewed, including "projects that are very likely to be carried out" (P3, p. 48). This section looks at mining activities that were supposed to be assessed in the proponent's analysis of cumulative effects as well as at the Project's possible impacts on the success of recreational and tourism development on the Rupert River.

The proponent reviewed mining activities in terms of their possible impact on changes occurring in the study area. The proponent drew up a table of mining exploration characteristics from 1976 to 2002 and of mining operations starting in 2004. It pointed out three areas with significant development potential in the study area: the area northwest of the Eastmain-1 reservoir, the Eau Claire Project of Eastmain Resources and the *Société québécoise d'exploration minière* (SOQUEM); the Virginia Gold Mines project in the area east of Lamothe Lake in the Rupert forebay; and the Orfée Zone close to the Lemoyne station (EI1.4, p. 19-2 and Table 22-10). The proponent also found that it did not have available data on mining exploration and operations that it could use to assess the Project's cumulative effects on the selected VECs (EI1.4, p. 22-23).

At the public hearings, the Chief of the Eastmain community pointed out the importance of reviewing the relationship between hydroelectric power projects and mining development, particularly with respect to the projects of Eastmain Resources in the Rivière À l'Eau Claire and of Virginia Gold Mines, owner of the Éléonore Mine, recently acquired by GoldCorp, in the northern part of Lake E11 (VAP8, p. 105 to 107). Our analysis of this aspect confirmed that there was a significant potential for long-term activities by these two companies in the two above-mentioned areas. The Panel would have liked the promoter to study the cumulative impacts of these development projects affecting employment and the need for access. It could have discussed the advantages of the Eastmain-1–Muskeg Station highway and the construction of an access road to a new camp on the M18 hunting grounds, the construction of which would constitute an impact mitigation measure for this trapping area. As for the Eau Claire project, the presence of worksites and the impacts on habitats and sturgeon stocks in the Eastmain and À l'Eau Clair rivers should have been required elements in the analysis of the Project's cumulative effects. It is essential that they be included for the Sarcelle powerhouse project.

Another area missing from the proponent's analysis of cumulative effects is tourism. The proponent says it does not have data from before 1990 and believes that sport fishing and hunting will not be affected. The proponent also says that several studies have been carried out on the tourism potential in the James Bay Region, including a study by the former *Direction de l'aménagement de la faune du Nord-du-Québec*, and that the *Plan*

régional de développement du territoire public of the *Ministère des Ressources naturelles et de la Faune* is being prepared (EI1.4, p. 18-32 and 18-33).

The public hearings demonstrated that the major players in the Region, such as Tourisme Baie-James, the COTA, the *CREBJ* and the *MBJ*, have specific tourism development plans for Northern Quebec. On the one hand, these stakeholders highlight the importance of close co operation with the proponent in order to set up a genuine tourism industry in accordance with the wishes of Jamesian communities that could help to promote a diversified economy for the region (M66, p.7). On the other hand, tourism has been suggested as a solution to replace the project or as a source of economic diversification for the Crees (RTP19, p. 97; VAP36, p. 49-51; VAP43, p. 18). The COTA has also pointed out the proponent's lack of analysis of the cumulative effects of the Project and of existing hydroelectric power projects on the development of the Cree tourism industry and on the importance and necessity of future co operation (M79, p. 26).

The Panel believes that the proponent should, at the very least, review the extent to which its project would have a positive or negative cumulative effect on planned tourism projects for the Rupert River, including the effects of sport fishing. It also believes that the Hydro-Québec agreement with the *MBJ*, which promotes recreation and tourism projects on the municipality's territory, is a serious agreement that would generate further development. The potential cumulative impact of this agreement should be looked at from two angles: increased stress on the natural habitat already disturbed by the presence of structures and as Quebec Crown land habitat, jurisdiction over which lies with the *MBJ* under the terms of the Act, but on which the Crees have exclusive rights to harvest certain wildlife species. As the proponent pointed out, it is true that there is a need to adopt a regional tourism development strategy (EI1.4, p. 18-32). It is within this context that the *Plan régional de développement du territoire public* from the *Ministère des Ressources naturelles et de la Faune* is important. This Plan must develop a collective heritage not only of natural resources but also of other aspects of territorial development, such as the tourism attraction of hydroelectric power facilities. It has to reconcile all of the various uses through consultations and joint activities involving various partners and levels of government.

8.2.5 Spatial boundaries

For the natural environment, the proponent defined a study area for the six major sectors considered. The boundaries of these sectors were established so as to cover the territory where effects are likely to occur.

The boundaries set for the La Grande Rivière estuary and James Bay coast sector was criticized by the Nunavut Impact Review Board (NTK) (MC7, MC21, MC22, M40, M92, C8 and C24) and the Makivik Corporation (M41) because the boundaries do not acknowledge the possible cumulative effects of the project in the northern and north-eastern sectors of Hudson and James bays.

In its impact study and in the its responses to the requests for additional information (RP10, question 62 and RP12, question 259), the proponent submitted that the study area for the James Bay coast sector was included inside the freshwater plume of the La Grande Rivière, the boundary of which, according to the proponent, is the 20 ‰ isohaline (i.e. salinity of 20 ppm). Modelling by the proponent indicated that the maximum surface area of the La Grande Rivière's winter plume would be 3,430 km^2 with a flow of 5,000 m^3/s and complete coastal ice cover, after the Rupert River diversion; this is 210 km^2 more than the maximum plume observed in 1993. Since this difference is less than the natural variation in the area of the plume measured in 1993, the proponent concluded that the increase in the area of the winter plume caused by the Rupert River diversion is within the range of current variations. 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 to measure its area. The proponent is of the view that winds and variations in atmospheric pressure play a much larger role in the mixing of water masses than the flow of the La Grande Rivière and that the variability in the extent of the La Grande Rivière plume is thus greater in open-water conditions than under ice cover. Consequently, the proponent concluded that the 450 m^3/s increase in the average monthly flow that would result from the diversion of the Rupert River will not cause any measurable changes in the summer plume.

In their submissions for the compliance stage of the impact study and for the public hearings, experts from NTK (MC21 and MC22) and the Makivik Corporation (M41) criticized the 20 ‰ salinity value chosen by the proponent to define the spatial boundaries of the effects on the northern and north-eastern sectors of James Bay and Hudson Bay. The experts stated that the extent of a freshwater plume is a useful means of evaluating certain

potential effects of a river in a marine environment but is by no means the only factor to be considered. The authors noted that there is a body of evidence suggesting that freshwater, be it inside or outside the plume of a river, has effects on the chemical, physical and biological characteristics of a marine ecosystem. The authors also noted that choosing a salinity value of 20 ‰ to define the boundaries of the plume is an arbitrary decision on the part of the proponent. They stated that the other authors instead used 25 ‰ isohalines as a basis for assessing the biological responses to the arrival of freshwater in the marine environment and observed that the area of the plume increased rapidly with salinity levels greater than 20 ‰. They also cited a study in which observed winter flows of 3,000 m^3/s on the La Grande Rivière (approximately 2/3 of the flows predicted for after the Rupert River diversion) caused a dilution of surface waters from James Bay to the entrance of Hudson Bay.

Two experts were consulted to obtain clarifications on this issue (DOE3, DOE6). The first expert (DOE3) is of the view that NTK's comments on the choice of a salinity value of 20 ‰ to define the spatial boundaries of the La Grande Rivière plume are justified. The expert is of the opinion that the proponent should have extended its winter sampling over a wider area (e.g. salinity of 25‰) and used a numerical model allowing it to predict the plume of the La Grande Rivière both under ice cover and in open-water conditions, but did not propose other concrete solutions. Furthermore, this expert made reference to various scenarios presented in the documents of NTK which predict current and future (after the Rupert River diversion) patterns for salinity and ice concentration. The expert is of the view that the scenarios, which are based on simulations, are unjustified, because there is a lack of oceanographic data for vast expanses of James Bay currently influenced by freshwater inflow.

In its submission and at the public hearings (M32, VAP19), Fisheries and Oceans Canada also expressed reservations about the proponent's calculation methods in this regard, demonstrating that the project would not significantly change the freshwater plume of the La Grande Rivière. Fisheries and Oceans Canada was of the view that the proponent's model should have used a more refined resolution to more precisely predict the effects of an increase in freshwater inflow from the La Grande Rivière. At the meeting between Fisheries and Oceans Canada and the proponent, which took place after the public hearings (DCAP22), the proponent explained its two dimensional (2D) modelling approach for the freshwater plume of the La Grande Rivière and expressed the difficulty of producing reliable three dimensional (3D) simulations given the current state of knowledge. Based on these explanations, Fisheries and Oceans Canada was able to conclude that the empirical model used by Hydro-Québec would actually have a sufficient spatial resolution to explain the project's effects and that a higher resolution numerical model was not necessary (OED24).

The second expert consulted (DOE6) agreed with the 20 ‰ salinity boundary set by the proponent and is of the view that the plume of the La Grande Rivière should not reach Hudson Bay. After reporting on the variations in flows expected in the La Grande Rivière after diversion, he concluded that the greatest increase would be 200 m^3/s, in February March, and the largest decrease would be 200 m^3/s, in July August. These variations represent 2.3% of the total freshwater flow entering into Hudson Bay from James Bay, and 1.6% if flows from the Nelson and Churchill rivers are added in. In his opinion, this would cause little change in the current transport of water and would have little or no influence on the circulation of water and salinity near the Belcher Islands. Moreover, these effects would be indiscernible, in his view, from the natural variability of the system. This expert also agreed with NTK's experts (MC22) that there would have to be an attempt to better characterize the natural variability of the system.

Based on the opinions of these two experts and on the conclusions of Fisheries and Oceans Canada, the Panel is of the view that the use of a threshold of 25‰ rather than 20‰ for salinity would definitely have changed the spatial boundaries of the La Grande Rivière estuary and James Bay coast sector. However, given the limited relative size of the flows in question compared with the entire system (1.6% to 2.3%), this would have little influence on the ability to predict cumulative effects of the Rupert River diversion on Hudson Bay. Little is known about the variability in the transport of water masses in this system. The cumulative effects caused by the diversion of the Rupert River, if any, would likely be difficult to dissociate from the current variability of the system. This does not mean, however, that there would not be any cumulative effects caused by the project or by the development and diversion of all of the rivers of James Bay and Hudson Bay that have occurred since the 1980s.

8.3 Hudson Bay and James Bay

8.3.1 Addition of the project to the La Grande Complex

The directives required the proponent to assess the cumulative effects of the project, by factoring in, among other things, the La Grande developments and the Eastmain-1 project. As previously mentioned, the proponent viewed the study area of the James Bay shore sector as included in the La Grande Rivière freshwater plume, which, in its opinion was demarcated by 20‰ isohaline (i.e. salinity of 20 ppt). This led the proponent to conclude, in its environmental impact assessment and in its answer to the request for additional information (COE11, question 259), that, in light of the data available and a bibliographic journal from 2005, the diversion of the Rupert will have no measurable effect on the physical properties of the James and Hudson bays, outside the limits of the La Grande Rivière winter plume. In its opinion, the conclusion is that the project will not have any impact on the biological components of the bays. After the public hearings, the proponent filed an additional sectoral report on the James and Hudson bays (DCAP13), the objective of which was to describe in greater detail the consulted references in order to develop an answer to questions 62 and 259, and also to respond to the NTK submission (M40). Although more detailed, the proponent's conclusion remained basically the same as those in previous documents:

- Impact on the James Bay and Hudson Bay freshwater: the expected average monthly maximum (200 m^3/s) accounted for a difference of 3 to 5%, compared with the La Grande Rivière's and Rupert River's current winter monthly flow. This increase in flow is negligible compared with the estimated average annual freshwater inflow of 20,310 m^3/s from the Hudson Bay rivers and the inflow from the spring thaw (about 250,000 m^3/s).
- Impact on salinity and surface water temperature: the potential repercussions of the project are so few, compared with the Hudson Bay's natural variations, that the project has no measurable impact on these two areas.
- Ice cover: the impact of increased freshwater inflow (200 m^3/s) in winter is a slight increase, a few millimetres, in ice-cover thickness. This impact is negligible compared with the natural variation of ice in Hudson Bay, and compared with climate changes under way, which are gradually diminishing ice cover.
- Impact on the La Grande Rivière plume: the increase in the La Grande Rivière flow, following the diversion of the Rupert River, will not have any measurable impact on the summer plume. The winter plume will undergo an increase in area of about 200 km^2, which is less than the natural variations measured under the ice cover.

However, a number of representations have been made to contest these interpretations during the compliance analysis of the environmental impact assessment and public hearings. They specifically involve the NTK (MC7, MC21, MC22, M40, M92, C8, C24), the Makivik Corporation (M41) and the Cree of Chisasibi (C17, DPO5.2).

8.3.2 Concerns raised by participants

These concerns were basically aimed at the following aspects:

- Changes in water regimes: the NTK and Makivik Corporation mention that hydroelectric developments in Manitoba, Ontario and Quebec resulted in significant changes to water regimes of rivers which flow into the James and Hudson bays. More specifically, the large Manitoba and Quebec projects had a major impact on the size and modulation of the flow of the largest rivers, the Nelson River and the La Grande Rivière, in this system. For example, La Grande Rivière and the Nelson River alone contribute 50 to 60% of the flow of tributaries into the James and Hudson bays from December to April. In both these water courses, the maximum spring and summer flows have been replaced by the maximum winter flow owing to energy demand. According to NTK and Makivik Corporation experts, such seasonal changes in water regimes undoubtedly upset the Hudson Bay marine ecosystems. An additional 450 m^3/s, which would result from the diversion of the Rupert River, will further exacerbate these effects.
- Drift currents: a simulation of drift currents presented in the latest NTK report (M40, figure 8a) suggests that the strong winter flow of the La Grande Rivière would be transported along the Quebec coast line, up to the Hudson Strait and the Labrador Sea. The land observations for estimating winter plume dispersion of the Grande Rivière do not allow us to confirm these patterns, which are on a much larger scale. However, the authors believe that the drift current issue and the consequences of the movement of such large quantities of freshwater along the shores of Hudson Bay deserve special attention.
- Water salinity: the analysis of available data, using two different approaches (M40.4 et M40.5), suggests that the water flowing into Hudson Bay has a lower

salinity since the commencement of operations at the La Grande Complex (M40). These decreases in salinity are 1 to 3 ppm. Salinity gradient models in the reference material suggest that the decreases in salinity observed at the entrance of the Hudson Bay apparently extend as far as the Belcher Islands and even beyond (M40). Based on simulations, NTK experts predict that the diversion of the Rupert River would intensify this decrease on the shores of Hudson Bay and the Belcher Islands.

- Ice concentration: The analysis of images from Environment Canada's Canadian Ice Service by NTK experts suggests that the average concentration of ice has increased in the eastern portion of the Hudson Bay around the Belcher Islands since commissioning of the La Grande Rivière hydroelectric developments (M40, figure 6). The authors allege that the most plausible explanation for this increase in ice concentration is the inflow of freshwater from the La Grande Complex. While it is acknowledged that the relationship between hydroelectric development and increases in ice concentration has not been proven, some models and observations of Inuit hunters support this interpretation. The authors believe that an increase in ice from the west caused by warmer temperatures (OED18) appears a lot less plausible. They also mention that the increase in ice concentration has undoubtedly been masked by the increase in regional temperatures, particularly from 2001 to 2003. In this context, warming of the climate could give the wrong picture of the true effects of the La Grande Complex on the ice concentration in the eastern part of the Hudson Bay. The authors concluded that the diversion of the Rupert River will significantly increase the ice concentration in the Belcher Islands area.
- Biological production: Based on current oceanographic knowledge of Hudson Bay, it is difficult to predict the impact of a 1 to 3 ppm reduction in water salinity on biological production (M40, p. 17). However, we know that the salinity and ice cover are part of biological productivity (M40). The modulation in flow causes a reduced spring flood and increases flow in the winter, owing to the demand for energy. As these changes in peak flow periods would affect salinity and ice cover, they could have a substantial indirect effect on biological productivity. NTK and Makivik Corporation experts believe, therefore, that the diversion of the Rupert might damage this ecosystem component.
- Eelgrass: A number of participants from Waskaganish and Chisasibi said that they had noticed that there was less eelgrass along the James Bay coast since 1998 and they associated this decline with the commissioning of the La Grande Complex.
- Wildfowl and marine mammals: Eelgrass beds are of vital importance to many species of migratory birds, especially the Canada goose and the Brent goose during migration. A number of participants from Waskaganish and Chisasibi associated the decline in eelgrass stocks and the commissioning of the La Grande Complex with a drop in geese populations on the east coast of James Bay (C17, DPO5.2). Participants from Nunavut (OED20) also believe that resident and migratory birds and marine mammals will undoubtedly be affected by the cumulative effects of the diversion of the Rupert. The latter are directly affected by ice conditions, which, in turn, are dependent on salinity, two physical components that would be affected by increased and regularized flows.

8.3.3 Issues raised by participants

A variety of issues were raised in position papers and at public hearings:

- Recognition of traditional knowledge – The documents submitted by the NTK show that the Inuit have a detailed knowledge of their environment and the resources they collect there. They stated that there is widespread consensus among elders and hunters that there has been a decrease in the drift currents from the Belcher islands to the Hudson Strait since the commissioning of the La Grande Complex. The Inuit are also concerned by the fact that ice conditions are no longer as predictable as they once were and have not been as safe since the operation of the La Grande Complex increased winter flow rates. For these reasons, the authors state that it is not acceptable to claim that the effects of the Rupert River diversion will be limited to the La Grande Rivière plume. In that context, NTK stakeholders feel that their communities should be fully involved in a network for the environmental monitoring of the James Bay and Hudson Bay marine ecosystems – a network they are promoting.
- Meeting the challenge of assessing cumulative effects on James Bay and Hudson Bay – According to NTK experts, reluctance to assess cumulative effects stems from the fact that scientists still do not understand and cannot predict cumulative effects from multiple causes. Widespread effects associated with

human activity, such as acid rain and pollution in the Great Lakes, were not recognized until after major changes to ecosystems were observed. It is also difficult to study cumulative effects from a development perspective using a "project-by-project" approach. In the case of large projects, it is risky to consider only the "additional" effects of each new project and use the previous project as a reference for estimating future cumulative effects. In that context, the NTK feels it is not acceptable to consider the diversion of the Rupert River as just another project, without taking into account the cumulative effects of the entire La Grande Complex. Essentially, the NTK is questioning the manner in which cumulative effects are assessed.

- The importance of ocean-climate interactions – As previously mentioned, climate change could be giving a false impression or even masking the actual effects of changes to the flow rate of Hudson Bay rivers. Greater effort will have to be made to understand the complex ocean-climate relationship throughout Hudson Bay (M40).
- Risk and uncertainty management – Both NTK and Makivik Corporation representatives have pointed out that the proponent often cites uncertainty or a lack of data to conclude that the Rupert River diversion will have little or no impact on marine ecosystems. In that context, NTK representatives feel that the burden of proof is placed on those who will be affected by the project rather than on the proponent – a burden they feel is unfair and costly for the communities. Here again, the NTK questions the way in which the cumulative effects are assessed and recommends adopting clearer notions of "risk," "probability" and "thresholds" in assessing cumulative effects.
- Seasonal and multiyear variability – The various stakeholders also pointed out that the proponent used "natural" or "actual" system variability as a basis for the conclusion that the diversion of the Rupert River will have little or only minimal effects on the ecosystems. According to NTK representatives, this assumes that the ecosystems will adapt to new conditions, if the conditions in question fall within the bounds of "natural" or "actual" variability. They feel it is risky to assume that the components of the ecosystems studied are all equally adaptable to new conditions. Current monitoring is useful but, in their opinion, does not support the conclusion that there will be no impact because the parameters will remain within natural fluctuations.
- Interjurisdictional environmental impacts – Canada does not have mechanisms for dealing with environmental impacts originating in one province or territory and affecting others, similar to the International Joint Commission managing transborder Canada–US disputes. The James Bay and Hudson Bay drainage basins are located in three provinces (Manitoba, Ontario and Quebec) and one territory (Nunavut). In this context, the NTK feels that Canada should put in place an interjurisdictional organization to supervise the stewardship of James Bay and Hudson Bay, and another to study drainage basins.

8.3.4 Panel's analysis

Opinion is divided on the interpretation of existing data and the causes of some of the changes that have occurred in recent decades in James Bay and Hudson Bay. For example, the NTK feels that the hydrological impact of the project will take the form of an additional injection of 40 to 50 km^3 of freshwater in the winter period (M40), while the proponent maintains that the net increase in freshwater flow rate into James Bay will be in the order of 1.4 km^3 from December to March inclusively. On another front, NTK experts feel that the most plausible explanation for the increase in ice concentration in the eastern portion of Hudson Bay and around the Belcher islands is the inflow of freshwater from the La Grande Complex. However, Gagnon and Gough, in a study published in 2005 (OED18), maintain that the changes observed in the freeze and thaw dates (freeze-up occurs later to the north and northeast of Hudson Bay, while the thaw occurs earlier in James Bay and along the southern and western shores of Hudson Bay) coincide with temperature trends in the area and with projections of general flow models. Lastly, the proponent is disputing the NTK's predictions regarding salinity distribution following the Rupert River diversion owing to a lack of data for the calibration of the model used and the inability of the model to consider multiple factors affecting salinity.

The opinions provided by the two experts consulted and Fisheries and Oceans Canada have made it possible to put a number of those differences into perspective:

- First expert's opinion (DOE3) – One of this expert's first observations was that there is currently very little information available on the James Bay and Hudson Bay marine ecosystems. The work of government agencies and universities in the past 30 to 40 years has focused on small-scale descriptive phenomena or on processes. This data cannot be used to

quantify changes, nor to relate them to natural and human activities. In his opinion, traditional ecological knowledge is the only source of information on some aspects of the marine environment. More specifically, the expert feels that studies making it possible to separate the effects of multiyear variability from those of climate change and changes in river flow rates owing to hydroelectric facilities will be required to better understand changes in ice conditions. He feels that establishing this type of link is not a simple matter and says that no observations have been made that could be used to confirm predictions that water from the La Grande Rivière plume would disperse along the north-east side of James Bay. For the same reasons, he feels that the scenarios submitted by the NTK, which predict present and future salinity and ice concentration patterns, cannot be supported owing to a lack of empirical data. Lastly, he states that eelgrass is a plant affected by a variety of factors and that only stations located outside the areas potentially susceptible to flow variation will make it possible to determine if this factor is significant or not. His conclusion is that current knowledge is insufficient to monitor changes resulting from current and future hydroelectric developments. Much more detailed studies would be needed to answer these questions.

- Second expert's opinion (DOE6) – As previously mentioned, this expert estimated that the anticipated increase in the flow rate of La Grande Rivière following the diversion will be in the order of 200 m^3/s in February–March, which represents 2.3% of the total freshwater flow into Hudson Bay from James Bay, and 1.6% if the flow rates of the Nelson and Churchill rivers are factored in. In his opinion, changes to present water transport will be minimal and should have little or no impact on water circulation and salinity around the Belcher islands. It is unlikely that the La Grande Rivière plume will reach Hudson Bay. Effects, if any, should occur between the Rupert Bay and the mouth of La Grande Rivière. However, these effects would be indistinguishable from the system's natural variability. In that context, he strongly doubts that a monthly increase of approximately 200 m^3/s would cause effects like those described by NTK experts (C18). As he states, "the cumulative effects are the result of successive increases in freshwater flow rates. The addition of a single drop of water can therefore have an impact. […] I am convinced there have been cumulative effects [on ice cover] associated with successive increases in freshwater flow during some months of the year since the 1970s. However, [proving this] would involve numerically connecting variations in ice cover with successive flow rate variations and climate variations during that period." He cites two recent studies showing that climate variability is probably the most important factor in explaining variations in ice cover. He feels that another systematic study of cumulative effects associated with variations in freshwater flow rates and air temperature increases is needed. This study should take into account all the flow rate variations, including those of rivers in Ontario and Manitoba, those resulting from ice melting and climate variations since the 1960s.
- Opinion of Fisheries and Oceans Canada (M32, VAP19) – In its position paper, this Department begins by stating that various scientists have theorized that changes in freshwater inflow into James Bay and Hudson Bay could alter the oceanography of those areas and, consequently, the productivity of marine resources. The proponent has evaluated the project's impact on the estuary and coastal areas of La Grande Rivière and Rupert Bay and has concluded that the project will have no direct residual impact and would therefore not contribute to cumulative effects across James Bay and Hudson Bay. Fisheries and Oceans Canada said it could not give an opinion concerning potential cumulative effects on the area's marine environment, as it does not have the information to conclude that the project is having direct, significant effects. In addition, better scientific knowledge of factors governing the area's physical and biological oceanography would be needed to evaluate the potential cumulative effects on the marine ecosystem and its resources. However, the Department recognizes the complexity of the issue and feels it cannot be dealt with in a one-time environmental assessment. This aspect was confirmed by the Minister in a letter to the NTK chairperson in August 2006 (C27):

"…the potential cumulative effects from human activities in James and Hudson Bays cannot be evaluated within the context of the environmental evaluation for a specific project such as this one [Eastmain-1-A and Rupert Diversion]. In effect, an evaluation of such a vast and complex ecosystem would require intimate knowledge and understanding of the diverse components of the environment in question and their determining factors. This would require very specialized expertise, a

great deal of information, and an in-depth analysis that are beyond the capability of a single project proponent. Therefore, DFO [Fisheries and Oceans Canada] believes that the current approach of a project-by-project environmental assessment cannot allow for an adequate appreciation for the cumulative and transboundary effects of such a vast and multi-jurisdictional area as James and Hudson Bays"

The Panel feels that the concerns of the various stakeholders with respect to cumulative effects that may have occurred since the commissioning of hydroelectric facilities are perfectly legitimate. Based on the proponent's numbers (RP10, question 62), James Bay and Hudson Bay receive, on average, 22,492 m^3/s of freshwater annually, of which 41% comes from controlled rivers. These changes to the hydrological regime manifest themselves primarily through an increase in winter flow rates to meet energy demand. Like the experts consulted (DOE6), the Panel feels that such changes to hydrological regimes have likely had cumulative effects on one or more components of the James Bay and Hudson Bay ecosystems. The question then becomes: Why are we asking ourselves today whether or not hydroelectric facilities have had cumulative effects, and why does the current level of knowledge not allow us to answer that question with an acceptable level of certainty? As mentioned by various stakeholders, the James Bay and Hudson Bay system is very vast and difficult to sample. Moreover, the Panel notes that the matter involves several jurisdictions and not just a single proponent. Of the 9,310 m^3/s inflow from controlled rivers that enters James Bay and Hudson Bay, 36.5% comes from Manitoba (Churchill and Nelson rivers), 26% from Ontario (Albany and Moose rivers) and 37.5% from Quebec (Eastmain and La Grande). It must be acknowledged that to date, the various stakeholders have made no concerted effort to study the important issue of cumulative effects caused by controlling such large volumes of water.

With respect to the Rupert diversion project as such, the Panel must recognize that its effect would inevitably be added to that of all the other projects carried out in Quebec, Manitoba and Ontario since the 1980s. In this context, we must conclude that adding this project would have a cumulative effect. However, based on the various analyses submitted during the assessment process, the impact would be minor, considering that the anticipated flow rate increase in the La Grande Rivière following the diversion would be in the order of 1.6% of all freshwater inflow from James Bay and Hudson Bay. These effects would also be impossible to distinguish from other factors influencing the James Bay and Hudson Bay ecosystems, based on current data.

Aside from the elements that the various stakeholders raised to highlight the presence and importance of studying cumulative effects, one recommendation emerged from most of the opinions, position papers and presentations made at the public hearings: that a large-scale research and monitoring program be implemented specifically to assess cumulative effects on James Bay and Hudson Bay. The NTK formulated a number of recommendations to that effect (M40).

Consequently, a number of observations emerge:

- Current data does not allow us to quantify cumulative effects on James Bay and Hudson Bay, nor to separate them from major factors affecting these ecosystems, such as multiyear variability and climate change.
- While recognizing that the Rupert diversion will have cumulative effects on James Bay and Hudson Bay, such impacts would be minor compared with this project's contribution to all hydroelectric facilities built since the early 1980s.
- The cumulative effects in James Bay and Hudson Bay fall within the purview of the governments of Canada, Quebec, Ontario, Manitoba and Nunavut.
- Cumulative effects on James Bay and Hudson Bay cannot be analysed without implementing a large-scale research and monitoring program.

8.4 Conclusions

The Panel recognizes that a number of problems encountered by the promoter, including data availability, are difficulties recognized by specialists in the field. However, the Panel does question the choice of VECs and indicators used to analyse the project's cumulative effects.

A review of shortcomings brought to light by the Panel's analysis shows a somewhat different view from that of the proponent. Thus, for Cree quality of life, the negative effects of the project, added to the effects of previous hydroelectric development projects, might amplify problems associated with the loss of grounds for the gathering of traditional foods. The Panel feels that even if the project's impact seems minimal in overall terms, its consequences will nonetheless be felt by the communities. It feels that the cumulative effect is real but difficult to quantify, which means that the relative importance of cumulative effects and the causes of changes attributable to the project have not been

demonstrated.

The Panel feels that examining only the mercury issue to determine cumulative health effects is insufficient, as the analysis shows the importance of assessing other elements associated with this VEC, such as mental and spiritual health. Mercury is a particular problem for children and women who are pregnant or intend to become so; the proponent has recognized mercury's existence but has underestimated the importance of residual effects in its evaluation. However, the proponent has shown a genuine willingness to put the necessary measures in place and co-operate with Cree health authorities to ensure that the impact is minimized as much as possible. The fact remains that this side effect of development is a significant burden for women in the Cree community and requires additional effort on their part to maintain healthy eating habits. Having taken into account the scientific data and potential solutions, which have included improving communication with citizens and the availability of other food sources, among others, the Panel concludes that this problem could be effectively managed with the co-operation of the proponent, the Cree health authorities and the community.

The Panel notes that environmental assets will be lost when the Rupert River is diverted and that the loss comes on top of changes to Quebec's hydrographic networks on rivers classified as "exceptional" or "remarkable." However, the Panel recognizes the societal choices that underpin the value assigned to hydroelectric development and feels that renewed debate on the subject would be warranted.

The Panel feels that the proponent should strive for a better understanding of what the addition of the Rupert bays to the area's other reservoirs would mean for the Cree with respect to the reduction of traditional fishing and hunting activities and associated psychosocial effects, while attempting to separate these from the other pressures at work in the community. A similar study to the present one for the eastern area of the La Grande Complex would be required to assess the rehabilitation and exploitation of the territories' resources, not only by those affected by the project, but for those who will be doubly affected by the Eastmain-1 project. Moreover, the cumulative effects of the La Grande Complex, coupled with the undetermined impact of the Rupert's increased flow rate, should be assessed for the communities of Chisasibi, Eastmain and Wemindji. The study should focus on the following aspects, among others: habitat management for and the conditions of fish stocks, beavers and other fur bearers; the need to change the boundaries of hunting grounds, if necessary; and the impact of building roads, access roads and watercourse crossings. Following such a study, the proponent would be better able to adjust proposed mitigation measures and establish new ones to deal with the situation.

Specific attention should also be paid to Chisasibi with a view to improving communications and finding the source of problems associated with the community's future development to counter residents' longstanding bad feeling toward Hydro-Québec and the La Grande Complex.

With respect to the tourism sector, the Panel feels it is essential that the proponent co-operate with and support the ATPC and ACAA in researching and monitoring the cumulative effects of Hydro-Québec projects to prevent and avoid significant impact on the development activities of these two organizations.

In a broader context, and with a view to contributing to the improvement of environmental cumulative effect assessments, the Panel would like to share the following thoughts. The audit showed the need for a comprehensive land-use planning vision to prevent cumulative effects. The Plan régional de développement du territoire public to be completed by the *Ministère des Ressources naturelles et de la Faune* is of primary importance if disputes are to be avoided.

In association with this comprehensive vision, the regional approach prevents project-by-project analysis. Taking into account the overall context of the changes where impacts will occur, it is difficult to avoid the real consequences of interbasin transfers. The Panel feels that before proceeding with any other hydroelectric development project, it would be beneficial to set indicators or thresholds defining the potential for development associated with cumulative effects on wildlife resources and all human communities.

With respect to the effects of the project on James Bay and Hudson Bay, the Panel feels that current data does not make it possible to quantify cumulative effects on these environments, nor to separate the effects from major factors affecting ecosystems, such as multiyear variability and climate change. While acknowledging that diversion of the Rupert will have cumulative effects on James and Hudson bays, these effects are not significant when seen in the light of the project's contribution to all hydroelectric developments commissioned since the beginning of the 1980s. However, these cumulative effects require action from a number of jurisdictions: the federal government, the provinces of Quebec,

Ontario and Manitoba, the territory of Nunavut. Analyzing these effects necessarily requires the creation of a large-scale research and monitoring program, preferably one that draws on traditional knowledge.

The Panel notes that the way cumulative impacts are assessed was questioned by practitioners in this field, who are calling for improvements. Some of them feel it necessary to look at the project under study in the light of regional VECs or to make the VECs the central focus of the analysis. Others point to the need to develop protocols and analytical and monitoring tools for all of the components involved. Similarly, others insist that there should be a strategic environmental assessment, whose aim is to systematically and comprehensively examine environmental impacts, including cumulative effects, when the various levels of government are drawing up policies, plans and programs. The Panel is of the opinion that it is important to look at the timeliness of further systematizing cumulative effects as part of environmental assessments as well as the possibility of supporting a strategic environmental assessment for all policies and programs.

In the same context, the Panel would like to stress that the federal government needs to re-examine the methods used to assess cumulative effects. The Canadian Environmental Assessment Agency Guide, while a useful tool, is not properly adhered to by practitioners, which means that the findings are limited and inconclusive. The Panel also believes that it should give more importance to traditional knowledge.



9

Renewable Resources and Sustainable Development

9. RENEWABLE RESOURCES AND SUSTAINABLE DEVELOPMENT

The objective of sustainable development is to meet the needs of the present without compromising the ability of future generations to meet their needs. This concept requires that the following actions be taken:

- Preserve the integrity of ecosystems, including their capacity to maintain their structures and functions and support biodiversity.
- Respect the needs of future generations by using renewable resources in a sustainable fashion
- Provide sustainable and equitable socio-economic benefits.

The promotion of sustainable development is a basic objective of environmental assessments. According to the directives for the preparation of the impact study, the proponent had to take into account factors directly associated with respect for sustainable development. To that end, the proponent had to assess the extent to which biodiversity is affected, verify whether the capacity of renewable resources would meet the needs of the present and those of the future (P3, p. 11), analyse anticipated changes in terms of the exercise of both traditional activities and other non-traditional uses of these resources, indicate how monitoring and follow-up programs would help to ensure a certain degree of progress towards the attainment of sustainable development, and determine appropriate indicators for verifying whether this progress could be maintained within this context (P3, pp. 5-6).

9.1 Proponent's Conclusions

Hydro-Québec's commitment to protecting the environment goes back over 30 years, and its adherence to the concept of sustainable development dates from 1989. This concept was formally implemented in several initiatives, including the development of and compliance with company policies and directives in that regard, the achievement and maintenance of ISO 14001 certifications and, since 2002, the preparation of annual reports on sustainable development in accordance with the Global Reporting Initiative guide. Under Hydro Québec's three pre-conditions for designing and carrying out its projects, projects have to be economically viable, environmentally acceptable and favourably received by local communities.

There are two components of environmental acceptability: preservation of biodiversity and maintenance of renewable resource capacity. As part of the assessment of renewable resources, the proponent targeted air, water, and fish, wildlife and forest resources. According to the proponent, hydroelectricity has the advantage of not having an impact on air quality because it does not emit atmospheric pollution. Hydroelectricity plays a lead role in the fight against climate change. However, the proponent's reservoirs only have low greenhouse gas emissions in the first few years following their flooding. The proponent believes that water quality will be maintained and aquatic life or recreational or other uses will not be affected. Furthermore, the community of Waskaganish will also be given a new water purification plant that complies with current quality standards (EI1.4, pp. 22-57 and 22-58).

In the case of fish resources, the proponent predicts there will be no negative impact, except for isolated changes in the distribution of fish in new waterways. The proponent does not foresee any reduction in the abundance of wildlife resources, although there will be certain changes in their distribution, which will require changes in hunters' travel habits. The project will not involve any loss of commercial forestry capacity (EI1.4, pp. 22-58 and 22 59).

With respect to the preservation of biodiversity, the proponent states that this has been one of its ongoing concerns: all of its studies of biological habitats include a specific component for species of special status so that the risks of endangering their survival can be assessed. The proponent finds that, despite the scale of the project and its impact, the survival of any animal or plant species in the study area is not compromised. Moreover, all types of terrestrial and aquatic ecosystems present in the affected areas will remain available after completion of the project (EI1.4, pp. 22-56).

The proponent also believes it has accorded considerable importance to social responsibility in the design and implementation of the project. In the project design, priority was given to criteria that respect the Crees' attachment to their environment, particularly minimum flooding of the land, the implementation of an ecological instream flow regime at closure points on the Rupert River, and the maintenance of natural water

levels in certain lakes. The proponent points out that field studies include the participation of members of the Cree community and that traditional knowledge has been taken into account. The Cree and Hydro-Québec have signed an agreement as proof of a new relationship intended to more effectively ensure that the project respects future generations. Furthermore, the proponent took concrete measures to maximize economic spinoffs in the Northern Quebec region and the adjoining Abitibi–Témiscamingue region (EI1.4, pp. 22-59 and 22-60). In terms of economic efficiency, the proponent believes that the diversion of the Rupert River to previously harnessed rivers will help to maximize the production capacity of several existing hydroelectric power production sites (EI1.4, pp. 22-60).

The proponent believes that its overall project incorporates the three general objectives for achieving sustainable development: environmental protection, social responsibility and economic efficiency (EI1.4, pp. 22-61).

9.2 Panel's Analysis

9.2.1 Environmental protection

The project entails reducing the flow of the Rupert River from KP 314 to its mouth. Despite maintaining an instream flow regime, restoring flow corresponding to the mean natural hydrograph in the Lemare and Nemiscau rivers and building nine control structures along the reduced-flow reach of the Rupert River, it is undeniable that the appearance of the river will change and that these expected modifications will raise questions and concerns on the part of users. From a biophysical impact perspective, the proponent has made a certain number of commitments, including the development of spawning grounds, the seeding of banks, the construction of fish passage systems and the implementation of programs to monitor the development of fish communities and productive capacity. The Panel finds that the sustainability of fish resources is not threatened by the project. However, it believes that the following points should be given special attention.

The Panel would like to point out the potential risk of a decline in the popularity of the Smokey Hill lake cisco fishing site. Maintaining the upstream migration of this species in the river and the importance of the spawning ground between KP 16.5 and 23 are determining factors in whether the Waskaganish Crees will continue harvesting the fish. The recommendations set out in Chapter 5 with respect to the biological aspect of this problem are therefore considered essential. It is important to preserve the abundance of this species throughout Rupert Bay and its major tributaries as well as dip net fishing at Smokey Hill, the success of which depends on both fish abundance and the configuration of the neighbouring rapids. Similarly, the Panel believes it is important that the proponent strive to maintain the sustainability of lake sturgeon. Given the significant longevity of this species and its fragility with respect to overfishing, monitoring should be based on the species' life cycle and harvesting, in accordance with the support capacity that the river will provide in the coming years. It is essential that the proponent and Cree users in the territory work in close cooperation to obtain meaningful results.

The Panel made changes to the follow-up indicators that the proponent had selected in its impact study in order to complete the assessment of the environment and the effects after the structures become operational. In order to partially correct for the deficient dissemination of the information gathered by the proponent on the development of ecosystems, it is recommended that the Cree be included in the planning, gathering and dissemination of the results of follow-up campaigns. The objective is to ensure that communities are given information and learn about the new habitats created by the project.

9.2.1.1 Adaptive management

The proponent is committed to respecting the principles of adaptive management for the anticipated instream flow regime downstream from the Rupert River diversion point. The Panel concludes that the implementation of adaptive management of instream flow allows this scheme to be revised, if need be, in order to correct any impact detected after the fact in the proponent's environmental follow-up or observed by the land users. The Panel is of the view that the changes that ecosystems downstream from the diversion point will undergo and the present uses along the river are significant enough to justify a review of the instream flow regime if it is demonstrated that the flow regime, as stipulated in the documents submitted by the proponent in support of its application for authorization, is inadequate for ensuring the sustainability of ecosystems. The Panel understands that changes to the instream flow regime that would tend to increase the flow values established in the analysis would represent an economic loss for the proponent in terms of electricity production. It has not been established how far these changes could go, and any such changes must be viewed in a context that takes into account ecological and financial profitability requirements.

9.2.1.2 Rupert genetic line trout

At the public hearings, some participants expressed their concerns about the survival of the Rupert genetic line brook trout. This genetic line is currently abundant in the lakes and small waterways sampled in the forebay, primarily in the Rupert River system, from Lake Mistassini to Mesgouez Lake. Despite the fact that the diversion bay impoundment will lead to the disappearance of numerous spawning grounds currently located in the tributaries of the lakes in this area, the Panel believes that the project will not jeopardize the survival of the Rupert genetic line.

The Panel is of the opinion that the project will have little impact on the Rupert genetic line brook trout in the Rupert River watershed, given the extent of its geographic distribution elsewhere in the system. However, in the diversion bay section, the abundance of brook trout will decline in relation to current levels.

9.2.1.3 Waskaganish and Ministikawatin biodiversity reserves

The Waskaganish Biodiversity Reserve encompasses the Pontax River watershed, including the five islands situated at the mouth of the river. The proponent has modelled the salinity conditions of the Rupert River after its diversion. 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. The Panel believes it will be sufficient to monitor the development of the littoral fringe following the diversion of the Rupert River in order to ensure that a possible advance of the freshwater/saltwater interface does not affect the integrity of these reserves. It was agreed that the promoter would ensure a broader monitoring of current, salinity and water level conditions in all sectors of Rupert Bay in co-operation with the community of Waskaganish.

9.2.1.4 Terrestrial ecosystems

The loss of terrestrial habitats to aquatic habitats leads to the assumption that the loss of animal production will be proportional to the size of the land area lost. While the territory is characterized by an abundance of water bodies, its land portion accounts for a much greater percentage of the total territory.

A monitoring program for large animals has been set up, in co-operation with the Cree, in order to spot animals endangered by the rising water and, if necessary, relocate or harvest them. Although it does not believe that there will be any caribou deaths during the diversion bay impoundment because the animals will move away, the Panel still has a lingering doubt regarding the woodland caribou, a species designated as threatened in Canada and vulnerable in Quebec. 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. This amply justifies the need for telemetric monitoring of the woodland caribou during the construction and operation phase, as was suggested by the Panel in Chapter 5. The native harvest should also be monitored in order to obtain additional information.

Flooding during various phases of the La Grande Complex and the project being studied have caused and will cause irreparable losses in terms of small mammals, some of which have been designated as having a special status. In spite of their inevitability, these successive losses during the course of hydropower projects have never been assessed. The Panel feels that the extent of this problem as it relates to regional biodiversity is such that it is asking the proponent to improve its follow-up program so as to have a better knowledge and understanding of the presence of these species in the area.

9.2.2 Economic viability

From a cost-effectiveness standpoint, the Panel believes that the diversion of the Rupert River to rivers that have already been developed will maximize the production capacity of a number of existing hydropower sites at a production cost that is clearly more advantageous than that of other proposed hydropower or wind energy projects.

Furthermore, the economic spinoff of the project, not only for Northern Quebec and the surrounding regions, but also for all of Quebec, is a key consideration that came up frequently during public hearings in Chibougamau and Montréal. It was also brought up by Crees in communities that were visited. Many Crees and Jamesians believe that the spinoff will be temporary and concentrated during the construction period, but that it will also lead to the development of expertise and the creation of companies, which will be useful even after the construction has been completed.

As the Cree see it, acquiring this expertise will depend primarily on training and access to qualified and diversified

jobs. The Panel believes that the availability of qualified workers is a key factor that will allow a region to benefit from the economic spinoff of the project. It is therefore important that the range of occupations where training is offered should be broadened to include subjects like tourism, the environment, wildlife resource management and any other field related to hydropower development and its biophysical and social repercussions. With this in mind, the proponent should provide support for organizations responsible for human resource development, such as the Cree School Board or the Cree Human Resources Development Agency. Nevertheless, it is up to Cree communities to take full advantage of the various training funds and programs offered by the proponent.

The Panel also notes that the proponent plans to monitor the economic spinoff of the project on a yearly basis during the construction phase. The follow-up will focus on such aspects as contracts awarded to Cree and Jamesian businesses, the hiring of regional workers and availability of workers in the communities, and the effectiveness of spinoff optimization measures in the region. The proponent also plans to conduct follow-up during the operating phase of the project. The Panel hopes that the proponent's commitment to negotiating a solution with the *CCQ*, in the absence of a specific labour pool for the region, will produce the desired results.

However, at this point, the review bodies have been unable to obtain specific information about the progress of discussions between Hydro-Québec and the Cree on a possible agreement regarding the Sarcelle powerhouse. For this reason, the review bodies cannot gauge the potential economic effects resulting from this component of the project.

9.2.3 Social acceptance

The Panel notes that, over the years, the proponent has made significant efforts to provide information and consultation in Cree communities. More recently, under the Boumhounan Agreement, tallymen were consulted about the mitigation measures required to allow them to pursue their traditional activities. However, the findings from public hearings in the communities reveal that not all of the objectives targeted by these efforts have been achieved. Rather, there is confusion surrounding the various hydropower projects in the James Bay region, anxiety about the future pursuit of traditional activities on territory affected by the project, and a poor understanding 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. The hearings revealed that Cree society is divided on the project. The Cree are attached to their culture, and the project calls into question the future direction and path of their society. Some of them believe that the project will jeopardize the practice of hunting, fishing and trapping, which they consider to be a fundamental value of Cree society. Others would like to join the modern world, accepting the changes to traditional values that would result. The Panel 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 coincides with the arrival of modernity.

In Chibougamau and Montréal, the focus was more on economic spinoff in the form of contracts awarded and jobs created, and on the opportunities for regional development and the resulting development of expertise. This project, which will require a total investment of $2.86 billion, is a key economic driver. Having been severely affected by the slowdown in other natural resource sectors, the regions adjacent to Northern Quebec look favourably on the possibility of receiving almost 15% of the direct economic spinoff from the project. Quebec as a whole is also divided between those who are in favour of preserving the Rupert River, which many believe to be one of the last virgin rivers in North America, and those who support economic viability.

9.2.3.1 Scope of the residual impact on traditional activities

For some Cree, the effects of the project are acceptable on the condition that they do not appreciably harm hunting, fishing and trapping opportunities. For others, the project is quite simply unacceptable because of the threat to spawning areas or key traditional hunting grounds. The analysis of land use reveals the extent of the challenges with regard to the pursuit of traditional activities in the areas affected by the project and the ability of users to adapt to these altered environments with a view to maintaining the capacity of these areas to provide wildlife resources. Previous experience in areas altered by hydropower development, notably reservoirs, and the use thereof by the Cree, leads more to a conclusion of failure than to the adaptation of hunting and fishing habits to new environments. On the one hand, altered environments are not always hospitable or easy to use; on the other hand, the disappearance of traditional

hunting and fishing grounds has marked users psychologically, to the point of leading them to reject these new environments.

The Panel believes that it is essential that the Cree be involved in the long-term planning and carrying out of field work required to follow up on the many environmental factors targeted by the proponent. In doing so, they will gain a better understanding of the altered environments, learn new methods for managing wildlife resources and, indirectly, contribute to transmitting this new traditional knowledge to future generations.

9.2.3.2 Health

Health organizations believe that the project will lead to an increase in the burden associated with the various health problems present in the communities. Given the uncertainty surrounding these aspects and the lack of a program to follow up on the determinants of health for the six Cree communities in question, the CBHSSJB and Health Canada suggest that the proponent develop and implement such a program in order to track the actual impact of the project and adopt whatever measures are required to ensure that the health of the Cree is maintained or improved.

For some, this project is unacceptable because of the complexity of the mercury problem in the area, especially since the mitigation measure is a negative aspect of the project. The Panel is of the opinion that this issue involves more than simply setting guidelines for the consumption of fish. It encompasses changes to a way of life and to the practice of subsistence fishing; the influence of the "south" and its associated foodstuffs; the choices that are now available to Crees who have become consumers in the same way as other Quebecers; and the level of acceptance and compliance on the part of the Cree with recommendations made by health organizations.

9.2.3.3 Improving the acceptability of the project

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. The Panel does not have any data that would enable it to suggest how to lessen these residual inconveniences; however, it does propose certain measures in this report that could improve the chances of the project being favourably received.

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 responsible, at least in part, for the great distress revealed to the review bodies during public hearings held in this village. Although it can be assumed that the current project will have little impact on the biophysical environment around the community, the same does not necessarily hold true for the social repercussions, which will compound those of previous projects. In addition, it is difficult for the Panel to distinguish between the impact of the project and other possible causes of distress. At the public hearings, various solutions were proposed, such as returning the village to the island of Fort George, relocating the village to an area that would be sheltered from the shock wave caused by a hypothetical dam failure, or building a bridge connecting Chisasibi to an island south of the community used by hunters. The recent agreement concerning a new relationship between Hydro-Québec, *SEBJ* and the Eeyou Istchee Crees signed in 2004, which offers certain solutions to the Chisasibi problem, does not appear to have eased the feelings of distress within the population. The fact that the proponent is required to present dam failure scenarios may also place undue stress on the population.

The Panel does not have sufficient information to be in a position to decide which solution should be chosen and has even less information about the resources needed to solve this community's problems. Furthermore, the solution to this type of problem clearly goes beyond the analysis framework of the present project, and the choice made must originate from within the community. However, the Panel believes that this problem should be carefully examined by all parties concerned, including the GCC, the CRA, the various levels of government involved and Hydro-Québec, with a view to identifying potential solutions.

Various changes, more or less directly related to hydropower development, have marked the lives of the community of Nemaska. One of the most important was the abandonment of the Old Nemaska site in favour of a new location on the shores of Champion Lake. Since then, Old Nemaska has become a resource centre for the entire population and is well frequented, particularly in summer. As mentioned in the report, the turbidity of the waters of this lake may change. When they stay in Old Nemaska, the Cree draw their water directly from the lake. Since Cree drinking water quality standards are based, among other things, on the level of turbidity, the Panel believes that the proponent should discuss this potential problem with members of the community of Nemaska in order to come up with a solution, as

required. This solution could, for example, take the form of a community well.

9.2.3.4 Relations between the proponent and the Cree

During the public hearings, the Panel noted the need to improve communications between the proponent and the Cree. The proponent's efforts in this regard did not achieve the desired results. The Panel is therefore of the view that the implementation of the project will be a good opportunity to correct this situation, especially since a study produced by the INRS in 2006 reveals that the communication mechanisms put in place further to the signing of the Boumhounan Agreement were also 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 (OED 23).

While the tallymen serve as conveyors of information for their families and the community at large, the information delivered to young people under 30, who account for approximately 50% of the population, must also be tailored to the needs of this segment of the population.

9.3 Conclusions

The Panel acknowledges that, in the development of its project, the proponent took into account the concern for maintaining the vitality and diversity of genes, species and all natural land and aquatic ecosystems. However, the Panel would like to draw attention to the project's anticipated effects on the capacity of some resources to renew themselves. Considering these recommendations and the measures proposed by the proponent, the Panel concludes that efforts to protect biodiversity and maintain the capacity of renewable resources in the project study area are adequate. The Panel is of the view that only the monitoring programs will be able to verify the accuracy of the proponent's forecasts and the effectiveness of mitigation measures and thus determine the project's definitive effects on the sustainability of renewable resources.

In terms of cost-effectiveness, the Panel recognizes the advantage of maximizing the production capacity of a number of existing sites used for hydropower purposes. The project's unit production cost will be better than that of other planned hydroelectric projects or wind power farms. The required investments will generate major long-term economic spinoff for the Crees, Jamesians and residents of adjoining areas, so long as the parties involved take advantage of the expertise acquired and make the most of a situation that is conducive to vocational training and to the creation of businesses that will outlast the project's construction period.

There is no doubt that Quebec society will profit the most from the project because of the greater economic spinoff to be generated in regions other than Northern Quebec, Abitibi–Témiscamingue and Saguenay–Lac Saint Jean and because of the royalties and profits that will be paid to the government. The Panel is of the view that the project will have unequal effects on the various sectors of Quebec. As some tallymen and their families will be adversely affected, notably as a result of the loss of land, they will need to be given special consideration in the awarding of contracts for the restoration of certain areas, remedial work or the maintenance of roads, and as a symbolic recognition of their contribution.

The Panel is still troubled by the ambivalence in Cree communities regarding acceptance of the project and acknowledges the individual and collective challenges facing the Cree in terms of such acceptance. The Panel finds that major efforts will have to be made to improve relations between Hydro-Québec and Cree communities and believes it is essential that the communities affected by the project actively participate in project planning and monitoring activities. The Panel also proposes some potential solutions that could promote harmony and better understanding.

The Commission is of the opinion that the entire project respects the spirit of sustainable development but wishes to specify that the proponent will have to adopt the recommendations set out in this report to ensure the maintenance of biodiversity and of the capacity of natural ecosystems to renew themselves. Compliance with these conditions will also help promote social acceptance of the project during the construction and operational phases.



10

Conclusions

10. CONCLUSIONS

10.1 Summary of conclusions

Project justification

Because estimates of additional acquisitions required by 2014 have been revised downward, improvement of the proponent's procurement and of export opportunities are now the project's main foci. The project can help achieve the desired 15 TWh margin of flexibility and help the proponent respond to the vagaries of internal demand and take advantage of export markets.

The Panel considers the project justifiable on the technical, strategic, commercial and economic levels and believes it will enable the proponent to consolidate its position as a supplier and exporter of electricity. The current and forecast economic situation would indicate that the project is economically viable in view of the cost of production, project costs and a reasonable expectation of profit on domestic and foreign markets. The proponent will in particular be able to take advantage of existing infrastructure to generate additional power at an attractive price.

The project will help increase the dividends paid by the proponent to the Quebec government, benefiting Quebec society as a whole.

The Panel's analysis of the data provided by the proponent and gathered during public hearings leads it to the conclusion that to date there is no one alternative solution, nor any combination of solutions, that could provide all of the project's operational and economic benefits. As regards wind power, that technology would be an interesting adjunct to the proposed project and would benefit from its implementation, but can in no way replace it.

However, the Panel deems these reasons not sufficient in themselves for it to recommend approval of the project, which must also be found environmentally and socially acceptable.

Economic spinoff

The project's economic advantages and spinoff for the proponent, for the host environment and for Quebec as a whole are clear, in spite of the high cost of the measures the proponent is absolutely required to take to offset the anticipated negative environmental and social effects. Beyond the direct impact and the multiplier effect of the proponent's expenditures during the project's construction phase, expected revenues during the operations phase will be an important plus for the Quebec economy.

The Panel concludes that the perception that a wild river has been tamed could negatively affect the possibility of developing a local tourist industry downstream of the Rupert dam and attracting lovers of the great outdoors, canoeists, kayakers and sport fishermen.

At the regional level, it is up to the two communities sharing the territory to work together, and with the proponent, to turn the project's spinoff into economic choices and substantive, lasting economic development.

Impact on the natural environment

As regards the diversion bays, the project will expand water surface, fostering the development of fish communities and thereby increasing the biomass of fish completing their life cycle there. The proposed arrangements to ensure the reproduction of lake trout and sturgeon are deemed acceptable and in keeping with best practices. The assumptions with respect to the changes in fish communities in the diversion bays and the success of the arrangements must however be checked through a rigorous monitoring program. The project's impact on the "giant" brook trout genetic line will be low over the entire Rupert River watershed and will not imperil its genetic integrity. The increase in mercury content in fish flesh is unavoidable, and the Panel is aware that the project will make it necessary to have new guidelines in place for some 20 to 30 years after diversion bay impoundment. Therefore, the change in mercury content over time will have to be tracked and findings will need to be explained to users of the territory, to keep these environments from being considered irrevocably lost. In view of the risk to woodland caribou, and in order to assess this ecotype's adaptation to the project, the Panel believes a telemetric monitoring program will be needed in the various project sectors during the construction and operational phases. As regards beavers and bears, the proponent has planned an intensive trapping and hunting program or transfer of the animals before diversion bay impoundment. The small mammals tracking program proposed by the proponent will need to be improved to afford better knowledge of these species' presence within the territory. The Panel is of the opinion that application of a judicious combination of the various measures planned to improve wildfowl

potential should encourage wildfowl to use the diversion bays, but changes in their populations will also need to be tracked.

In the reduced-flow section of the Rupert River, an instream flow regime will preserve the habitat necessary for fish to successfully carry on their biological activities. Should the minimum flow values or periods be insufficient to ensure the continuity of the fish communities, a change to these shall be among the solutions looked at following additional studies. Some spawning grounds will be lost due to the construction of hydraulic structures, whereas others will be affected by the new flow distribution. The proponent has committed to developing spawning grounds to make up for those lost and to redeveloping those affected by the new flow distribution. Should this redevelopment work be inefficacious, corrective measures will have to be taken, possibly extending to redevelopment of spawning grounds in other stretches of the river. Anadromous lake cisco will still be able to migrate upstream of the current spawning site in the future, but no one can yet say whether there will still be any at the traditional Smokey Hill fishing site after diversion of the Rupert River. As its tracking results dictate, the proponent shall fulfil its commitment to develop a new dip-net fishing site equivalent to Smokey Hill. The Panel believes that, in spite of habitat losses in certain stretches of the Rupert River, fish communities will hold their own in the short, medium and long term after flow reduction, but emphasizes the importance of monitoring in this area. The Panel considers that decreased water levels in the stretches not influenced by a hydraulic structure will bring changes to riverside habitats that will be negligible for larger fauna and should be minimal, if not positive, for beavers. Finally, the Panel considers that wildfowl populations in Rupert River habitats should be only slightly affected by the project.

In the area of the Rupert River bay and Rupert estuary, the impact of the project on fish communities will be minor. Maintenance of an instream flow regime should allow preservation of the reproduction habitats of the first rapids and limit the intrusion of salt water farther up the bay. No appreciable harm to avifauna or aquatic vegetation is likely to ensue from the reduced flow of fresh water into the bay from the Rupert River.

In the increased-flow sector, it is hard to render a decision on the survival of the sturgeon spawning grounds, considering that reference conditions are evolving because of the recent impoundment of the Eastmain-1 reservoir. The Panel considers it important for the follow-up program at the Eastmain-1 generating station to be taken into consideration when a follow-up program for the project under review is developed and for the program to continue after Eastmain-1-A comes into service. Should the lake sturgeon of the Rupert River succeed in colonizing the Eastmain-Opinaca system, the dike that diverted the waters of the Opinaca River into the Boyd-Sakami diversion system will be an insuperable obstacle for them, keeping the individuals living in the downstream stretch of the Opinaca River isolated and protecting the integrity of this genetic line. The Panel considers that measures to redevelop the area immediately downstream of the future Sarcelle station, in habitats favourable for the spawning of the species, are acceptable and sufficient. However, the proponent shall see to the success of these arrangements and shall take the requisite corrective measures should they fail. In addition, special monitoring shall be done of lake sturgeon in the Boyd-Sakami diversion to ensure that young individuals are moving into the sector. The problem of the increase in mercury content in fish flesh must also be taken into account downstream of the Eastmain-1 reservoir, given that mercury is discharged, in particular, by the downstream migration of fish through the station's turbines or control structures. This bioaccumulation phenomenon must be included in a mercury content monitoring program following project commissioning. The Panel considers that there will be no serious impact in this sector on terrestrial and semi-aquatic fauna, nor on wildfowl, because changes to the environment are so slight.

In the Grande Rivière estuary sector and the coast of James Bay, the conclusion that diversion of the Rupert River will not cause any significant impact on the fish community and its habitat is reasonable in view of the fact that the ensuing hydrological changes are within the current range of discharge variation. For the same reason, the Panel considers that the diversion of the Rupert should not alter the current situation of eelgrass on the James Bay coast.

In the sectors affected by related structures and activities, the main sources of impact on fish and fish habitat will be the work in water and the encroachment on crossing points during the construction of permanent and temporary roads. Application of Quebec standards in that regard and of the proponent's standard environmental clauses should allow these impacts during construction to be much attenuated. Impacts on terrestrial and semi-aquatic fauna in the neighbourhood of the Sarcelle-Eastmain-1 transmission line and project

roads will be slight and will mainly arise from disturbances during the work. Impacts on wildfowl will essentially be temporary since avifauna habitat will to a great extent be restored upon completion of the work.

Social impact

Changes to the Crees' way of life

At the end of the 1960s, the Crees still lived by trapping fur-bearing animals, but the advent of social services and the decline of the fur trade have brought rapid cultural change. The La Grande Complex was another vector of change, and Cree society negotiated the conditions under which it hoped to solve the problems the project was expected to cause. At that time, in Cree communities, the effects of poverty and unemployment, population decline through exodus to urban centres, and cultural and linguistic losses related to the abandonment of traditional ways of life, were less severe than in other Aboriginal communities in Canada. Even 35 years after the beginning of the La Grande Complex, the people still occupy their land area and speak their language. This is in part owing to the way the Crees use the development projects to adapt, maintain their cultural integrity and move their society forward.

Given the population growth in these communities, bringing with it the need for additional services, job creation within the communities and the higher cost of living and infrastructure, the need for income has increased exponentially. Since every year 400 young people enter the labour market, the Panel observes that today it is difficult for Cree society to pass up any development opportunity that would increase income, whether on an ad hoc or longer-term basis, for individuals or for communities.

Contribution of the Jamesians

Since the Jamesians' arrival, they have always benefited from the development of their territory, first through the mining development of the 1950s, then the forest industry in the 1960s, and finally the hydroelectric development at the La Grande Complex in the 1970s. Since the 1980s, the end of the big hydroelectric projects and the decline of the mining industry, and now that of the forest industry, have brought economic hardship, increased unemployment and an exodus of non-Aboriginal workers from the territory. The Panel believes that the Eastmain-1-A and Rupert diversion project will bring economic benefits to this community and will help reduce unemployment and stimulate long-term job creation in other sectors of the economy at this difficult time in its evolution.

Health

It is difficult to separate out the project's direct effect on the Cree people's health and health effects having other causes. The Panel nonetheless considers that the proponent should offer the Cree health authorities its full co-operation so that the authorities can document the project's effects on key health determinants for the Crees by targeting certain indicators pertinent to the project impacts.

As regards mercury contamination of fish, the Panel fully recognizes the scope of this problem, a naturally occurring one that is made worse by the hydroelectric projects. It believes, however, on the basis of the information it has obtained, that the problem is not insoluble in a framework of sustained management, planning, monitoring and communications, with adequate resources and with the co-operation of all concerned. The CBHSSJB is in the best position to manage this issue and to implement health policies and programs and research initiatives on mercury and Cree health, with the proponent's ongoing support, as well as the communications media best suited to keeping the public abreast of these.

There is some cause for concern that changes in colour and turbidity caused by changing discharge levels in the river and its tributaries will mean that the water will no longer be deemed acceptable for household uses, which could restrict its use by the Crees. The proponent should therefore monitor water quality and impart the relevant information to the local authorities.

At the public hearings, many community members attributed such problems as diabetes, heart disease, dysfunctional families, substance abuse and other types of social problem to the changes that have occurred following hydroelectric development. The Panel considers that it is impossible to assign a single cause to all of these problems. It has however been reassured by the CBHSSJB's declaration that it feels it can manage the aftermath of the project.

The Panel is aware of the loss that will be felt by the members of the Cree community, but it hopes that reliance on traditional values and community support, together with the measures called for in the Boumhounan Agreement, will mitigate this.

Territory

The project will have a direct impact on Cree users and, by extension, on the communities whose territories are within its area of influence, but will not affect Lake Mistassini or any of the fish resources therein.

The Panel has been able to determine that the potential yield of the Mistassini and Nemaska communities' hunting grounds will be reduced. Many Nemaska and Waskaganish fishermen who frequent fishing sites on the Rupert upstream and downstream of Rupert dam will have to rethink their activities under these new harvesting conditions. In addition, the project points up the adaptations that will be required of the members of a number of communities regarding travel by boat and snowmobile.

Certain community use areas will be affected, such as Smokey Hill and Asinii Kabasiganot, and other prized areas may lose some of their value or require an adaptation by users. The Panel notes that Wemindji community members still regret the flooding of large parts of their territory and the diversion of some rivers, but they believe it is possible to go ahead with this project, especially if the proponent is ready to fulfil its commitments to the Cree people in terms of the continuation of traditional activities.

The Panel further notes that the hunting lands in the various areas targeted by the Rupert diversion will be affected in various ways. The proponent has arranged for a series of mitigation measures, in conjunction with tallymen and the communities concerned, such as the identification of alternate sites, the deforestation of navigation corridors and riparian zones along the diversion bays, development of access ramps, wetland enhancement and the revegetation of shores. The Crees wish to participate in all discussions and decisions on implementation of these measures. Users of traplines in the areas affected must adapt to the practical impacts of the project and will feel cultural and spiritual loss. Some nonetheless fear they will have to go hunting and fishing on other traplines should the number of animals that can be trapped declines and fishery yields are unsatisfactory. Users of traplines in the areas affected must adapt to the practical impacts of the project and will feel cultural and spiritual loss. The Panel notes the commitments made by the proponent to these trappers and their families with respect to the work and the corrective measures that will be taken in co-operation with the parties affected, and expects the proponent to co-operate with affected trapline users in developing programs for each trapper who has suffered losses. It takes note also of the commitments made by numerous trappers, including those whose territories are in the flooded areas, to co-operate with the proponent in doing work, corrective measures and studies.

The Panel hopes that the programs for trappers and communities will have the long-term effect of contributing to the improvement and maintenance of good relations between Hydro-Québec and the local Cree communities, and will make the grievances aired at the public hearings a thing of the past.

The Panel hopes that the proponent and the Cree people, represented by the CRA, local communities and the Cree institutions concerned, will succeed in finding ways to help the Crees adapt to the effects of the project and to take advantage of opportunities arising from it. Moreover, the Panel believes that the corrective programs for trappers and canoe brigades will afford opportunities for breakthroughs in co-operation between the proponent, Quebec society and the Cree people.

The Panel considers that the project will help open up the territory, thus facilitating the development of recreational and tourism activities such as pleasure boating and sport hunting and fishing activities. Opening up the territory will also have a ripple effect on other types of projects, in particular mining, forest and industrial development. These activities may generate attractive economic spinoff, but they will also bring with them environmental impacts that will have to be assessed. The Panel agrees with the proponent's analysis and considers that continuation of the Weh-Sees Indohoun Corporation's mandate will help mitigate the impacts of the project on sport hunting and fishing during the construction of the structures. It believes, however, that the Weh-Sees Indohoun territory should be extended to include the areas neighbouring the project work camps, which are on category III lands, subject to consultations with the relevant wildlife management authorities.

The Panel believes that James Bay tourism will survive the project, since there are numerous traffic builders in places outside the area directly affected. It considers that tourism may make a non-negligible contribution to the economy, to the extent that the various responsible agencies and stakeholders are able to work with each other and with the proponent, which will have to give them its full co-operation. It is conscious, however, that there is a risk that the project will have an effect on existing wealth and opportunities for expansion in the project area.

Archaeological, heritage and burial sites

The Panel deems it essential for the proponent to complete the proposed inventory and excavation program before structures are built or, at the very least, before the diversion bay impoundment. The same procedure should be followed for the digs that may be recommended after the 2006 and 2007 inventories.

The Boumhounan Archaeological and Burial Site Fund calls for measures to be implemented taking into account sites affected by the project and for agreement with the families on actions to be taken. Despite these measures, the Panel considers that the loss of territory and of burial sites should be recognized by naming the structures after Cree families directly affected by the project.

Because of the changes to the environment, certain cultural sites will be transformed. These places bear witness to events in mythology or recorded history and are valued by the Crees. The Panel believes that the proponent, in conjunction with the Crees, should develop an intangible cultural heritage file. The Panel also believes that the proponent should provide the CRA with records of its inventories and archaeological digs and participate actively in the presentation of any cultural remains discovered.

Though recognized as an archaeological site, Smokey Hill is not part of the proponent's inventory program because no structure is planned for its shores. The Panel believes it would be valuable to delve into the history of the site's occupation, since it is in danger of losing its function as a fishing site, its landscape value and possibly its traditional attractiveness once the project is complete.

Navigation

Diversion bays

Though navigation conditions will change in the diversion bays, the Panel is of the view that the mitigation measures provided for in the monitoring program will help maintain safe navigation, insofar as is possible, on these waterways.

Reduced flow section of the Rupert River and Rupert Bay

Given the proponent's evaluation and the planned measures and controls, the Panel considers that the Rupert, Lemare and Nemiscau rivers will remain navigable. It will be the proponent's responsibility to maintain navigability, regardless of future hydraulic conditions. To this end, a minimum one-metre depth must be maintained for users of the Rupert River to allow the passage of the motorboats used by the Cree. Also, to keep navigation safe for users, the proponent must set out channel markers at critical points along those stretches not influenced by hydraulic structures. The proponent must provide an information system to alert users to exceptional outflows downstream of dams to ensure their safety. Similarly, a monitoring system for navigation conditions in the estuary and bay must be implemented in collaboration with the Waskaganish community. The Cree have already marked out a low-tide navigation channel to avoid shoals, and this practice must be maintained at the proponent's expense.

The changes made to the Rupert River will not impede boats and kayaks requiring a minimum depth of 30 cm. However, navigation conditions will no longer be the same, and some rapids will become accessible and others inaccessible. The project will disrupt the natural course of the Rupert, which may lead to changes in the recreational boating clientele on the river. The Panel acknowledges that the appeal of the Rupert River for canoeing and camping may be reduced.

The proponent has undertaken to develop and reroute portages to keep the rivers affected by the project navigable. It would be desirable for the proponent to undertake to do this in a way that keeps the portages safe and easy to use for all comers.

The Panel considers that a canoe brigade monitoring program should be implemented by the proponent, who should work with the Cree communities to encourage their young people to continue with this tradition and to find alternative routes where applicable.

Increased flow section

In order to facilitate navigation, it would be desirable for the proponent to implement a program for clearing wood debris and map out and mark the navigation corridors in the increased flow section. In order to ensure the safety of users, the signage on the navigation corridor should be examined to see if, besides the marking of the most difficult stretches, it should include booms, in particular upstream from the Sarcelle dams. The Cree should be consulted to determine what works are needed to maintain safe navigation in the La Grande estuary.

Given the scale of the project and many small watercourses crossed by access roads for the planned work, Transport Canada has agreed that the majority of these watercourses are not navigable within the meaning of the *Navigable Waters Protection Act*, except for those where temporary or permanent bridges are planned, namely the Rupert, Nemiscau and Lemare rivers (C10). It would be wise to follow up on some of these watercourses and those crossed by the Muskeg–Eastmain-1 road, such as the Acotago, so that measures can be taken to keep them in use.

Safety of structures

The Panel considers that, given the regulatory requirements governing the design, construction and periodic inspection of hydro-electrical installations, the

safety regime for Quebec dams contains all necessary elements to inspire public confidence in the integrity and safety of these structures.

In its analysis of the facts, the Panel has detected nothing that would lead it to conclude objectively that the fears expressed by Cree people as to the safety of the dams and their emergency plans may be founded. The Panel is nonetheless troubled by the intensity of these fears, which it attributes to problems of communication between the proponent and the Cree communities, and it concludes that the proponent's communications activities need to be thoroughly reviewed. Similarly, it suspects that the analysis and presentation of hypothetical dam rupture scenarios by the proponent may have been misinterpreted and used to fuel these fears, producing the opposite effect to what one would want.

The Panel believes that Cree community leaders have an important role to play in helping the proponent determine the type of information and the means of communication to be used to reassure the population with regard to dam safety issues. They also have an obligation to facilitate the dissemination and understanding of this information in their communities by the most efficacious means.

The Panel finds that requirements under the Quebec *Règlement sur la sécurité des barrages* regarding disaster contingency plans are adequate for ensuring public safety if properly executed. These plans are based on hypothetical break studies examining the worst possible scenarios and the specific nature of the anticipated risks.

The proponent's assertions that it considers the safety of its dams to be paramount and that it intends to fully comply with requirements under the Act and Regulations are credible and acceptable.

Cumulative impacts on the environment and residents

Despite the fact that the Panel is aware of problems in this matter, including the lack of reference data and thresholds, it questions the proponent's selection of valued environmental components (VECs) and indicators in its analysis of the project's cumulative impacts.

The Panel believes that looking at the issue of mercury alone is insufficient for determining the cumulative impacts on health, as the analysis highlights the importance of evaluating other elements related to this VEC, such as mental and spiritual health. Although the proponent acknowledges the existence of mercury, which is an issue of particular concern to children and women who are pregnant or seeking to be, it underestimated the importance of mercury in its assessment. Nevertheless, the proponent shows a willingness to work with Cree health authorities (CBHSSJB) to implement the necessary measures for mitigating the impact of mercury as much as possible. The fact remains that this undesirable by-product of the project places a heavy burden on women in the Cree community, requiring them to make an extra effort in maintaining a healthy diet. Considering the scientific data and possible solutions, which range from a more effective public communications strategy to the availability of alternative food sources, the Panel finds that the issue could be managed effectively if there is co-operation among the proponent, Cree health authorities and the Cree community. It should be noted that the CBHSSJB, and not the proponent, is primarily responsible for advising the public on this issue.

In terms of the quality of life of the Cree, the negative impacts of the project, combined with the effects of previous hydro-electrical projects, could exacerbate problems relating to opening and developing the land and harvesting traditional foods. The Panel believes that although the impact of the project appears marginal when looking at the big picture, the communities will still suffer consequences. It feels that the cumulative impact is real, but difficult to quantify, making it impossible to specify the relative significance of the marginal cumulative impact and the causes of change attributable to the project. Although the Panel is aware of certain positive factors, such as the development of a road network, population growth, better social services infrastructure and common disease rates comparable to those of other First Nations and the general population, it did not have the opportunity to examine global studies that would have enabled it to focus on the relative importance of the cumulative benefits of hydro-electrical development for the Cree nation. It therefore had to rely on its own judgment in this respect.

The Panel is of the opinion that the cumulative impacts of the La Grande Complex, coupled with the effects of the increased flow of the Rupert River, should be evaluated for the Chisasibi, Eastmain and Wemindji communities. The study could look at habitat management, the status of fish stocks, beaver populations and other fur-bearing animals, the need to adjust the perimeter of traplines (if required) and the impacts of the construction of roads, access roads and watercourse crossings. The study would enable the proponent to better tailor the proposed mitigation measures and establish new ones to address the needs identified by the follow-up program.

Like Nunavut stakeholders and experts who have expressed opinions on the issue, the Panel finds that the data that are currently available are insufficient to quantify the cumulative impacts on James Bay and Hudson's Bay or separate them from the major factors affecting these ecosystems, including inter-annual variability and climate change. Although the diversion of the Rupert River will have a cumulative impact on the bays, the effects will be minor in terms of the project's contribution to the hydro-electrical structures that have been built since the early 1980s. Because the effects extend beyond the borders of the province and affect many jurisdictions, including those of the federal government and the governments of Quebec, Ontario, Manitoba and Nunavut, the Panel considers that a formal analysis of these impacts cannot be conducted without establishing a large-scale research and follow-up program, a measure which the Panel recommends. Furthermore, greater recognition needs to be given to traditional environmental knowledge when directing research efforts.

The Panel finds that natural heritage will be lost as a result of the diversion of the Rupert River, representing yet another change to Quebec's system of exceptional and remarkable rivers. However, it does recognize the societal choice underlying the transformation of rivers for the purpose of hydro-electrical development and believes that this could renew debate on this issue.

The analysis also shows the need for an overall vision with respect to the land's development to ensure that knowledge of the cumulative impacts is taken into account in regional planning and in selecting development projects. In this context, the regional development plan for public land that is to be prepared by the *Ministère des Ressources naturelles et de la Faune* du Québec is key to preventing disputes and overdevelopment. The Panel believes that thought needs to be given to the possibility of a more systematic analysis of the cumulative impacts.

Sustainable development and renewable resources

The Panel acknowledges that the proponent has taken into account concern for maintaining the vitality and diversity of genetics, species and all natural land and aquatic ecosystems in the development of its project. However, it would like to draw attention to the anticipated impacts on the capacity of some resources to renew themselves and makes appropriate recommendations for ensuring their survival. Considering these recommendations and the measures proposed by the proponent, the Panel finds that efforts made to protect biodiversity and maintain the capacity of renewable resources in the project's area of study are adequate. It considers the follow-up programs that will verify the accuracy of the proponent's forecasts and the effectiveness of mitigation measures to be paramount in determining the project's definitive impacts on the sustainability of renewable resources.

In terms of cost-effectiveness, the Panel recognizes the advantage of maximizing the production capacity of a number of existing facilities. The project's production cost per unit will be better than that of other planned hydro-electrical projects or wind power farms. The required investments will generate major long-term economic spinoff for the Crees, James Bay residents and residents of adjoining areas so long as the parties involved take advantage of the expertise acquired and a situation that is conducive to vocational training and the creation of businesses that will outlast the project's construction period.

Despite the significant spinoff to be generated in the area, the Panel feels that Quebec society will benefit the most from the project, owing to the long-term economic advantages that the proponent and the government will enjoy.

As some tallymen and their families will be adversely affected, notably as a result of the loss of land, they will need to be given special consideration in the awarding of contracts for the restoration of certain areas, remedial work or the maintenance of roads.

In symbolic recognition of their contribution, Cree names should be assigned to the bays and dams.

The Panel is still troubled by the ambivalence in Cree communities regarding acceptance of the project and acknowledges the challenges facing individuals and Cree communities in terms of such acceptance. It finds that both Hydro-Québec and the Cree communities will have to make major efforts to improve relations between them. It believes that the Cree's involvement in planning and conducting follow-up is essential and proposes some potential solutions that could promote harmony and understanding.

The Panel feels that the entire project respects the spirit of sustainable development, but wishes to specify that the proponent will have to honour its commitments and adopt the recommendations made by the Panel. Complying with these conditions will also help promote social acceptance of the project during the construction and operational phases.

Lastly, the Panel recognizes the positive aspect of the concept of ecological instream flow co-developed by the proponent and the Crees, providing a framework embracing renewable resources and the sustainability of fish communities. This is in accordance with the principle of maintaining biodiversity and the capacity of aquatic ecosystems for self-renewal.

Communication

During hearings in Cree communities, the Panel learned of the numerous communication problems between the communities and Hydro-Québec. These problems are unfortunate and cause tension, mistrust and a lack of understanding between the parties. It is in the parties' best interest to come to an agreement in the spirit of partnership promoted in the *Paix des braves* and the Boumhounan agreement. A good number of the criticisms directed at the proponent by Cree stakeholders are a testament to their experiences during the construction of the La Grande Complex. These criticisms make it difficult to have much confidence in a new project. The recounting of unilateral action taken and insensitivity shown by Hydro-Québec and its employees and contractors during that period, resulting from a lack of communication, is widespread in villages. As part of the proposed project, the proponent's representatives must address past issues and the resulting perceptions in their efforts to improve consultation and communications with the communities. The project's technical aspects compound this challenge.

The Panel believes and strongly hopes that communications can be improved by giving more importance to the Cree culture and language and by further adapting the information and means of communication to the communities' ways of doing things. Adapting complex data and explaining technical aspects in laymen's terms should be considered. The message of adapted, respectful communication should come not only from the enterprise's executives and public relations team, but also from all of the proponent's employees, foremen and contractors.

The Crees will have to demonstrate openness and a willingness to become informed and establish and maintain close communications with this omnipresent Crown corporation.

The various sections of the report contain a number of observations and suggestions regarding communication.

Involvement of the Cree community and traditional knowledge

Despite the proponent's efforts to consult and cooperate with the tallymen affected, at the hearings, many people expressed great dismay at the proponent's lack of attention to acquiring and incorporating traditional knowledge in its studies. The Panel concludes that the proponent should have done more, recognizing the added value of intimate knowledge of the land, its inhabitants and their customs in preparing a work plan and gathering data for the scientific analysis of various subjects of study for a project of this scale. It considers the consultation and ongoing involvement of individuals with traditional knowledge to be essential to enabling the proponent to apply traditional knowledge in its planning, development and follow-up studies, thereby ensuring that its project and the necessary mitigation measures are fully adapted to the environmental and social contexts.

Paramount importance of follow-up and adaptive management

In its report, the Panel indicated that the proposed project is likely to have numerous environmental and social impacts, which can only be deemed justifiable insofar as they can be controlled through the implementation of effective mitigation measures at the proponent's expense, monitored under a strict program and tailored to needs. From this angle, as stated many times already, the follow-up program is of prime importance.

In connection with such follow-up, the proponent has undertaken to respect the principles of adaptive management for the ecological instream flow regime downstream from the point of deviation of the Rupert River and for the various wildlife developments undertaken to restore, replace or offset habitats disrupted or lost as a result of the project. Though determined rigorously and in accordance with standard practice, wildlife developments are always subject to a degree of uncertainty arising from the inherent variability in the behaviour of organisms and ecosystems. The principle of adaptive management stipulates that *a posteriori* adjustments should be made to any action or development that is failing to meet the objectives it was intended to achieve. In the context of instream flows, the principles of adaptive management dictate revision of modulation periods or flow values to correct situations identified in the course of follow-up or observed by users of the land. The same applies to any wildlife development where follow-up shows that it is not meeting the objectives set.

Following its review of the mitigation and follow-up measures proposed by the proponent, the Panel finds that the measures, as well as the related investments and mechanisms provided for, can be deemed sufficient insofar as they will be complemented by the recommendations made by the review bodies.

10.2 Overall finding

Having reviewed every aspect of the project in accordance with the *Canadian Environmental Assessment Act* and in compliance with the Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project, the Panel finds that the project meets requirements from a technical, strategic, commercial and economic perspective and that no alternative is currently preferable. Although the Panel believes that the anticipated environmental and social impacts will be numerous and widespread, the impacts are definable and could be mitigated in a satisfactory manner if all of the necessary conditions are met. For these reasons, and considering the project's clear benefits, the Panel finds that the acceptance of these impacts is justifiable.

Consequently, the Panel recommends that the project be submitted to the decision-making processes of the competent federal authorities on condition that the following recommendations be incorporated into their approval requirements, in addition to Hydro-Québec's commitments.

10.3 Recommendations

Foreword

The Panel notes that, in the course of its joint work with the Environmental and Social Impact Review Committee (COMEX), it was informed of the preliminary conditions COMEX would propose to the provincial administrator of the *James Bay and Northern Quebec Agreement* (JBNQA).

To Fisheries and Oceans Canada, within the context of enforcing the *Fisheries Act*, the Panel recommends:

General recommendations

1 That the proponent submit to Fisheries and Oceans Canada the detailed monitoring programs regarding the various aquatic environment components defined in the documents tabled in support of the request, no later than one year after the work has begun. The monitoring programs proposed must specify the sampling methods and protocols, completion schedule and project sectors that will be surveyed. These programs must explain, among other things, the choice of the final mitigation measures, the location of habitat enhancements and how the integration of data gathered from Cree hunters' observations will be facilitated and made possible. In addition to ensuring compliance to the commitments made by the proponent, these programs will have to account for the aspects specified in the recommendations hereinafter. Results obtained within the scope of the various monitoring programs shall be submitted regularly to Fisheries and Oceans Canada and used to review the planning of these programs.

The Rupert diversion bays section

2 That, in order to establish baseline conditions, the proponent submit to Fisheries and Oceans Canada its monitoring program for fish communities and population dynamics in the Rupert diversion bays, no later than six months after the project is approved.

3 That the proponent submit to Fisheries and Oceans Canada its detailed habitat enhancement and monitoring plan for spawning grounds effectiveness in the diversion bays sector. This program targets lake trout, lake sturgeon and brook trout particularly.

4 That, if spawning ground enhancements should prove ineffective for fish reproduction, then the proponent shall be required to search for new water bodies which are more favourable to these populations and make the proper habitat enhancements. These new enhancements shall be submitted to Fisheries and Oceans Canada.

5 That the proponent submit to Fisheries and Oceans Canada a program of genetic characterization of the Rupert brook trout strain between Lake Mistassini and Mesgouez Lake of the Rupert River basin.

The Rupert, Lemare and Nemiscau rivers section

6 That the adaptive management program for the instream flow regime target specific biological and hydraulic indicators, define objectives to be reached and indicate the application guidelines for corrective measures to be taken if these objectives are not met. As the proponent has committed to use an adaptive management approach for the ecological instream flow regime, it shall propose the modifications required to correct the situation if the values or periods of this regime should prove to be incorrectly assessed as regards fish habitats or would not guarantee the sustainability of fish resources valued by the Crees. These modifications shall be submitted to Fisheries and Oceans Canada.

7 That the proponent submit to Fisheries and Oceans Canada its monitoring program to regenerate the aquatic beds in the sector downstream from KP 314 of the Rupert River, in order to substantiate its predictions. The proponent shall include in the monitoring the use and colonization of aquatic beds by northern pike and prey species.

8 That the proponent submit to Fisheries and Oceans Canada its monitoring program for the thermal regime downstream from the various instream flow release structures for the Rupert, Lemare and Nemiscau rivers, in order to substantiate its predictions.

9 That the proponent submit to Fisheries and Oceans Canada its monitoring and remedial measures program for tributaries that are likely to be subject to erosion and, in some cases, to hinder the free movement of fish.

10 That the proponent submit to Fisheries and Oceans Canada a monitoring program of anadromous cisco between KP 13.5 and 25.5 of the Rupert River. The monitoring must include drifting larvae in the spring and the structure of anadromous cisco populations in the fall, as well as the baseline conditions over a two-year period before the partial diversion of the Rupert River. Lake whitefish was chosen as the target species to establish the flow during fall spawning. The results of this modeling cannot, however, be completely transposed to the Smokey Hill site regarding cisco breeding. The cisco seems to prefer slower currents than lake whitefish and its spawning period occurs slightly later. The previous recommendation regarding the adaptive management of instream flow will therefore have to be applied to anadromous cisco in addition to the species already targetted. The monitoring of anadromous cisco migration will have to be defined in collaboration with the community of Waskaganish and affected tallymen.

11 That the proponent submit to Fisheries and Oceans Canada any relocation of dip netting sites at Smokey Hill. This relocation will have to be defined in collaboration with the community of Waskaganish and affected tallymen.

12 That the proponent submit to Fisheries and Oceans Canada a monitoring program for the effectiveness of spawning ground enhancements located downstream of KP 314 on the Rupert River. Should these habitat enhancements not meet the objectives set out in the documents tabled to support the request, the planning of remedial measures, which may even include the creation of new spawning grounds, will also have to be submitted to Fisheries and Oceans Canada.

13 That the proponent submit to Fisheries and Oceans Canada a monitoring program specific to the lake sturgeon, including the species' drifting larvae. Specific attention must be given to the Rupert River stretch between KP 216 to KP 300.

The Rupert Bay and Rupert River estuary section

14 That the proponent submit to Fisheries and Oceans Canada, no later than one year after the project's authorization, a detailed monitoring program for total organic carbon (TOC) in the Rupert estuary and Rupert Bay.

15 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program of saltwater intrusion into Rupert Bay and the mouth of the Pontax River to substantiate the predictions of the simulation model..

The increased-flow section

16 That the proponent inform Fisheries and Oceans Canada about losses for every form of fish habitat located in the Sarcelle powerhouse area of influence, both upstream and downstream, and specify, if required, the measures planned to mitigate or compensate for them.

17 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program for multi-species spawning ground enhancements planned downstream of the Sarcelle powerhouse.

18 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program of lake sturgeon populations in the Boyd-Sakami system.

19 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program for the effectiveness of the fish pass developed to maintain the free movement of fish at KP 207, particularly for lake sturgeon, after the commissioning of the Eastmain-1-A powerhouse.

20 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program to establish, after the commissioning of the Eastmain-1-A powerhouse, baseline conditions for spawning grounds located in the area of influence of the Eastmain-1 powerhouses and dam. This monitoring must also document baseline conditions and modifications to other forms of fish habitat (nursery and feeding areas, and migration paths) to define, if required, mitigation and compensation measures.

21 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program to maintain fish populations in the stretch of the Eastmain River between KP 193 and KP 217, that takes into account the commissioning of the Eastmain-1-A powerhouse and the results gathered within the framework of the environmental follow-up program of the fish populations downstream from the Eastmain-1 dam.

The sections affected by the structures and related activities

22 That the proponent submit to Fisheries and Oceans Canada a detailed monitoring program for the water crossings characterized by the absence of impassable obstacles close to structures. Structures in the shape of prefabricated arches will also have to be integrated into this monitoring program if their presence decreases the width of the stream and, in the absence of obstacles, the free movement of fish.

To Transport Canada, within the context of enforcing the *Navigable Waters Protection Act*, the Panel recommends:

23 That the proponent provide Transport Canada with a comprehensive navigability monitoring program every year for the first five years.

24 That the hydrographic charts to be produced by the proponent during the construction and operational phases of the project be made available to all users. The proponent should notify Transport Canada of the measures it intends to take to ensure that the charts are distributed and updated.

25 That the proponent set up a mechanism for receiving comments and complaints from user of water bodies that will be affected by the project.

The Rupert diversion bays section

26 That the proponent determine, together with the tallymen affected, which corridors should be deforested in the diversion bays to ensure safe navigation and make it possible to access the shoreline of some bays by water craft. In the event that a corridor outside of the bays (e.g. the original corridor of the Nemiscau River) is more suitable, the proponent should agree on a preferred navigability plan for these corridors with the tallymen and submit it to Transport Canada.

The Rupert, Lemare and Nemiscau rivers section

27 That, in the course of monitoring Rupert River navigation conditions, the proponent ensure a depth of no less than one metre over the entire stretch, except for rapids.

28 That, in the bay and estuary of the Rupert River and in critical areas such as stretches that are not affected by hydraulic structures, the proponent be obligated to mark the navigation channel. For the first five years following the river's diversion, the proponent should hire, at its expense, a member of the Waskaganish community to mark the channel.

29 That, together with the users concerned, the proponent improve canoe trails along the Rupert River to make them safe for all users and suitable for their use. The necessary work should be carried out in the first two years following the diversion of the Rupert River by the Cree communities concerned. The proponent should submit a report on the work carried out to Transport Canada.

30 That, considering that the proponent has agreed to conduct a study on navigation conditions in certain tributaries of the Rupert River, including the production of baseline conditions, the proponent be obligated to provide baseline conditions, covering at least the tributaries of the Rupert River and other water courses in the area under study that will have a bridge, before construction of the structures begins.

31 That, in the event of exceptional climatic events that would make the use of the Rupert Dam's control structure essential, the proponent develop an information process that would warn users of water being released from the dam spillway, giving them the opportunity to take the necessary measures to ensure their safety.

The increased-flow section

32 That the proponent establish a program for disposing of wood debris in the increased-flow section of the river. The program should be developed and carried out together with the Crees in order to identify priority sections. The proponent should hire local workers at its expense to carry out the work.

33 That, in order to facilitate navigation and ensure safe travel, the proponent map, together with the Crees, preferred navigation corridors in the increased-flow section of the river. It should also plan to install booms in risk areas, notably upstream from the Sarcelle structure.

In addition to the above recommendations, which are specifically addressed to federal decision-making departments pursuant to the applicable acts, the Panel submits the following recommendations for consideration:

To the federal government, the Panel recommends:

34 The issue of cumulative effects affects several jurisdictions, including the federal government, the provinces of Quebec, Ontario and Manitoba, the territory of Nunavut as well as several government departments linked to these various levels of government. Assessing cumulative effects therefore goes far beyond the responsibility of a single proponent. Within this context, it would be imperative for the federal government to implement a large-scale research and monitoring program for the James Bay and Hudson Bay ecosystems. Such a program could be coordinated by an independent body whose structure is akin to that of the International Joint Commission. Such a structure could foster the pooling of efforts and resources of all concerned government agencies, as well as those of the academic community, which is already working on various problems related to the cumulative effects in this sector. Whatever the chosen structure, it would be essential for the various Aboriginal communities affected to be stakeholders in this research and monitoring program, in order to integrate into it traditional knowledge and local expertise.

35 That the Territorial Program managed by the Cree Human Resources Development agency be reinstated.

To Hydro-Québec, the Panel recommends:

Biophysical aspects

The Rupert diversion bays section

36 That the proponent ensure the transmission of results to Crees and tallymen when performing follow-ups. It should also develop a mechanism which puts the results into layman's terms for the communities affected.

37 That the proponent integrate Crees from every community affected by the project into its sampling campaign field teams. The traditional knowledge of users should be recognized when developing and implementing monitoring programs.

38 That the proponent propose to integrate the relevant elements of its project monitoring program with those already planned for the development of Eastmain-1, to avoid redundancy and foster complementarity and efficiency.

39 That the proponent implement a communication plan to transmit sampling campaign results concerning the characterization of fish communities and the dynamics of the Rupert diversion bays, in order to keep the users of these bodies of water informed.

40 That the proponent monitor mercury in fish flesh for the Rupert diversion bays sector.

41 That the proponent monitor every habitat enhancements in order to verify their use by waterfowl.

42 That the proponent monitor the evolution in waterfowl density in the Rupert diversion bays sector in order to verify if this density is in compliance with objectives given in the documents tabled in support of the request. This information could be used to plan for required mitigation measures.

43 That the proponent monitor the use of nest boxes by tree-nesting ducks. This follow-up could be done jointly with affected tallymen and spread over a period of at least five years.

44 That the planned caribou monitoring program include telemetric monitoring of woodland caribou in various project sectors during the construction and operation phases. The proponent would carry out a survey to pinpoint woodland caribou herds in order to establish baseline conditions.

45 That the proponent, in cooperation with applicable Cree organizations, perform monitoring of subsistence caribou harvesting in the study area.

46 That, during the impoundment of the diversion bays, the proponent perform a helicopter overflight within diversion bay boundaries to follow the movements of land wildlife.

47 That the trapping or relocation program for beaver planned in the diversion bays be given enough time before impoundment occurs, to allow for an adequate attempt at trapping or relocating beavers which are affected by the project.

48 That the proponent carry out a new survey of micromammals in order to increase knowledge as to the presence of these species in the study area. To this end, it should improve the monitoring program that it has planned for developed or seeded wetlands.

The Rupert, Lemare and Nemiscau rivers section

49 That the proponent promote a voluntary registration program of anadromous cisco catches downstream from KP 25. This program should begin two years before the Rupert River diversion, and be developed in collaboration with the community of Waskaganish and affected tallymen.

50 That the proponent jointly develop, with the community of Waskaganish, an information program for community residents in order to promote, strengthen and maintain the use of a fishing site at Smokey Hill.

51 That the proponent promote a voluntary registration program of lake sturgeon catches downstream from KP 314 of the Rupert River. The program should be planned and implemented in collaboration with affected users.

52 That the proponent monitor mercury in fish flesh for the Rupert, Lemare and Nemiscau rivers sector downstream from the control structures.

53 That the proponent monitor special-status plant species. Specifically, it should include the effect of seeding where *Gratiola aurea* will have been identified.

The increased-flow section

54 That the proponent monitor mercury in fish flesh for the increased-flow section. The proponent should include stations downstream from the control structures and Eastmain-1-A powerhouse in its monitoring program. The stations should permit the measurement of bioaccumulation in non-piscivorous fish and assess the scope of the mercury export downstream from these structures.

The La Grande Rivière estuary and James Bay coast section

55 That the proponent perform, in consultation with the Crees, a long-term monitoring of the eelgrass beds on the east coast of James Bay, in order to contribute to a better assessment of their condition. This monitoring should include stations located outside of the potential influence areas of instream flow modulations from the La Grande Complex, in order to establish whether this factor is important in eelgrass abundance variations observed since 1998.

Social aspects

56 That the proponent support the "canoe brigade" initiative during and after the work. Before the construction of the Rupert River hydraulic structures begins, the proponent should work with Cree communities to encourage youth to participate in the initiative. The proponent should also help promote and ensure the continuity of the initiative, regardless of the route chosen on nearby rivers.

57 That the proponent work with the Cree Board of Health and Social Services of James Bay (CBHSSJB) to develop a monitoring program for assessing the impact of its project on certain determinants (to be selected jointly) that affect the health of Crees.

58 That before the work begins, the proponent develop, together with health care organizations, a performance measurement program that includes performance indicators covering:

- measures needed to support Cree workers who are experiencing difficulties related to their integration into the work environment;
- social relations between all workers;
- problems likely to occur in some Cree communities owing to the proximity of workcamps.
- success of the measures, to be assessed annually for the duration of the work.

59 That the proponent provide data on changes in mercury levels in fish for the Rupert diversion bays and the Rupert, Lemare and Nemiscau rivers downstream from the closure points. The proponent's monitoring program should also cover mercury levels downstream from the control structures and the Eastmain-1-A powerhouse. From the monitoring stations, it should be possible to evaluate the phenomenon of increased bioaccumulation in non-piscivorous fish and assess the scope of the dissemination of mercury downstream from the structures. The proponent should ensure technical and scientific support for the CBHSSJB. It should submit a joint report with the CBHSSJB on progress made in research regarding the issue of mercury in terms of overall health and on the effectiveness of information campaigns pertaining to mercury and fish consumption.

60 That, because the Mercury Agreement will expire before changes in mercury levels in fish in the reservoirs and diversion bays and mercury's impact on health are fully known, the proponent submit, together with the Cree authorities concerned, a report on the activities governed by the Agreement and a progress report on changes in mercury levels one year before the Agreement expires. The report should set out the merits or lack thereof of extending the Agreement and specify future objectives and orientations, if applicable.

61 That the proponent implement a Rupert River water quality monitoring program by focussing on sectors where Aboriginal camps are concentrated so as to determine the scope of the project's impact on water quality relative to the different water uses and inform the competent authorities of findings every year for the first five years following the start of the work.

62 That the proponent conduct a follow-up to ensure the integrity of the Waskaganish water intake and prevent silting resulting from changes in river hydrodynamics or shoreline stability.

63 That the proponent, in close consultation with the competent Cree authorities, ensure the availability of

a mechanism for receiving comments and complaints and proposing solutions to any problem that could result from dissatisfaction among users of the land caused by the impacts of the project.

64 That the proponent provide each tallyman with a written document outlining all of the planned mitigation and compensation measures agreed upon with the tallymen for their respective traplines.

65 That, in addition to the parameters already included in its program for monitoring the use of traplines during the construction phase, the proponent take into account over a longer timeframe the tallymen's need to use other land for food and the means they use to do so, including financial compensation.

66 That the proponent integrate members of the Eastmain and Wemindji communities, notably the tallymen affected by the project or users appointed by them, into its fieldwork teams for monitoring and mapping the navigation corridors and snowmobile trails on the Opinaca Reservoir and Boyd and Sakami lakes. The traditional knowledge of users should be incorporated when developing and implementing the programs.

67 That the proponent monitor ice cover in the Rupert estuary and along the shoreline of Rupert Bay together with the tallymen or their delegates. The monitoring program, covering 10 years from the time the Rupert Dam is brought into operation, should include freeze-up and thaw periods.

68 That the proponent install signs indicating snowmobile crossings along the new access routes built for the project. With the help of the tallymen affected by the project, the proponent should also determine where parking areas could be created along the routes to reduce the risk of accidents and then proceed with the construction of the parking areas.

69 That the proponent develop a five-year program consisting of annual initiatives to mitigate and compensate for the impacts on traplines and community areas that are observed in the course of the project's monitoring programs. The program is to be carried out with the tallymen and communities concerned. The program should cover at least 10 years for traplines affected along the Rupert River and 15 years for those along the diversion bays and should be re-evaluated after those periods. Planned joint initiatives could include participation in follow-up inventories, the removal of debris and any other measures to increase knowledge and use of the territory by users.

70 That, in order to develop tourism in the James Bay area, the proponent, as a good corporate citizen, explore the various avenues suggested, including cultural event sponsorship or a financial contribution to implement this development. The proponent should work with COTA and Tourisme Baie-James to consolidate the offer of recreational and tourism activities, such as establishing packages for visiting the La Grande Complex and other local attractions. Together with COTA and the CNACA it should conduct a study on the Rupert River's tourism potential and, if appropriate, develop a program of corrective measures addressing the project's impacts on lost or diminished opportunities respecting expanding or emerging tourism products offered by Crees in the area.

71 That the proponent establish a program for disseminating information on wildlife management and exploitation for the other project camps (i.e. Sakami Lake, Sarcelle River, Rupert River, Jolliet Lake and Kilometre 257 and the Kauschiskach camp), like the one planned for the Nemiscau camp. The proponent should ensure that the information on hunting and sportfishing rules applicable to the territory be provided to workers upon their arrival.

72 That, together with the responsible jurisdictions, the proponent install signs on all new and existing roads in the project area, indicating the territorial hunting and fishing limits for non-Aboriginals.

73 That, in the event that the mandate of the Weh-Sees Indohoun Corporation is extended, the proponent agree to conduct a study on the satisfaction of individuals overseeing traplines in the corporation's area of intervention relating to the assessment of wildlife management and exploitation work. The proponent should suggest means for reducing any inconveniences identified by the tallymen.

74 That, due to the controversy resulting from the poor harvesting of wood during the impoundment of the Eastmain 1 Reservoir, as well as the precarious state of Quebec's wood industry, and considering the impact of forest fires on the affected area, the proponent maximize the economic recovery of the forestry resource.

75 That, for the purpose of obtaining an overall understanding of the human occupation of the land affected by the project and preserving certain elements of the past, the proponent carry out the proposed archaeological survey and excavation program before the construction of the structures, or at least before the impoundment of the diversion bays.

76 That, considering that the proponent's archaeological studies are important as elements that bear witness to the past, the proponent should promote them in the Cree community and Quebec society by providing summaries of the archaeological digs and inventories as well as actively participating in showcasing whatever artefacts are uncovered.

77 That, because some Crees have complained about the lack of information on the flooding of the territory for Eastmain-1, it would be desirable that the means of communication used be improved for the project under study.

78 That, because there are uncertainties regarding the eventual use of the fishing grounds, the value of the landscape and the traditional attraction of Smokey Hill, the proponent address the previous role that Smokey Hill played.

79 That, in the event that the Smokey Hill site should no longer be able to serve as a valued fishing ground or community meeting place, the proponent find and develop a site to replace it, together with the Crees.

80 That the loss of the land and burial grounds be recognized by a Cree toponym.

81 That, considering the major and irreversible changes to the Rupert River, the proponent sponsor a commemorative work depicting the history, occupants, aesthetic value and valued areas of this heritage river. The work will be dedicated to the Eeyou Istchee Cree nation.

82 That, considering the serious concerns expressed by many members of the Cree community concerning the safety of Hydro-Québec's structures, the proponent thoroughly review the communications strategy it has adopted to communicate with this population.

To the Cree authorities, the Panel recommends:

83 That Cree community leaders agree to play a major role in defining the type of information that the proponent should provide for community members to reassure them about the safety of the hydroelectric structures and that they do everything in their power to facilitate the dissemination of the information in their communities.

10.4 Divergent opinion

In signing the *Paix des braves* agreement with the Quebec government in 2002, the Cree Nation consented to the Eastmain-1-A and Rupert Diversion hydroelectric project. Under this agreement, the project is subject to the applicable environmental legislation as well as the environmental and social protection regimes provided for under Section 22 of the JBNQA. With a view to harmonizing the various environmental assessment and review processes, the Quebec and Canadian governments and the CRA signed an agreement setting out the operational procedures to be followed by the different review bodies in their assessment of the project. This report is that of the Federal Review Panel appointed to evaluate this project. As a member of this Panel, I can say that I agree with the majority on several points concerning the joint analysis we have carried out.

Moreover, I believe that, in its approach to hydroelectric development, the Crown corporation should emphasize equipment maximization and I believe that Quebec is entitled to exploit this generating option to meet its needs and to take advantage of opportunities in the export market. I consider that the cost of the project is clearly advantageous compared to the other proposed hydroelectric projects. I agree with the conclusions according to which the project's main advantages are the economic spin-offs it will generate for Northern Québec and the surrounding regions and that, although these benefits will be temporary and concentrated during the construction phase, they could lead to the acquisition of expertise and the creation of businesses. However, I do not believe that these advantages outweigh the project's negative impacts and some uncertainty remains regarding the magnitude of these impacts. The following are the points on which my opinion diverges from the conclusions of the majority of members of the Panel.

1. Adaptive management

In order to limit the impact of the diversion of the Rupert River on fish habitats, an ecological instream flow regime is planned that would be synchronized around three periods of biological activity of the main fish species present in the river. The proponent has also agreed to respect the principle of adaptive management for this instream flow regime. The application of this principle would allow, if need be, for the revision of this regime if an impact is detected *a posteriori*, either during environmental monitoring by the proponent or as observed by users of the territory.

However, such a measure does not allow one to determine, in advance of the project's approval, the potentially adverse effects if changes in the values of this regime aimed at protecting habitats or the sustainability of fish resources were to prove unrealistic in terms of the project's economic efficiency. While the proponent's

environmental protection commitments were surely factored into its economic risk analysis, we have no information whatsoever on the percentage of maximum flow that it would consider reasonable to restore to the river. The project's economic profitability must be assessed on the basis of environmental requirements before permits are obtained, otherwise the project would be funded on "environmental credit," in which case it would be unacceptable for the project to go ahead. This situation brings to the fore the dilemma of pursuing a profitable business proposal vs protecting the environment. To accept a project is also to accept that the mitigation measures required of the proponent be realistic, even in the case of a Crown corporation.

2. Sum of effects of the project

The assessment of the project's impact on the use of the territory by the Cree community reveals some significant negative aspects. For example, the ability of the Mistassini and Nemaska communities to exploit their hunting grounds would be seriously compromised. Although the wetland development and bank seeding program should stimulate new plant growth on the banks in the bays and on the Rupert River and favour the return of wildlife and waterfowl, hunters will nonetheless have to adapt to the new environmental conditions. Many fishers in the Nemaska and Waskaganish communities who use the Rupert River fishing grounds upstream and downstream of the Rupert dam will have to reorganize their activities in accordance with the new conditions.

With regard to community sites, four sectors could lose some of their appeal or, at the very least, require major adaptation on the part of users. The first sector, which stretches over nearly 10 km, between KP 5 and 15 on the Rupert River, is a popular fishing and goose-hunting area for many members of the Waskaganish community. The integrity of the Smokey Hill lake cisco fishing ground and the sturgeon fishing ground at KP 136 as well as the future use of the Asinii Kabasiganot sector are also called into question. Bank exposure in the Rupert River estuary resulting from the drop in water levels will alter these areas, which are frequently used by the community for all types of fishing, hunting and recreational activities.

The Rupert River represents an area and a way of life that are highly valued by the Nemaska and Waskaganish communities, and these communities will be affected by the changes to the River. The full force of the impact of the Eastmain-1 reservoir and powerhouse as well as the effects of the project as a whole will be felt by members of these communities who practice activities in this sector. Since a permit has already been issued for the Eastmain-1 project, there is no way to assess the magnitude of the impacts on traplines that will now be doubly affected. Moreover, numerous camps, burial sites, birth places and other valued sites in the diversion bays will be lost.

In addition to the need to adapt to new harvesting conditions, the project draws attention to the difficulties that certain members of the Nemaska and Waskaganish communities will have travelling by snowmobile and boat, particularly in the Rupert estuary. Other communities are currently facing difficulties with snowmobile and boat travel as a result of the construction of the La Grande Complex. For Eastmain, users will once again be forced to adapt to modified navigation conditions resulting from Eastmain-1. For the Wemindji and Chisasibi communities, the only way to assess the true impact of the project will be by monitoring navigation conditions and studying complaints by users.

In addition, members of the Nemaska and Waskaganish communities fear a decline in the quality of the water in the Rupert River, which they use for domestic purposes. Monitoring will be the only way to verify the extent to which an increase in the river's turbidity downstream of Lake Nemiscau will drive away certain users and force them to seek alternative solutions.

Most of the tallymen have indicated that they will continue to use their hunting grounds even if the project goes ahead, but say they will have to wait and see what the real impact of the project will be on their practices. 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 harvested and if fishing yields are unsatisfactory. The proponent has not, however, assessed the potential impact of the project on neighbouring traplines.

According to the proponent, approximately 12% of the population of the six communities concerned would be directly affected by the project. The extent of the project's impacts on other members of the Cree community remains unpredictable. Some of the effects of the project are known. Others remain to be determined because, in certain cases, discussions must be held between the proponent and the tallymen affected by the project before decisions can be made on the nature and scale of the work to be undertaken. It is impossible to judge the extent to which the impacts on traditional fishing, hunting and trapping activities will be mitigated by the measures proposed by the proponent or compensated by the

funds provided for in the Boumhounan Agreement, which is designed to facilitate use of the land and the pursuit of traditional activities. Only a follow-up study on the satisfaction of the tallymen and other hunting ground users will indicate whether the majority of them are able to successfully readapt to the new travel and resource management conditions. Given the magnitude of the follow-up and monitoring required, some of which will serve to confirm the hypotheses on which the very design of the project is based, it will be several years before we will be able to determine the accuracy of these hypotheses and the success of the mitigation and compensation measures. Only then will we be able to fully judge whether the project's advantages outweigh its disadvantages.

3. Restrictions on fish consumption

The problem of mercury contamination among the Crees was established in the 1970s. At that point, guidelines were issued restricting the consumption of fish caught in the region's natural lakes. Further restrictions were added as a result of the contamination of modified environments resulting from the La Grande Complex for 30 years after its commissioning. In the first summer following the commencement of operations on the Rupert, recommendations on the consumption of fish from modified environments of the La Grande Complex, with the exception of the Eastmain 1 reservoir, the Rupert diversion bays and the Lemare and Nemiscau rivers, will be much the same as those for the region's natural lakes. The project will extend the additional restrictions planned for the Eastmain 1 reservoir by one year. Other restrictions will have to be applied for the Rupert diversion bays and the Nemiscau and Lemare Rivers, but not in the lower Rupert.

The project will thus result in additional consumption restrictions for the Mistissini and Nemaska communities. As for the community of Eastmain, the cumulative effect of the Eastmain-1 and Eastmain-1-A projects will result in a one-year extension of the fish consumption restrictions already planned for walleye and lake trout in the Eastmain 1 reservoir. For the sector including the diversion bays and the area downstream of them, only one meal per month would be acceptable for walleye, northern pike and lake trout from the diversion bays and the Eastmain 1 reservoir. These restrictions would remain in effect for a period of four to 13 years, depending on the species and the location. For lake whitefish, lake sturgeon, brook trout and longnose sucker, unrestricted consumption of 12 meals and more per month will be replaced by eight meals per month, valid for a period of 10 years in the diversion bays. There would be no change in current recommendations for the Rupert River downstream of the dam and for the Lemare River as far as piscivorous species are concerned. For other species, a restriction of eight meals per month is proposed for a period of five to eight years for the Lemare River. As for the Nemiscau River, recommendations range from eight meals to one meal per month, for periods of three to 11 years, depending on the species.

In the 1990s, Aboriginal people were considered vulnerable groups due to the large quantity of fish they consume. In order to preserve the nutritional health benefits of some fish consumption, health organizations preferred to talk about an intervention threshold instead of restrictions. It is obvious that, due to the restrictions that have already been imposed, certain sub-groups in these communities, including pregnant women, are particularly affected by the even stricter restrictions if the guidelines of the WHO are stringently applied.

In its impact study, the proponent only presented restrictions aimed at adults in general. It planned to formulate "substantially lower" recommendations for vulnerable sub-groups at a later date, in accordance with WHO recommendations and in collaboration with the Cree Board of Health and Social Services of James Bay (CBHSSJB), the public health authority for the Crees, and the *Conseil régional de la santé et des services sociaux de la Baie-James* (James Bay regional health and social services board), responsible for non-Aboriginals, notably in order to avoid any potential overexposure of fetuses to methyl mercury. In response to a request by Health Canada at the public hearings, Hydro-Québec presented the theoretical repercussions of the project on fish consumption for women of child-bearing age, nursing women, and children. The restrictions that apply to these groups are substantial, particularly for piscivorous species, and in some cases, particularly in the diversion bays, consumption is not recommended at all. For lake whitefish, the recommendations decrease from eight to four meals per month for the Rupert, Lemare and Nemiscau rivers downstream of the closure points and for Lake Nemiscau. For the Eastmain 1 reservoir, the restriction is now two meals instead of four. The duration of the recommendations is more restrictive for piscivorous species, depending on their location. For lake trout caught downstream of the Nemiscau River closure point, the recommendation ranges from two meals per month to "not recommended" for periods ranging from 0 to 16 years, and from 13 to 28 years for walleye downstream of the Rupert diversion bay.

We are faced with an impact that is finishing at Chisasibi and Wemindji, with restrictions that come on top of those already made necessary by the Eastmain-1 project, with additional consumption restrictions to those already imposed by the natural presence of mercury in the environment and with major consumption restrictions for vulnerable sub-groups. The residual cumulative impact in relation to mercury therefore exists. Since the proposed solutions are additional consumption restrictions lasting for a period of 29 years, this impact can be described as being negative, and, due to its inevitably, it can be considered a major impact.

4. Social acceptability

Hydroelectric development has left a strong mark on Cree society over the past 30 years. The public hearings revealed that many of the negative aspects of this development have been poorly assimilated. Moreover, it became clear that there is no consensus on the project under study. In every community visited, an agonizing debate has played out between those who accept the project and its economic advantages, and others who, while they welcome development driven by a new modernity, see the preservation of their living environment and respect for their cultural values as a necessary component of that development.

The Chiefs of the Nemaska, Waskaganish and Chisasibi, along with many members of these communities, have expressed opposition to this project. The environmental groups that participated in the hearings share their opposition, preferring alternative options. Certain members of the Waskaganish and Nemaska communities have trouble accepting the fact that only the tallymen and their families were asked to identify their hunting and fishing zones, their valued sites and the compensation measures that would allow these users to pursue their activities in these areas. Many believe that the communities as a whole should have been consulted in this regard since all of them will feel the impact of the partial diversion of the Rupert River. Others consider unacceptable the agreement signed between the *MBJ* and Hydro-Québec, which provides for, among other things, a remedial works fund aimed at facilitating cultural, social, environmental, tourist and economic projects in the municipality's territory. The Crees have exclusive hunting rights to certain wildlife species on category III land, which are Crown land and under the jurisdiction of the municipality. As such, there is an urgent need to establish a regional development plan for public lands, the responsibility of which falls to the *Ministère des Ressources naturelles et de la Faune* du Québec Such a plan must go beyond the mere development of natural resources to emphasize the collective heritage present and take into account the different uses of this territory by all.

The *Paix des braves* notably advocates the use of hydroelectricity to foster the development of the territory. With the Eastmain-1-A and Rupert Diversion project, one would hope to see the Crees enter a new era of development characterized by a desire to take control of their future. But it would be important to take the time to gather together all the elements necessary to guarantee that hydroelectric development is pursued in a harmonious way.

5. Loss of a natural and cultural heritage

On a historical level, the Rupert River is part of one of the major arteries linking the St. Lawrence River and James Bay watersheds. It was one of the rivers most frequently travelled by explorers transporting commercial goods, including furs. The Crees have used it for centuries and it continues to play an essential role in their culture and way of life. Archaeological sites attest to its use as far back as the period of prehistoric human occupation. During the public hearings, the Rupert River was referred to on many occasions as being a jewel of Quebec, a pristine river that must be preserved.

A comprehensive survey of Quebec's natural river heritage indicates that very few rivers suitable for canoeing are rated as being exceptional in terms of landscape quality over their entire length or on at least one stretch. The proponent prepared an overview of the rivers rated by the *FQCK* as having exceptional or very good landscape quality, in whole or in part, in order to determine the relative significance of the Rupert River in the James Bay landscape. The following table presents a list of all the rivers in Quebec with canoe routes classified as being exceptional in whole or in part and those classified as being remarkable over their entire length. This classification is based on the ratings established by the *FQCK* and the rivers are grouped according to watershed.

This table shows that, of the 339 canoeing rivers studied by the *FQCK*, only 17 Quebec canoeing rivers have exceptional landscape over their entire length, while 10 have exceptional landscape on at least one stretch. Among them, several are only tributaries, and 33.3% have hydroelectric structures on them or are contemplated by projects under study.

Canoeing rivers possessing remarkable landscapes over their entire length represent 18.6% of Quebec's

Table 10-1 Landscape classification of navigable rivers in Québec

Rating	Exceptional*****	Exceptional on at least one stretch****	Remarkable****
Watershed 01 28 rivers	None	Bonaventure (58.5)[1] Cascapedia (31) Du Grand Pabos (11)	Assemetquagan (25.3 + 30.4) § Bonaventure Ouest (41) § Petite Cascapedia Est (48.5) § Petite Cascapedia Ouest (19) § Petite Cascapedia (33) La Grande Rivière (45) Du Grand Pabos (11 + 16.7) Du Petit Pabos (35) Port-Daniel (15.1) Squatec (25.3)
Watershed 02 25 rivers	Cap-Chat (36.3) Sainte-Anne (39.1) Saint-Jean (63.4) York (82.8)	None	Dartmouth (35) Madeleine (78) Malbaie (13.1) **+Mistigougèche** (16 + 23.6) §
Watershed 03 29 rivers	None	None	Eaton Nord (20.5) § Ditton (9) §
Watershed 04 64 rivers	Dumoine (140)	**+Gens de Terre** (51.5) Rouge (8)	**+Noire** (39 + 172) Aux bleuets (54) § De l'Orignal (60) Tomasine (24)
Watershed 05 61 rivers	Sainte-Anne-du-Nord (50 + 15) Des Neiges (17) §	Jacques-Cartier (23 + 38) Malbaie (45 + 52)	Aux Rats (45) § Du Gouffre (72) Sautauriski (24) § Tourilli (23.6) §
Watershed 06 38 rivers	**+Saguenay** (111)	None	Sainte-Marguerite Nord-Est (34) § Aux Écorces Nord-Est (60) § **++Ouiatchouan** (36.4) Petite Rivière Pikauba (71) § Saint-Jean (55)
Watershed 07 28 rivers	Magpie Ouest (183) § Manitou (70) Moisie (400) **+Mouchalagane** (128) **++ Natashquan** (108 + 290) **++Saint-Jean §** (220)	**+Portneuf** (67km) **++Du Petit Mécatina** (515 km)	Aguanish (270) **+Godbout** (99) Mac Donald (80) **+Magpie** (55) Nipissis (75 + 60) § Pentecôte (45) Aux Rochers (16.2) **+Du Sault aux Cochons** (128) **+Seignelay** (88) **+De la Trinité** (83)
Watershed 08 34 rivers	None	None	À la Marte (174.9) § **++Rupert** (518[2] + 107.8) Témiscamie (98.8 -source=Labrador)

Table 10-1(continued) Landscape classification of navigable rivers in Québec

Rating	Exceptional*****	Exceptional on at least one stretch****	Remarkable****
Watershed 09 16 rivers North of the 51st parallel	**+À L'eau Claire** (92 + 35) De Povirnituk (416)	**+Eastmain** (303)	Grande Rivière de la Baleine (375) Innuksuac (404) Petite Rivière de la Baleine (380) Au Castor (114) Au Castor Est (105) § À L'eau froide (206) § **+La Grande Rivière** (779) La Nataspoka (189) **+Sakami** (410)
Watershed 10 16 rivers North of the 54th parallel	Koroc (165)	None	Arnaud (292) À la Baleine (380) **+Caniapiscau** (310) Aux Feuilles (351) George (179 + 420) Aux Mélèzes (267) Swampy Bay (310) § Wheeler (190) § De Pas (215) § **+Koksoak** (138) Du Sable (88) § Vachon (232)
Total 339	**17**	**10**	**63**

1: Length in kilometres of canoe routes.
2: Includes Lake Mistassini
+: Hydroelectric structures/reservoir; ++ Hydroelectric project.
§: Tributary (exception made for tributaries of the Ottawa, Gatineau and St. Lawrence rivers).

Watershed 01: Gaspésie (rivers that flow into the Gulf of St. Lawrence, Chaleur Bay or tributaries of these rivers); Lower St. Lawrence (Témiscouata River).
Watershed 02: Gaspésie (rivers that flow into the Gulf of St. Lawrence); Lower St. Lawrence (rivers that flow into the St. Lawrence or tributaries).
Watershed 03: Centre-du-Québec and Eastern Townships (tributaries of the Saint-François and Au Saumon rivers – Mont-Mégantic region).
Watershed 04: Laurentians, Ottawa Valley, Abitibi-Témiscamingue (tributaries of the Ottawa River, La Vérendrye Wildlife Reserve, north of the Mitchinamécus reservoir).
Watershed 05: Mauricie, Quebec City, Charlevoix (rivers that flow into the St. Lawrence – North Shore or tributaries of these rivers).
Watershed 06: Saguenay–Lac-Saint-Jean (Saguenay or its tributaries, rivers that flow into Lac Saint-Jean or Kénogami Lake).
Watershed 07: Duplessis, Manicouagan (rivers that flow into the Manicouagan reservoir or the St. Lawrence River or Gulf of St. Lawrence on the North Shore).
Watershed 08: Abitibi-Témiscamingue, Nord-du-Québec (mainly rivers in the *MBJ*).
Watershed 09: Nord-du-Québec (rivers north of the 52nd parallel that flow into James Bay or Hudson Bay or their tributaries).
Watershed 10: Nord-du-Québec (north of the 54th parallel, mainly rivers that flow into Ungava Bay).

Source: R18

natural river heritage. But, here again, 20.6% of these beautiful rivers have existing or planned hydroelectric structures on them. If one excludes tributary rivers, there are 25 rivers north of the 49th parallel that have a very good canoe route, including the rivers in watersheds 08, 09 and 10 and those in watershed 07, with the exception of the Sault aux Cochons River located at latitude 48°44'. Of these main watercourses, 36% have existing or planned structures.

The table also shows that there are no other canoe routes with landscapes that are equal or superior in quality to those of the Rupert River located in watershed 08 or wholly on the territory of the *MBJ*: the Rivière à la Marte is a tributary of the Rupert River and the source of the Témiscamie River is located in Labrador.

The proponent admits that the significance of the project's impact on the landscapes of the Rupert River and its tributary will be "moderate," since the landscape will lose some of the features that make it remarkable, including the spectacular scenery afforded by the Smokey Hill, Oatmeal and Gorge rapids. Thus, in spite of the instream flow and construction of hydraulic structures along its route, this river would lose several of the vital features that render its landscape "remarkable."

Moreover, the 555.8-km stretch of the Rupert River that is suitable for canoeing is longer than most of the major waterways in Quebec, including the Chaudière River (30.6 km), Yamaska River (44.6 km), Saguenay River (111 km), Richelieu River (130 km) and Saint-Maurice River (389 km). The only exception is the Ottawa River (1,132 km), which is the longest river in Quebec. In terms of total length, the Rupert is surpassed only by the St. Lawrence River (2,600 km), Ottawa River (1,166 km), Saint-Maurice River (1,046 km), Grande River (779 km) and Grande Rivière de la Baleine River (720 km). Thus, the cumulative residual impact would not only involve a 2% increase in the stretch of the river that is considered unsuitable for recreational boating, as indicated by the proponent in its impact assessment, but the partial diversion of the Rupert would have a significant impact on the natural heritage of Quebec's extremely beautiful rivers and major water ways. It turns out that Quebec, which is recognized for its watercourses, has a very limited number of rivers deemed to be of exceptional beauty, and that several of its rivers considered to possess "remarkable" landscape have already been affected by hydroelectric development.

Despite the mitigation measures proposed by the proponent, therefore, the partial diversion of the Rupert River represents a major negative cumulative effect on Quebec's natural and cultural heritage and raises questions about whether limits should be imposed on hydroelectric development, particularly on Eeyou Istchee territory.

The project to create the Albanel-Témiscamie-Otish National Park, an area representative of the boreal forest and encompassing the upper Rupert River, should have included this river up to its mouth. Moreover, this park is regarded as a potential lever to facilitate the emergence of small tourist-centred enterprises in the region. There is nothing to indicate that things would be otherwise for the rest of the Rupert River. In order to recognize and truly protect the collective heritage of the historical and prehistoric corridor of this natural and still-pristine river, an effort must be made to avoid fragmenting its territory. Given the irreversible nature of all that would be lost as a result of this project, this type of river should be included in the category of species designated as being at risk, threatened or vulnerable, and considered as such in Quebec's system of protected areas.

For all of the reasons mentioned above, it is my opinion that this project should not be carried out.



Jocelyne Beaudet

Member



Appendix 1

Documentation

CODIFICATION

1. **Procedure (P)**
2. **The proponent's Environmental Impact Statement and sectoral studies**
    - 2.1 Environmental Impact Statement submitted by the proponent (EI)
    - 2.2 Sectoral study submitted by the proponent (ES)
3. **Compliance review of the environmental impact assessment**
    - 3.1 Position papers and other documents submitted by the participants (MC)
    - 3.2 Notices from government departments and agencies (AV)
    - 3.3 Proponent's responses (RP)
    - 3.4 Documents submitted by the review bodies (COE)
4. **Technical meetings**
    - 4.1 Documents submitted by the proponent (RTP)
    - 4.2 Documents submitted by the review bodies (RTOE)
    - 4.3 Transcripts (verbatim) of technical meetings (VRT)
5. **Public hearings**
    - 5.1 Position papers and documents submitted by the participants (M)
    - 5.2 Documents submitted by participants without an oral presentation (DAP)
    - 5.3 Documents submitted by participants during an oral presentation (no position papers submitted (DPO)
    - 5.4 Documents submitted during the hearings by the proponent (PAP)
    - 5.5 Complementary documents submitted by the proponent (DCAP)
    - 5.6 Documents submitted by the review bodies (DOE)
    - 5.7 Transcripts (verbatim) of the hearings (VAP)
6. **Documents submitted after the public hearings**
    - 6.1 Documents submitted by the participants (D)
    - 6.2 Documents submitted by the proponent (PD)
    - 6.3 Documents submitted by the review bodies (OED)
7. **Miscellaneous correspondence (C)**
8. **Other reference documents (R)**

1. PROCEDURES

P1 - CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY – MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC – SECRÉTARIAT DES AFFAIRES INTERGOUVERNEMENTALES CANADIENNES DU QUÉBEC – SECRETARIAT AUX AFFAIRES AUTOCHTONES DU QUÉBEC – CREE REGIONAL AUTHORITY. *Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project.* April 2003. 12 p.
P2 - MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC. *Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert Diversion Project*. July 2003. 55 p. and 2 appendices.
P3 - ENVIRONMENT CANADA. *Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert Diversion Project*. August 14, 2003. 55 p. and 2 appendices.
P4 - CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY. *Mandate of the Federal Environmental Assessment Review Panel for the Eastmain-1-A and the Rupert Diversion Project.* November 1, 2004. 3 p.
P5 - FEDERAL REVIEW PANEL – COMEX. *Operational Procedures for the Review of the Eastmain-1-A and Rupert Diversion Project.* December 2004. 12 p.
P6 - FEDERAL REVIEW PANEL – COMEX. *Examen de la conformité de l'étude d'impact – Guide pour l'élaboration de commentaires*. February 2005. 4 p.
P6.1 – *Transmittal slip for written comments on the compliance of the impact assessment.* 1 p.
P7 - FEDERAL REVIEW PANEL – COMEX. *Procedures Relating to Public Hearings to Review the Eastmain-1-A and Rupert Diversion Hydroelectric Project.* November 28, 2005. 4 p.

2. ENVIRONMENTAL IMPACT STATEMENT AND SECTORAL STUDIES SUBMITTED BY THE PROPONENT

2.1 Environmental Impact Statement submitted by the proponent (HYDRO-QUÉBEC PRODUCTION)

EI1 - *Eastmain-1-A and Rupert Division - Environmental Impact Statement. December 2004. 2,354 p. with maps and tables.*

EI1.1 - *Volume 1 - Chapter 1 to 9.*
EI1.2 - *Volume 2 - Chapter 10 to 12.*
EI1.3 - *Volume 3 - Chapter 13 to 15.*
EI1.4 - *Volume 4 - Chapter 16 to 25.*
EI1.5 - *Volume 5 - Appendices.*
EI1.6 - *Volume 6 - Methods.*
EI1.7 - *Volume 7 - Maps – Biophysical Environment.*
EI1.8 - *Volume 8 - Maps – Human Environment.*
EI1.9 - *Volume 9 - Summary of the Emergency Measures Plan in the Event of Dam Failure.*

EI2 - *Summary Report. December 2004. 185 p. with maps and tables.*
EI3 - *Environmental Impact Statement Executive Summary (English, French, Cree). December 2004. 17 p.*
EI4 - *Eastmain-1-A and Rupert Diversion – English–French glossary, March 8, 2005. 197 p.*

2.2 Sectoral studies

ES1 - AMENATECH. *Centrale de l'Eastmain-1-A et dérivation Rupert - Étude relative à l'utilisation du territoire par les Jamésiens - Volumes 1 et 2*. June 30, 2004. Various pagings, 3 maps, appendices.
ES2 - ARCHÉOTEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Inventaire archéologique aux sites des ouvrages - Campagne de relevés géotechniques 2002*. July 2003. 271 p.
ES3 - ARCHÉOTEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Inventaire archéologique effectué en 2003 du territoire touché par la dérivation Rupert*. September 2004. 188 p.
ES4 - ARCHÉOTEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Potentiel archéologique.* November 2004. 101 p. and 9 leaflets.
ES5 - BERNATCHEZ, L. and R. SAINT-LAURENT. *Centrale de l'Eastmain-1-A et dérivation Rupert – Caractérisation génétique de l'esturgeon jaune du bassin de la rivière Rupert.* Prepared by Université Laval. December 2004. 50 p.
ES6 - CURTIS, M. *Centrale de l'Eastmain-1-A et dérivation Rupert – Fish Parasite Survey*. Prepared by McGill University. December 2003. 42 p. and 4 appendices.
ES7 - DEL DEGAN, MASSÉ ET ASSOCIÉS. *Centrale de l'Eastmain-1-A et dérivation Rupert – Étude de la grande et de la petite faune*. March 2004. Various pagings, 11 maps.
ES8 - ENVIRONNEMENT ILLIMITÉ. *Centrale de l'Eastmain-1-A et dérivation Rupert – État de référence - esturgeon jaune*. December 2003. 124 p. and 4 appendices.

ES9 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Oiseaux de proie*. February 2004, 55 p. and appendices.
ES10 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Espèces à statut particulier*. February 2004. 69 p. and appendices.
ES11 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Oiseaux forestiers 2002*. February 2004. 42 p. and appendices.
ES12 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Oiseaux forestiers 2003*. February 2004. 66 p. and appendices.
ES13 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert – Étude de la végétation et des espèces floristiques et fauniques à statut particulier*. February 2004. 91 p. and appendices.
ES14 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune – Limicoles nicheurs*. February 2004. 44 p. and appendices.
ES15 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Limicoles migrateurs des baies de Rupert et Boatswain*. February 2004. 95 p. and appendices.
ES16 - FORAMEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Sauvagine et autres oiseaux aquatiques*. Février 2004. 113 p. and appendices.
ES17 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Caractérisation des habitats du poisson*. Décembre 2004, 128 p. with 11 appendices and 5 maps.
ES18 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Caractérisation des communautés et de la production de poissons*. Décembre 2004. 173 p. and appendices and 3 maps.
ES19 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Détermination du régime de débits réservés écologiques*. Décembre 2004. 92 p. and appendices.
ES20 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Eau brute de Waskaganish*. December 2003. 15 p. and 1 appendix.
ES21 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Mercure dans la chair des poissons*. December 2004. 121 p. and appendices.
ES22 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Potentiel d'aménagement pour l'omble de fontaine et le touladi*. December 2004. 86 p. and appendices.
ES23 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Océanographie biologique de la baie de Rupert*. December 2004. 144 p. and appendices.
ES24 - GÉNIVAR. *Centrale de l'Eastmain-1-A et dérivation Rupert - Qualité de l'eau*. Décembre 2004. 70 p. and 1 appendix.
ES25 - INSTITUT NATIONAL DE LA RECHERCHE SCIENTIFIQUE. *Centrale de l'Eastmain-1-A et dérivation Rupert - Simulation des habitats de reproduction des poissons de la rivière Rupert avec HYDROSIM/MODELEUR*. December 2004. 72 p.
ES26 - NOVE ENVIRONNEMENT. *Centrale de l'Eastmain-1-A et dérivation Rupert – Utilisation du territoire par les Cris - Activités de chasse, de pêche et de trappage*. May 2004. 490 p. and appendices.
ES27 - POLY-GÉO. *Centrale de l'Eastmain-1-A et dérivation Rupert - Étude géomorphologique des axes fluviaux et lacustres*. March 2004. Vol. 1: 153 p. and appendices. Vol. 2: Appendix (maps).
ES28 - POLY-GÉO. *Centrale de l'Eastmain-1-A et dérivation Rupert - Géomorphologie de la baie de Rupert*. February 2004. 94 p. and appendices.
ES29 - ROCHE. *Centrale de l'Eastmain-1-A et dérivation Rupert - Portrait économique du territoire*. December 2004. 68 p. and 2 appendices.
ES30 - TECSULT ENVIRONNEMENT. *Centrale de l'Eastmain-1-A et dérivation Rupert - Avifaune - Sauvagine et autres oiseaux aquatiques*. 2004. 157 p. and appendices.
ES31 - VINCENT ROQUET ET ASSOCIÉS. *Centrale de l'Eastmain-1-A et dérivation Rupert - Description du environment cri*. November 2004. Vol. 1: 92 p. Vol. 2: 246 p.
ES32 - HYDRO-QUÉBEC. *Projet potentiel EM-1/Rupert, Prévision des teneurs en mercure dans les poissons*. June 2000. 96 p. and appendices.
ES33 - HYDRO-QUÉBEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Régime hydrodynamique de la baie de Rupert*. September 2004. Various pagings.
ES34 - HYDRO-QUÉBEC. *Avant-projet de l'aménagement de la centrale de l'Eastmain-1-A et de la dérivation Rupert. Étude du tronçon aval de la Rupert. Reconstitution des apports journaliers aux seuils des rivières Rupert, Lemare et Nemiscau pour les conditions actuelles et futures*. March 2004.
ES35 - GROUPE ENVIRONNEMENT SHOONER. *Accroissement du potentiel salmonicole de la rivière Betsiamites. Étude de faisabilité. Phase 1. Rapport des activités 1991*. 1993. 2 volumes.
ES36 - GROUPE ENVIRONNEMENT SHOONER. *Bilan de l'exploitation des ressources halieutiques dans les secteurs accessibles du territoire de la Baie-James*. 1996. 164 p. and appendices.
ES37 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Summary documents in French and French (sic) submitted to Hydro-Quebec from the sectoral (sic) report entitled: The Evolution of Health Status and Health Determinants in the Cree Region Vol. 1*. March 15, 2006. 125 p.

ES37.1 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *The Evolution of Health Status and Health Determinants in the Cree Region Vol. 1*. March 15, 2006. 155 p.
ES38 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *The Evolution of Health Status and Health Determinants in the Cree Region Vol. 2*. March 15, 2006. 373 p.

3. COMPLIANCE REVIEW OF THE ENVIRONMENTAL IMPACT STATEMENT

3.1 Position papers and other documents submitted by the participants

Cree Regional Authority

MC1 - *Environmental Review of the Eastmain-1-A–Rupert Diversion – Chapters 2 and 21 of the EIS*. March 18, 2005. 2 p. Appendix: 20 p.
MC2 - *Environmental Review of the Eastmain-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapter 16 of the EIS*. March 30, 2005. 3 p.
MC2.1 - Table. 15 p.
MC3 - *Environmental Review of the Eastmain-1-A–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-1-A–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-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapter 23 of the EIS*. March 31, 2005. 2 p.
MC5.1 - Table. 16 p.
MC6 - *Environmental Review of the Eastmain-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapters 10, 11, and 12*. April 7, 2005. 4 p. Appendix 1: 12 p. Appendix 2: 8 p.
MC7 - *Environmental Review of the Eastmain-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapters 7, 16, 18, 21 and 22 Regarding Issues, Valued Ecosystem Components (VECs) and Cumulative Effects*. April 7, 2005. 3 p. and appendix: 9 p.
MC8 - *Environmental Review of the Eastmain-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapter16 – Description of Human Environment and Assessment of Impacts – Society and Health – (Social Cohesion)*. April 8, 2005. 3 p. and appendix: 10 p.
MC9 - *Environmental Review of the Eastmain-1-A–Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapters 8, 9, 10, 11 and 12 (Lake Sturgeon and Cisco)*. April 11, 2005. 4 p. and appendix: 12 p.
MC10 - *Environmental Review of the Eastmain 1A-Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapters 10, 11, 12, 13 and 14 (Erosion and Bank Stability)*. April 11, 2005. 2 p. Appendix 1: 7 p., Appendix 2: 8 p.
MC 11 - *Environmental Review of the Eastmain 1A-Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapter 17 of the EIS*. April 12, 2005. 11 p. Appendix: 3 p.
MC11.1 - Table. 5 p.
MC12 - *Environmental Review of the Eastmain-1-A Rupert Diversion Hydroelectric Project – Conformity Analysis of Chapter 5 - Public Participation and Chapters 16, 18, 20: Description of Human Environment and Assessment of Impacts – Feeling of Loss and Cree Culture*. April 12, 2005. 2 p. Appendix 1: 16 p. Appendix 2: 17 p.
MC13 - *The Environmental Impact Statement for the EM-1-A Hydro Project and the Directives for the Preparation of the Impact Statement. Conformity Analysis from a Regional Economic Perspective*. April 29, 2005. 57 p.
MC14 - LOON, Alfred. *Questions Arising from the Conformity Analysis of the Impact Statement for the Eastmain-1-A/Rupert Diversion Project: Some General Observations and Suggestions Regarding Additional Information Needs and Clarifications*. May 4, 2005. 9 p.
MC15 - VINCENT, Sylvie. *Environnement humain - Consolidation des commentaires et Synthèse des lacunes repérées par l'Administration régionale crie dans le cadre de l'analyse de conformité*. June 15, 2005. Letter: 1 p. Document: 29 p.

Other Cree organizations

MC16 - CREE NATION OF WEMINDJI. *Conformity Analysis Eastmain-1-A Powerhouse and Rupert Diversion Environmental Impact Statement*. April 25, 2005. 5 p. and appendix: 16 p.
MC17 - 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 26, 2005. 14 p.

MC18 - COUNCIL OF THE CREE NATION OF MISTISSINI. *Conformity Analysis Eastmain-1-A Powerhouse and Rupert Diversion Environmental Impact Statement – Concerns About the Way in Which Decisions are Being Made.* (letter) April 27, 2005. 5 p.
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 Rupert Diversion Environmental Impact Statement.* April 2005. Letter: 3 p. and appendix: 22 p.

Inuit (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 Powerhouse and Rupert Diversion Meets the Requirements Outlined in the Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert.* April 25, 2005. 29 p. Appendix 1: 30 p. Appendix 2: 40 p.
MC22 - NUNAVUT HUDSON BAY INTER-AGENCY WORKING GROUP (NTK). *Comments on the Proponents' Provisional Responses to Requests for Additional Information with Particular Reference to Questions 62 and 259 from the Review Panels.* December 8, 2005. 27 p.

Environmental groups

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.* April 28, 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 projet.* April 29, 2005. 17 p.
MC25 - RÉVÉRENCE RUPERT. *Examen de l'Étude d'impact sur l'environnement du projet Eastmain 1A –dérivation Rupert.* April 29, 2005. 22 p.
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 Rupert Diversion Project.* April 29, 2005. 13 p.
MC27 - FONDATION RIVIÈRES. *Commentaires relatifs à l'étude d'impacts concernant sa conformité aux directives finales des comités d'examen.* April 30, 2005. 68 p.

Other

MC28 - LANGELIER, Guy. *Commentaires sur les impacts environnementaux de la dérivation rivière Rupert.* 26 avril 2005. 9 p. Annexes : 18 p.
MC29 - LANGELIER, Guy. *Addenda: Commentaires sur les impacts environnementaux de la dérivation de la rivière Rupert.* 29 avril 2005. 2 p.
MC30 - WHITEMAN, Gail. - ROTTERDAM SCHOOL OF MANAGEMENT – ERASMUS UNIVERSITY. *Comments on the Environmental Impact Assessment for the Eastmain-1-A Powerhouse Rupert Diversion Project.* April 29, 2005. 6 p.

3.2 Notices from government departments and agencies

Government of Quebec

AV1 - CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. *Technical notice.* February 3, 2005. 2 p.
AV2 - CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. *Technical notice.* February 17, 2005. Letter: 1 p. Document: 3 p.
AV3 - MINISTÈRE DE LA SÉCURITÉ PUBLIQUE. *Technical notice.* February 22, 2005. 1 p.
AV4 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS - BUREAU DES CHANGEMENTS CLIMATIQUES. *Commentaires sur l'étude d'impact sur l'environnement.* March 2, 2005. Letter: 1 p. Document: 2 p.
AV5 - MINISTÈRE DE LA SANTÉ ET DES SERVICES SOCIAUX. *Notice.* March 9, 2005. 2 p.
AV6 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS - DIRECTION DU PATRIMOINE ÉCOLOGIQUE ET DU DÉVELOPPEMENT DURABLE. *Avis relatif à la recevabilité du projet Eastmain-1-A et dérivation Rupert.* March 15, 2005. Letter: 1 p. Appendix A: 4 p. Appendix B: 4 p. Appendix C: 3 p. Appendix D: 1 p.
AV7 - MINISTÈRE DE LA CULTURE ET DES COMMUNICATIONS - DIRECTION DE L'ABITIBI-TÉMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Technical notice.* March 22, 2005. 2 p.
AV8 - SECRÉTARIAT AUX AFFAIRES AUTOCHTONES – DIRECTION DES RELATIONS ET DU SUIVI DES ENTENTES. *Technical notice.* March 30, 2005. 2 p.

AV9 - MINISTÈRE DU DÉVELOPPEMENT ÉCONOMIQUE, DE L'INNOVATION ET DE L'EXPORTATION. *Technical notice*. April 4, 2005. 2 p.
AV10 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – DIRECTION RÉGIONALE DE L'ANALYSE ET DE L'EXPERTISE DE L'ABITIBI-TEMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Technical notice*. April 29, 2005. Letter: 2 p. Document: 24 p.
AV11 - MINISTÈRE DES RESSOURCES NATURELLES ET DE LA FAUNE. *Commentaires sur l'étude d'impact sur l'environnement - Centrale de l'Eastmain-1-A et dérivation Rupert*. April 29, 2005. Letter: 2 p. Document: 10 p. Appendix 1: 39 p. Appendix 2: 6 p. Appendix 3: 5 p.
AV12 - MINISTÈRE DE LA CULTURE ET DES COMMUNICATIONS, DIRECTION DE L'ABITIBI-TEMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Technical notice*. November 8, 2005. 1 p.
AV13 - CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. *Technical notice*. December 16, 2005. Note 1: 1 p. Note 2: 2 p.
AV14 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – BUREAU DES CHANGEMENTS CLIMATIQUES. *Comments on November 2005 responses – Chapter 4 – Bloc B1*. December 29, 2005. 1 p.
AV15 - MINISTÈRE DE LA CULTURE ET DES COMMUNICATIONS – DIRECTION DE L'ABITIBI-TEMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Technical notice – Additional information*. January 9, 2006. 1 p.
AV16 - SECRÉTARIAT AUX AFFAIRES AUTOCHTONES. *Technical notice – Additional information*. January 13, 2006. 2 p.
AV17 - MINISTÈRE DES SERVICES SOCIAUX ET DE LA SANTÉ. *Technical notice*. January 15, 2006. 2 p.
AV18 - CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. *Technical notice*. January 16, 2006. 2 p.
AV19 - MINISTÈRE DE LA SÉCURITÉ PUBLIQUE. *Technical notice*. January 16, 2006. 1 p.
AV20 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – DIRECTION DU PATRIMOINE ÉCOLOGIQUE ET DES PARCS. *Troisième avis relatif à la recevabilité du projet*. January 17, 2006. Letter: 1 p. Appendix A2: 3 p. Appendix B2: 3 p. Appendix C2: 2 p. Appendix D2: 1 p.
AV21 - MINISTÈRE DES RESSOURCES NATURELLES ET DE LA FAUNE. *Technical notice*. January 24, 2006. Letter: 2 p. Document: 3 p.
AV22 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – DIRECTION RÉGIONALE DE L'ANALYSE ET DE L'EXPERTISE DE L'ABITIBI-TEMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Comments on Additional Information*. January 20, 2006. Letter: 2 p. Document: 8 p.
AV23 - MINISTÈRE DE LA SÉCURITÉ PUBLIQUE – DIRECTION RÉGIONALE DE LA SÉCURITÉ CIVILE OUTAOUAIS – ABITIBI-TÉMISCAMINGUE ET NORD-DU-QUÉBEC. *Étude d'impact - Projet de centrale de l'Eastmain-1-A et dérivation Rupert*. February 27, 2006. 1 p.
AV24 - MINISTÈRE DE LA CULTURE ET DES COMMUNICATIONS – DIRECTION DE L'ABITIBI-TÉMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Technical notice*. March 24, 2006. 1 p.
AV25 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – DIRECTION RÉGIONALE DE L'ANALYSE ET DE L'EXPERTISE DE L'ABITIBI-TEMISCAMINGUE ET DU NORD-DU-QUÉBEC. *Commentaires sur l'acceptabilité environnementale du projet*. April 3, 2006. Letter: 2 p. Document: 4 p.
AV26 - CENTRE D'EXPERTISE HYDRIQUE DU QUÉBEC. *Recevabilité de l'étude d'impact*. April 4, 2006. 1 p.
AV27 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – DIRECTION DU PATRIMOINE ÉCOLOGIQUE ET DES PARCS. *Avis relatif à l'acceptabilité du projet*. April 11, 2006. 2 p.
AV28 - SECRÉTARIAT AUX AFFAIRES AUTOCHTONES. *Technical notice*. April 21, 2006. 4 p.
AV29 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS – BUREAU DES CHANGEMENTS CLIMATIQUES. *Acceptabilité environnementale du projet*. May 8, 2006. 1 p.

Federal government

AV30 - TRANSPORT CANADA. *Commentaires de Transports Canada sur la recevabilité du projet de construction de l'aménagement hydroélectrique Eastmain 1-A et dérivation de la rivière Rupert*. March 22, 2005. 6 p.
AV31 - HEALTH CANADA. *Commentaires sur la conformité de l'étude d'impact - Volet mercure et santé humaine*. April 5, 2005. 10 p.
AV32 - HEALTH CANADA. *Commentaires sur la conformité de l'étude d'impact - Volet social*. April 20, 2005. 14 p.
AV32.1 - *Commentaires sur la conformité de l'étude d'impact - Volet Social - Addenda*. April 29, 2005. 2 p.
AV33 - NATURAL RESOURCES CANADA – EARTH SCIENCES SECTOR/GEOLOGICAL SURVEY OF CANADA. *Conformity Comments Eastmain-1-A Powerhouse – Rupert River Diversion*. April 17, 2005. Letter: 1 p. Document: 5 p.
AV34 - RESSOURCES NATURELLES CANADA - SECTEUR DES SCIENCES DE LA TERRE COMMISSION GEOLOGIQUE DU CANADA. *Commentaires sur la conformité Centrale de l'Eastmain-1-A et dérivation Rupert*. May 6, 2005. Letter: 1 p. Document: 2 p.
AV35 - FISHERIES AND OCEANS CANADA. *Examen de la conformité de l'étude d'impact du projet Eastmain-1-A et dérivation Rupert aux Directives - Avis de conformité*. April 29, 2005. 31 p.
AV36 - ENVIRONMENT CANADA. *Analyse de conformité*. April 29, 2005. 10 p.
AV37 - ENVIRONMENT CANADA. *Analyse de conformité*. December 2, 2005. 3 p.
AV38 - FISHERIES AND OCEANS CANADA. *Commentaires sur la conformité aux directives des réponses fournies*

par les promoteurs dans le complément de l'étude d'impact sur l'environnement pour le projet Eastmain-1-A et dérivation Rupert. January 19, 2006. 8 p.
AV39 - TRANSPORT CANADA. *Commentaires de Transports Canada quant à la conformité du projet contenu dans le complément à l'étude d'impact sur l'environnement.* January 19, 2006. 2 p.
AV40 - ENVIRONMENT CANADA. *Analyse de conformité.* January 23, 2006. 2 p.
AV41 - HEALTH CANADA. *Commentaires sur la conformité de l'étude d'impact - Volet mercure et santé humaine,* January 19, 2006. 2 p.

3.3 Proponent's responses (HYDRO-QUÉBEC PRODUCTION)

RP1 - *Table - Question 25 - Hivers glaciologiques.* April 26, 2005. 1 p.
RP2 - *Autres questions prises en différé.* April 29, 2005. Letters: 2 p. Document: 6 p. Appendix 1: 2 p. Appendix 2: 2 p.
RP3 - *Tables - Réponses écrites des promoteurs - Version révisée de la réponse à la question 8.* May 6, 2005. Letter 1 p. Document: 2 p.
RP4 - *Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc C3 - Environment terrestre.* September 27, 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.* October 19, 2005. 109 p.
RP6 - *Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc D3 - Archéologie.* October 27, 2005. 20 p. Appendix: 31 p.
RP7 - *Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc C2A - Poissons - Secteurs des biefs.* November 2, 2005. 26 p. 2 maps.
RP8 - *Complément de l'étude d'impact sur l'environnement - Réponses provisoires - Bloc B1 – Environment physique - Aspects techniques.* November 17, 2005. 161 p. Appendix A: 14 p. Appendix B: 5 p.
RP9 - *Complément de l'étude d'impact sur l'environnement - Réponses provisoires – Modifications au chapitre 4 - Description du projet.* November 17, 2005. 95 p. Maps: 8 p. Panels: 22 p.
RP10 - *Supplement to the Environmental Impact Statement – Volume 1 - Answers 1 to 137. December 8, 2005. 244 p. Appendix 1: 11 p. Appendix 2: 7 p. Appendix 3: 43 p. Appendix 4: 5 p.*
RP11 - *Supplement to the Environmental Impact Statement – Volume 2 - Answers 138 to 225. December 8, 2005. 347 p.*
RP12 - *Supplement to the Environmental Impact Statement – Volume 3 - Answers 226 to 313. December 8, 2005. 326 p.*
RP13 - *Supplement to the Environmental Impact Statement – Volume 4 - Answers 314 to 384. December 8, 2005. 215 p. Appendix: 31 p.*
RP14 - *Supplement to the Environmental Impact Statement - Volume 5 - Chapter 4 modified – Project Description. December 8, 2005. 97 p.*
RP15 - *Supplement to the Environmental Impact Statement - Volume 6 – Pocket insert maps. December 8, 2005. Maps 1, 109-1, 109-2, 319-1, C1, C2, C3.*
RP16 - *Supplement to the Environmental Impact Statement - Volume 7 – Map sheets. December 8, 2005. Appendix 048-A: 14 p. Appendix 048–B: 5 p. Appendix 096-A: 29 p. Appendix 096-B: 4 p. Appendix 191: 81 and 233 p. Appendix N- modified: 27 p.*
RP17 - *Supplement to the Environmental Impact Statement – Missing answers of volumes 1 to 7 – Volume A - Answers 44, 101, 105 to 109, 173, 175, 177,199, 200, 216, 220, 223, 290 to 292 - December 21, 2005. 173 p. Appendix 1: 1 p. Appendix 2: 10 p. Appendix 3: 1 p.*
RP18 - *Supplement to the Environmental Impact Statement – Missing answers of volumes 1 to 7 - Volume B - Answers 105 and 223. December 21, 2005. 105 - Part 1 : 44 p. 105 - Part 2 : 43 p. 11 maps. Morantz Report: 33 p.*
RP19 - *Supplement to the Environmental Impact Statement – Volume 8 – Summary of the Emergency Measures Plan in the Event of Dam Failure on the Rupert River Diversion. November 2005. 27 p. 12 tables. 16 charts. 6 maps.*
RP20 - *Supplement to the Environmental Impact Statement – Volume 9 - Summary of the Emergency Measures Plan in the Event of Failure of dike OA-03 in the Boyd-Sakami System. September 2005. 12 p. 3 tables. 5 charts. Appendix A: 1 p.*
RP21 - *Supplement to the Environmental Impact Statement – Volume 10 – Summary Report – Update. December 21, 2005. 226 p.*
RP22 - GÉNIVAR. *Comparaison des pêches cries et des pêches scientifiques dans le secteur des biefs Rupert.* July 2005. 35 p. Appendix 1: 4 p. Appendix 2: 7 p. Appendix 3: 1 p. Appendix 4: 5 p.
RP23 - *Supplement to the Environmental Impact Statement – Partial Answer to Question 272. January 2006. 22 p.*
RP24 - *Supplement to the Environmental Impact Statement – Partial Answer to Question 272 (part II). January 2006. 7 p. Final gross findings of the perception survey.*
RP25 - *Supplement to the Environmental Impact Statement – Morantz Report (Question 272) – French version. March 13, 2006. 35 p.*

3.4 Documents submitted by the review bodies

COE1 - ECORESSOURCES CONSULTANTS. *Analyse du traitement des enjeux économiques dans l'Étude d'impact sur l'environnement du projet Eastmain-1-A et dérivation Rupert - Rapport final.* Prepared by Jean Nolet. March 18, 2004 (2005). 40 p.

COE2 - CENTRE HELIOS. *Projet Eastmain-1-A / dérivation Rupert – Rapport sur la conformité de l'étude d'impact soumis à la Commission fédérale d'examen.* Prepared by Philip Raphals. March 18, 2005. 29 p. Appendix: 11 p.
COE3 - FEDERAL REVIEW PANEL. *Questions et commentaires techniques de la Commission fédérale d'examen pour le ministère des Pêches et Océans Canada – Analyse de conformité - Projet Eastmain-1-A et dérivation Rupert.* March 29, 2005. 29 p.
COE4 - BERNARD, Jean-Thomas. *Commentaires sur la justification du projet Centrale de l'Eastmain-1-A et dérivation Rupert.* April 2005. 8 p.
COE5 - FEIT, Harvey A. *Evaluation for the Federal Review Panel of Conformity of the Eastmain-1-A and Rupert Diversion Project EIS with Directives for Selected Social Components.* April 4, 2005. 46 p.
COE6 - FEDERAL REVIEW PANEL. *Minutes – Technical meeting with the Department of Fisheries and Oceans – April 6 and 7, 2005 at the Maurice Lamontagne Institute in Mont Joli – April 15, 2005 conference call.* April 15, 2005. 3 p.
COE7 - *Letter to P. Mora - SEBJ - Préavis relatif à la conformité de l'étude d'impact du projet.* May 5, 2005. 5 p.
COE8 - FEDERAL REVIEW PANEL. *Summary – Conference call with the Department of Fisheries and Oceans – May 24, 2005.* May 24, 2005. 2 p.
COE9 - FEDERAL REVIEW PANEL. *Summary – Federal Review Panel meetings with various federal departments.* May 26, 2005. 1 p.
COE10 - *Préavis relatif à la conformité de l'étude d'impact du projet.* June 23, 2005. 83 p.
COE11 - *Eastmain-1-A and Rupert Diversion Project – Conformity of the Impact Statement – Request for Additional Information.* August 2, 005. 86 p.
COE12 - VINCENT, Pierre. *Analyse finale des principaux enjeux entourant l'examen public du projet Eastmain 1A/dérivation Rupert.* December 13, 2005. 5 p.
COE13 - AWASHISH, Philip and Brian Craik. *Account of the Meeting between the Cree Regional Authority and Philip Awashish and Brian Craik, Members of the review Committee and of the Federal Commission for the Social and Environmental Impact Review of the Proposed Eastmain 1A - Rupert Diversion Project.* December 15, 2005. 2 p.
COE14 - CENTRE HELIOS. *Projet Eastmain-1-A / dérivation Rupert – Complément de l'étude d'impact soumis à la Commission fédérale d'examen – Commentaires concernant la justification du projet.* January 20, 2006. 5 p.
COE15 - *List of errata identified by the review bodies in the supplement to the environmental impact statement submitted by the proponent.* February 28, 2006. 2 p.

4. TECHNICAL MEETINGS

4.1 Documents submitted by the proponent

Meetings of April 20 and 21, 2005

RTP1 - *Chart - Débit vs Temps (Période 1961-2003).* April 20, 2005. 1 p.
RTP2 - *Table - Hivers glaciologiques au PK 314 de la rivière Rupert.* April 20, 2005. 1 p.
RTP3 - *Photograph - Boats.* April 21, 2005. 5 p.

Meeting of January 24, 2006

RTP4 - *Map 220 -1 – Dike C-R-1-2-3 – Hydrographical network.* January 24, 2006. 5 p.
RTP5 - *Table 161-2-A – Apport solide des tributaires.* January 24, 2006. 5 p.
RTP6 - *Chart – Figure 7-3-7-A - Station RN2805 (PK209,0) - Niveau d'eau vs débits.* January 24, 2006. 1 p.
RTP7 - *Méthode M6 - Régime thermique - Version modifiée.* January 24, 2006. 19 p.
RTP8 - *Opinion Survey Table.* January 24, 2006. 2 p.
RTP9 - GÉNIVAR. *Presentation - Réponse 204 - Position des stations d'échantillonnage pour le cisco de lac en aval de Smokey Hill.* 24 janvier 2006. 7 p.

RTP9.1 - *Centrale de l'Eastmain-1-A et dérivation Rupert - Rapport d'activités 2003 – Campagne hivernale sur la frayère de cisco de lac, en aval de Smokey Hill.* July 2003. 38 p.

RTP9.2 - *Table - Données relatives à l'échantillonnage par placettes à l'automne 2002 dans la Rupert, à l'aval de Smokey Hill.* 2 p.

RTP10 - *Table 81-1 - Émissions de gaz à effet de serre des environnements naturels actuels des biefs Rupert et des réservoirs du Québec et émissions brutes futures des biefs Rupert.* 1 p.
RTP11 - *Vérification des données du Tableau 81-1 par Louis Varfalvy en collaboration avec Maryse Lambert.* January 23, 2006. 3 p.
RTP12 - *Table 81-2: Émissions de gaz à effet de serre des environnements naturels actuels des biefs Rupert et émissions futures estimées selon l'approche du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) et Environnement Canada.* 1 p.

Meeting of February 8, 2006

RTP13 - *Réponses à certaines questions d'éclaircissement posées par les organismes d'examen lors de la rencontre d'information technique du 8 février 2006.* February 14, 2006. 20 p.
RTP14 - *Note d'étude technique - Évaluation sommaire de la possibilité de stratification thermique dans le lac Nemiscau.* February 8, 2006. 9 p.
RTP15 - CRSNG – *Effets climatiques du réservoir Robert-Bourassa sur le paysage forestier insulaire: mesure des impacts sur la productivité et la régénération par expérimentation et suivi télémétrique.* November 2001. 10 p.
RTP16 - *Complexe La Grande – Suivi environnemental de la végétation riveraine et aquatique – Rapport synthèse pour la période 1979–1999.* December 2001. 124 p.
RTP17 - CROP. *Survey of Eastmain-1 workers.* February 15, 2006. 26 p.
RTP18 - CROP. *Study on the perception of Cree communities.* February 15, 2006. 41 p.
RTP19 - GEEWEHEDIN CONSULTING SERVICES. *Enquête de perception auprès de chefs de file dans les neuf communautés cries d'Eeyou Istche.* Prepared by Susan Hilton. February 15, 2006. 150 p.
RTP19.1 - *GEEWEHEDIN CONSULTING SERVICES. Opinion Leaders Perception Study of the Nine Cree Communities of Eeyou Istchee - Interview Transcripts.* Prepared by Susan Hilton. February 15, 2006. 618 p.

4.2 Documents submitted by the review bodies

RTOE1 - *Minutes – Introductory meeting between the review bodies and the proponent. February* 10, 2005. 3 p.
RTOE2 - *Clarification questions for the proponent – Notes – Technical meeting.* April 20–21, 2005. 26 p.
RTOE2.1 - Presentation – Aquatic environment. April 20, 2006. 15 p.
RTOE2.2 - Presentation – Archeology. April 21, 2006. 6 p.
RTOE2.3 - Presentation – Social environment and health. April 21, 2006. 8 p.
RTOE2.4 - Presentation – Rationale. April 21, 2006. 9 p.
RTOE3 - Agenda – Meeting with the review bodies. July 12, 2005. 1 p.
RTOE4 - Clarification questions prepared by the review bodies for the technical meeting on January 24, 2006. January 17, 2006. 3 p.
RTOE5 - Technical meeting with Hydro-Québec on February 8, 2006 – Clarification questions prepared by the review bodies in preparation for the public hearings. February 1, 2006. 5 p.

Transcripts (verbatim) of the technical meetings

VRT1 - *Technical information meeting – Volume 1 – Aquatic environment.* April 20, 2005. 100 p.
VRT2 - *Technical information meeting – Volume 2 – Project rationale.* April 21, 2005. 70 p.
VRT3 - *Technical information meeting – Volume 3 – Socio-economic impacts.* April 21, 2005. 46 p.
VRT4 - *Technical information meeting.* June 8, 2005. 83 p.
VRT5 - *Technical information meeting.* July 12, 2005. 87 p.
VRT6 - *Technical information meeting.* August 9, 2005. 109 p.
VRT7 - *Technical information meeting.* October 12, 2005. 107 p.
VRT8 - *Technical information meeting.* January 24, 2006. 174 p.
VRT9 - *Technical information meeting.* February 8, 2006. 91 p.

5. PUBLIC HEARINGS

5.1 Briefs and documents submitted by the participants

Includes documents submitted by the participants during their presentations on their position papers or in support of their position papers. Whenever practical, the documents are listed in order of presentation in the public hearing transcripts (section 5.7).

Mistissini

M1 - LONGCHAP, Chief John, CREE NATION OF MISTISSINI. *A Submission to the Provincial Review Committee and the Federal Review Panel.* March 15, 2006. 6 p. (Reference to session 1, page 81).
M2 - NEEPOSH, George et al. *Statement by Neeposh Family - Trapline M25.* March 15, 2006. 18 p. (Reference to session 1, page 97).
M3 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Public hearing presentation.* March 14, 2006. 14 p.
Note: A position paper was submitted by the CBHSSJB at the first session. Copies of the position paper were made available to participants attending other sessions; oral presentations were given by representatives of this organizations at all public hearing locations.

Nemaska

M4 - WAPACHEE, Gordon and Winnie Wapachee. *Comments and Concerns by Tallymen of N23 – Gordon & Minnie Wapachee – Presented by Glen Cooper – Appointed spokesperson of Gordon & Minnie Wapachee.* March 21, 2006. 3 p. (Reference to session 5, page 61).
M5 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Presentation.* March 14, 2006. 13 p.
M5.1 - *Visit to Eastmain-1 camp, worksites and other camps – CBHSSJB representatives – June 9–10, 2004 – Final Report.* November 25, 2004. 14 p.

Eastmain

M6 - CREE NATION OF EASTMAIN AND CREE NATION OF WEMINDJI. *A joint statement from the Cree Nations of Eastmain and Wemindji on some subjects of shared interest and concern.* April 25, 2006. 8 p. (Reference to session 8, page 106).

Wemindji

M7 - MARK, Chief Rodney. *An Introductory Statement by Chief Rodney Mark, Cree Nation of Wemindji.* April 14, 2006. 3 p. (Reference to session 11, page 42).
M8 - GEORGEKISH, Emily. *Poem - No Heart Too Small, No World To Wide…* April 2006. 1 p. (Reference to session 11, page 103).
M9 - GEORGEKISH, Roderick. *Submission for Public Hearing.* April 2006. 1 p. (Reference to session 13, page 33).
M10 - STEWART, Jennifer (Mayappo). *Submission for Public Hearings.* April 2006. 1 p. (Reference to session 13, page 54).
M11 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *What People in Eeyou Istchee Say About Their Health – Results from the 2003 Canadian Community Health Survey.* Prepared by Ellen Bobet. 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. *Position paper submitted at the public hearings.* April 15, 2006. 9 p. (Reference to session 14, page 58).
M14 - ROCHE LTÉE, GROUPE-CONSEIL. *Position paper submitted at the public hearings.* April 2006. 8 p. (Reference to session 14, page 69).
M15 - MUNICIPALITÉ DE BAIE-JAMES (MBJ). *Position paper submitted at the public hearings.*April 2006. 8 p. (Reference to session 14, page 79).
M16 - COMITÉ DE MAXIMISATION DES RETOMBÉES ÉCONOMIQUES DU NORD-DU-QUÉBEC (COMAX-NORD). *Position paper submitted at the public hearings.* April 2006. 10 p. (Reference to session 14, page 90).
M17 - VILLE DE LEBEL-SUR-QUEVILLON. *Position paper submitted at the public hearings.* April 2006. 12 p. (Reference to session 14, page 90).
M18 - COMMISSION ÉCONOMIQUE ET TOURISTIQUE DE CHIBOUGAMAU (CETC). *Position paper submitted at the public hearings.* April 2006. 10 p. (Reference to session 15, page 64).
M19 - CHAMBRE DE COMMERCE DE CHIBOUGAMAU. *Position paper submitted at the public hearings.* April 2006. 10 p. (Reference to session 15, page 114).
M20 - COMITÉ DE MAXIMISATION DES RETOMBÉES ÉCONOMIQUES EN ABITIBI-TÉMISCAMINGUE (COMAX-AT). *Position paper submitted at the public hearings.* May 2006. 23 p. (Reference to session 15, page 155).
M21 - LA CONFÉRENCE RÉGIONALE DES ÉLUS DE L'ABITIBI-TÉMISCAMINGUE (CRÉAT). *Position paper submitted at the public hearings.* Version 1: April 21, 2006. 23 p. Version 2: May 3, 2006. 27 p. (Reference to session 15, page 164).
M22 - ASSOCIATION DE LA CONSTRUCTION DU QUÉBEC (ACQ) – RÉGION DU SAGUENAY/LAC-SAINT-JEAN. *Position paper submitted at the public hearings.* April 27, 2006. 11 p. (Reference to session 16, page 7).
M23 - AUTOMATISATION GRIMARD. *Position paper submitted at the public hearings.* April 12, 2006. 5 p. (Reference to session 16, page 18).
M24 - CONFÉRENCE RÉGIONALE DES ÉLUS DE LA BAIE-JAMES (CRÉBJ). *Position paper submitted at the public hearings.* April 2006. 34 p. (Reference to session 16, page 31).
M24.1 - *Presentation.* April 2006. 19 p.
M24.2 - *Plan quinquennal de développement 2004-2009.* 153 p.
M25 - ASSOCIATION DES CLD DU SAGUENAY–LAC-SAINT-JEAN. *Position paper submitted at the public hearings.* April 2006. 20 p. (Reference to session 16, page 95).
M26 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Presentation.* April 2006. 11 p.

Montréal

M27 - CANADIAN HYDROPOWER ASSOCIATION. *Position paper submitted at the public hearings.* May 1, 2006. 7 p. (Reference to session 17, page 76).
M28 - SGS X-PER-X. *Position paper submitted at the public hearings.* April 2006. 5 p. (Reference to session 17, page 106).
M29 - RÉVÉRENCE RUPERT. *Évaluation EM-1-A - Un rapport de force à l'avantage certain du promoteur et des solutions de rechange non évaluées.* May 1, 2006. 11 p. (Reference to session 17, page 141).

M29.1 - RÉVÉRENCE RUPERT - FONDATION RIVIÈRES - SIERRA CLUB OF CANADA. *Press release.* March 20, 2006. 5 p.

M29.2 - *List of documentaries to be viewed.* 1 p.

M29.3 - ENERZONIA. *EM-1-A - Solutions de rechange. Des solutions de rechange réelles et crédibles.* April 30, 2006. 20 p. (Reference to session 17, page 150).

M29.4 - ENERZONIA. *Les solutions de rechange au Projet Eastmain-1-A et dérivation Rupert: Des options réelles, crédibles et fiables.* May 2006. 60 p.

M29.5 - FECHNER MEDIA – *The New Power* (movie).

M30 - RÉVÉRENCE RUPERT. *Presentation – Des impacts bio-physiques déjà visibles et bien d'autres injustifiés.* May 2, 2006. 36 p.

M30.1 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS. *Inspection report. September* 22, 2005. 2 p

M30.2 - MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS. *Avis d'infraction à la SEBJ.* December 22, 2005. 2 p.

M30.3 - UNION FOR THE COORDINATION OF TRANSMISSION OF ELECTRICITY (UCTE). *System Adequacy Forecast 2005–2015.* January 2005. 75 p.

M30.4 - EUROPEAN WIND ENERGY ASSOCIATION (EWEA). *Wind Power Installed in Europe by End of 2005 (cumulative).* 2005. 1 p.

M30.5 - *Précisions sur la pénétration éolienne en Espagne.* May 2, 2006. 1 p.

M31 - NATURE QUÉBEC/UQCN. *Position paper submitted at the public hearings.* May 2006. 29 p. (Reference to session 18, page 51).
M32 - FISHERIES AND OCEANS CANADA. *Position paper submitted at the public hearings.* April 2006. 24 p. (Reference to session 19, page 20).

M32.1 - *Presentation.* May 2, 2006. 17 p. (Reference to session 19, page 20).

M33 - ENVIRONMENT CANADA. *Position paper submitted at the public hearings.* April 2006. 12 p. (Reference to session 19, page 87).

M33.1 - *Presentation.* May 2, 2006. 21 p. (Reference to session 19, page 87).

M34 - CEGERTEC EXPERTS-CONSEILS. *Position paper submitted at the public hearings.* April 2006. 6 p. (Reference to session 20, page 7).
M35 - CIMA et al. *Position paper submitted at the public hearings.* May 2006. 10 p. (Reference to session 20, page 18).
M36 - BPR – DOMAINE FORGET DE CHARLEVOIX. *Position paper submitted at the public hearings.* April 14, 2006. 4 p. (Reference to session 20, page 41).
M37 - TECSULT. *Position paper submitted at the public hearings.*April 2006. 6 p. (Reference to session 20, page 62).
M38 - FERNAND GILBERT (FGL). *Position paper submitted at the public hearings.* May 2, 2006. 8 p. (Reference to session 20, page 79).
M39 - GROUPE S.M. INTERNATIONAL. *Position paper submitted at the public hearings.* 2006. 7 p. (Reference to session 20, page 98).
M40 - NUNAVUT HUDSON BAY INTER-AGENCY WORKING GROUP (NTK). *Submission for the Public Hearings – Overview.* April 2006. 31 p. 6 maps. (Reference to session 21, page 35).

M40.1 - *Presentation.* May 3, 2006. 68 p.

M40.2 - *Content of submission.* April 2006. 1 p.

M40.3 - *Letter of transmittal.* April 18, 2006. 3 p.

M40.4 - *Appendix A – On the cumulative effects of winter discharges from the La Grande Complex and variable surface currents in James Bay and Hudson Bay and on the timing and distribution of winter surface salinities in southeastern Hudson Bay.* April 2006. 28 p. 2 maps.

M40.5 - *Appendix B - Salinity and Ice Concentration Analysis to Assess the Cumulative Effects of the La Grande Rivière 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.

M40.7 - MANITOBA CLEAN ENVIRONMENT COMMISSION. *Report on Public Hearings Wuskwatim Generation and Transmission Projects.* September 2004. 151 p.

M40.8 - *Letter to Larry Murray, Fisheries and Oceans Canada – Request for information on the process and authorizations on the Eastmain-1-A and Rupert Diversion Hydroelectric Project.* September 30, 2004. 22 p. (Reference to session 21, page 71).

M41 - MAKIVIK CORPORATION. *Submission for the Public Hearings.* April 23, 2006. 5 p. (Reference to session 21, page 122).

M41.1 - GEOARTIC. *Assessment of the Potential Environmental Impact of the La Grande Rivière 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.

M41.3 - GEOARTIC. *Attachment 2 - An Assessment of the Potential for Changes in River Discharges to Have Significant Long-range and Long-term Impacts on Southeastern Hudson Bay.* April 2006. 18 p.

M41.4 - MAKIVIK CORPORATION. *An Overview of Nunavik Inuit Marine Land Use and Environmental and Ecological Knowledge – Northern James Bay and Southeastern Hudson Bay.* April 2006. 11 p. 5 maps

M41.5 - TUCKATUCK, Alec K. *An Assessment of the Environmental Impact Statement for the Eastmain-1-A Powerhouse and Rupert Diversion*. April 2006. 3 p.

M42 - PÔLE QUÉBEC CHAUDIÈRE-APPALACHES, LA CHAMBRE DE COMMERCE DE QUÉBEC, LA CHAMBRE DE COMMERCE DES ENTREPRENEURS DE QUÉBEC, CHAMBRE DE COMMERCE DE LÉVIS. *L'impact économique sur la ZONE QCA du projet hydroélectrique Eastmain 1-A et dérivation Rupert.* May 3, 2006. 28 p. (Reference to session 22, page 79).

M42.1 - *Correspondance sur les matériaux transformés Pôle Québec Chaudière-Appalaches.* May 3, 2006. 15 p.

M42.2 - *Additional information.* May 17, 2006. 1 p.

M43 - BRETON, BANVILLE & ASSOCIÉS S.E.N.C. *Contexte énergétique entourant la justification du projet Eastmain-1A et dérivation Rupert d'une situation de surplus énergétique à une situation de pénurie énergétique.* April 2006. 17 p. (Reference to session 22, page 121).

M44 - CANMEC. *Position paper submitted at the public hearings.* April 2006. 4 p. (Reference to session 22, page 142).

M45 - MÉTIS CORPORATION OF QUEBEC AND EASTERN CANADA. *Position paper submitted at the public hearings.* April 24, 2006. 13 p. (Reference to session 22, page 151).

M45.1 - INDIAN AND NORTHERN AFFAIRS CANADA. *Letter from Michel Roy to Pierre Montour of the Métis Corporation of Quebec and Eastern Canada.* April 10, 2006. 1 p.

M45.2 - FISHERIES AND OCEANS CANADA. *Letter from Thomas Hoggarth to Pierre Montour of the Métis Corporation of Quebec and Eastern Canada.* January 26, 2006. 2 p.

M46 - GRAND COUNCIL OF THE CREES – CREE REGIONAL AUTHORITY. *Submission for the Public Hearings.* May 4, 2006. 17 p. (Reference to session 23, page 94).

M47 - HEALTH CANADA. *Position paper submitted at the public hearings.*April 2006. 25 p. (Reference to session 23, page 101).

M47.1 - *Presentation – Environmental health and comsumer safety, Safe Environments Program.* May 4, 2006. 24 p.

M47.2 - *Addenda – Further details from Health Canada following the position paper presentation at the public hearings,* May 26, 2006. Letter: 2 p. Appendices: 52 p.

M48 - TRANSPORT CANADA. *Position paper submitted at the public hearings. (Programs Group and Marine Safety).* April 2006. 8 p. (Reference to session 23, page 194).

M48.1 - *Presentation – Marine Safety. Navigable Waters Protection Act.* May 4, 2006. 32 p.

M49 - CONSTRUCTIONS PÉRIBONKA. *Position paper submitted at the public hearings.* May 2, 2006. 12 p. (Reference to session 24, page 13).

M50 - ASSOCIATION DE L'INDUSTRIE ÉLECTRIQUE DU QUÉBEC (AIEQ). *Position paper submitted at the public hearings.* April 20, 2006. 34 p. (Reference to session 24, page 38).

M50.1 - *Presentation.* May 4, 2006. 10 p.

M51 - TECHMAT. *Position paper submitted at the public hearings.* April 19, 2006. 5 p. (Reference to session 24, page 58).

M52 - SNC-LAVALIN. *Position paper submitted at the public hearings.* April 27, 2006. 7 p. 1 map. (Reference to session 24, page 70).

M52.1 - *Map.* May 4, 2006. 1 p.

M53 - DESSAU SOPRIN. *Position paper submitted at the public hearings.* Version 1: April 18, 2006. Version 2: April 25, 2006. 6 p. (Reference to session 24, page 91).

M54 - LABORATOIRES S.L. - COGEMAT. *Position paper submitted at the public hearings.* April 24, 2006. 2 p. (Reference to session 24, page 100).

M55 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Public hearing presentation.* May 4, 2006. 34 p.

M56 - GROUPE DE RECHERCHE APPLIQUÉE EN MACROÉCOLOGIE (GRAME). *Position paper submitted at the public hearings.* April 25, 2006. 23 p. Appendices: 20 p. (Reference to session 25, page 7).

M56.1 - BÉLANGER, CAMILLE, Jean-François LEFEBVRE and Yves GUÉRARD. *Windpower and its Dependence on Hydro Reservoirs – Results from Wind Farms Simulations for Quebec.* May 15, 1998. 15 p.

M57 - BLACKSMITH, Kenny. *Presentation.* May 5, 2006. 12 p. (Reference to session 25, page 52).

M58 - VILLE DE MATAGAMI. *Position paper submitted at the public hearings.*April 2006. 12 p. (Reference to session 25, page 67).
M59 - FONDATION RIVIÈRES. *Presentation.* May 5, 2006. 2 p. (Reference to session 25, page 112).
M59.1 - *Chart - Variation des réseaux comparés.* 1 p.
M59.2 - *Table - Approvisionnements.* 1 p.
M59.3 - *Table - Bilan en énergie - Hydro-Québec Production.* 2 p.
M59.4 - *Table - Hydrogrammes PK 314.* 1 p.
M59.5 - *Table - Moyenne mensuelle des surplus - déficits énergétiques.* 1 p.
M60 - NATURAL RESOURCES CANADA. *Position paper submitted at the public hearings.* April 2006. 8 p. (Reference to session 26, page 5).
M60.1 - *Presentation – Technical analysis.* May 5, 2006. 12 p.
M61 - QUEBEC MANUFACTURERS AND EXPORTERS. *Position paper submitted at the public hearings.* May 5, 2006. 18 p. (Reference to session 26, page 37).
M61.1 - *Presentation.* May 5, 2006. 8 p.
M62 - MOSES, Ted. *Presentation.* May 5, 2006. 14 p. (Reference to session 26, page 67).
M63 - CHAMBRE DE COMMERCE D'AMOS-RÉGION. *Position paper submitted at the public hearings.* April 28, 2006. 13 p. (Reference to session 27, page 8).
M64 - DAOUST, Sylvain. *Position paper submitted at the public hearings.* May 5, 2006. 13 p. (Reference to session 27, page 34). (Réf. BIP : AUD F050-FR).
M64.1 - *Additional comments.* May 18, 2006. 2 p.
M65 - EEYOU COMMUNICATIONS NETWORK. *Submission for the public hearings.* May 12, 2006. 1 p. (Reference to session 27, page 41).
M65.1 - *Presentation.* May 16, 2006. 10 p.
M66 - TOURISME BAIE JAMES. *Position paper submitted at the public hearings.* May 12, 2006. 7 p. (Reference to session 28, page 4).
M66.1 - TOURISME BAIE JAMES. *Plan directeur marketing et de développement touristique.* March 30, 2005. 101 p.
M67 - FÉDÉRATION DES CHAMBRES DE COMMERCE DU QUÉBEC (FCCQ). *Position paper submitted at the public hearings – Economic vision,* April 6, 2006. 23 p. (Reference to session 29, page 4).
M67.1 - *Presentation.* May 17, 2006. 64 p.
M68 - CHAMBRE DE COMMERCE ET D'INDUSTRIE DE ROUYN-NORANDA. *Position paper submitted at the public hearings.* April 11, 2006. 28 p. (Reference to session 29, page 43).
M69 - ASSOCIATION DES CONSTRUCTEURS DE ROUTES ET GRANDS TRAVAUX DU QUÉBEC. *Position paper submitted at the public hearings.* May 17, 2006. 13 p. (Reference to session 29, page 57).
M70 - NISKAMOON CORPORATION - DR. BILLY DIAMOND. *Presentation.* May 17, 2006. 47 p. (Reference to session 30, page 6).
M70.1 - HYDRO-QUÉBEC/SEBJ AND EEYOU ISTCHEE CREE. *Agreement Concerning a New Relationship. Presentation.* March 2004. 62 p.
M70.2 - NADOSHTIN NISKAMOON. *Nadoshtin Agreement.* 2002. 105 p.
M70.3 - HYDRO-QUÉBEC/SEBJ AND EEYOU ISTCHEE CREE. *Mercury Agreement.* 2001. 39 p.
M70.4 - HYDRO-QUÉBEC/SEBJ AND EEYOU ISTCHEE CREE. *Cree Employment Agreement.* February 7, 2002. 59 p.
M70.5 - HYDRO-QUÉBEC/SEBJ AND EEYOU ISTCHEE CREE. *Boumhounan Agreement.* 2002. 100 p.
M70.6 - HYDRO-QUÉBEC/SEBJ AND EEYOU ISTCHEE CREE. *Niskamoon Agreement.* November 24, 2004. 28 p.
M71 - ESAU, Charles. *Presentation.* May 16, 2006. 49 p. (Reference to session 30, page 81).
M72 - FÉDÉRATION DES TRAVAILLEURS DU QUÉBEC (FTQ). *Position paper submitted at the public hearings.* May 4, 2006. 13 p.
M73 - ALUMINIUM ASSOCIATION OF CANADA. *Position paper submitted at the public hearings.* May 5, 2006. 15 p.
M74 - DUMONT, Charles. *Position paper submitted at the public hearings.* May 9, 2006. 1 p.
M74.1 - *Personal account.* May 9, 2006. 1 p.
M74.2 - *Comments on Hydro-Québec's presentation by Dr Michel Plante, May 4, 2006.* May 9, 2006. 1 p.
M74.3 - *Comments on Health Canada's position paper.* May 9, 2006. 3 p.
M75 - PROMOTION SAGUENAY. *Position paper submitted at the public hearings.* May 12, 2006. 17 p.

Waskaganish

M76 - WASKAGANISH YOUTH COUNCIL. *Survey information.* 2006. 69 p. (Reference to session 31, page 80).
M77 - DIAMOND, Billy. *Presentation.* May 30, 2006. 40 p. (Reference to session 31, page 93).
M78 - DIAMOND, J. *Presentation – An Alternative to the Proposed EM1-A Rupert Diversion,* June 8, 2006. 39 p. (Reference to session 31, page 93).

M79 - CREE OUTFITTING AND TOURISM ASSOCIATION (COTA). *Submission for the Public Hearings.* May 16, 2006. 36 p. (Reference to session 31, page 121).

M79.1 - *Letter from Robin McGinley to Eric Giroux.* May 16, 2006. 1 p.

M79.2 - *Presentation.* May 30, 2006. 26 p.

M79.3 - *Letter from Robin McGinley to Eric Giroux – Additionnal information.* June 2, 2006. 1 p.

M79.4 - *Strategic Marketing Operation Plan (SMOAP).* 2006. 4 p.

M80 - MURDOCH, John S. *Report on the Constitutional Rights of the Waskaganish First Nation,* May 30, 2006. 84 p. (Reference to session 32, page 48).

M81 - CREE HUMAN RESOURCES DEPARTMENT (CHRD). *Submission for the Public Hearings –Employment and Training, in Response to the Permanent Employment Needs of the Cree.* June 1, 2006. 6 p. (Reference to session 33, page 9).

M81.1 - *Presentation - Employment and Training.* June 2006. 24 p. (Reference to session 33, page 9).

M82 - CREE TRAPPERS' ASSOCIATION (CTA) OF WASKAGANISH. *Submission for the public hearings.* June 1, 2006. 5 p. (Reference to session 33, page 59).

M83 - WEISTCHE, Chief Robert. *Presentation.* May 2006. 52 p. (Reference to session 34, page 33).

M83.1 - *Speech.* June 1, 2006. 8 p.

M84 - HESTER, William T. *Submission for the public hearings.* 2006. 6 p. (Reference to session 34, page 65).

M85 - ESAU, Charles. *Preliminary Analysis of the Eastmain-1-A Powerhouse and the Rupert Diversion Environmental Impact Statement - Summary Report.* 2006. 4 p. (Reference to session 30, page 81).

M85.1 - *Presentation.* May 30, 2006. 12 p.

M85.2 - *Final analysis.* May 31, 2006. 3 p.

M86 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *Presentation.* June 1, 2006. 24 p.

Chisasibi

M87 - CREE NATIVE ARTS AND CRAFTS ASSOCIATION (CNACA). *Presentation for Hearingsin Chisasibi.* June 6, 2006. 21 p. (Reference to session 37, page 95).

M87.1 - *Presentation for Hearings in Montreal.* May 2006. 19 p.

M87.2 - *Action Plan.* 2003. 52 p.

M87.3 - *Report on Feasability.* May 2001. 41 p.

M87.4 - *Submission for the Public Hearings.* May 2006. 32 p.

M88 - CREE CULTURAL DEPARTMENT. *Presentation.* June 2006. 28 p. (Reference to session 37, page).

M89 - BEARSKIN, A. *Presentation.* 2006. 24 p. (Reference to session 39, page 68).

M90 - REDNOSE, Gabriel. *Submission for the Public Hearings - A New Estimate.* June 7, 2006. 13 p. (Reference to session 41, page 4).

M90.1 - REDNOSE, Gabriel. *Speech.* June 2006. 12 p.

M91 - WAPACHEE, Bertie William. *Submission for the Public Hearings.* June 9, 2006. (Reference to session 43, page 67).

M91.1 - *Presentation.* June 9, 2006. 57 p.

M91.2 - *Photograph of fish # 1.* June, 2006.

M91.3 - *Photograph of fish # 2.* June, 2006.

M91.4 - *Photograph of fish # 3.* June, 2006.

M91.5 - *Photograph of fish # 4.* June, 2006.

M91.6 - *Photograph of fish # 5.* June, 2006.

M92 - RUPERT, Chief Abraham. *Eelgrass in the James Bay and Hudson Bay Ecosystem.* 2006. 6 p. (Reference to session 43, page 106).

M92.1 - *Letter to the Panel from Chief Abraham Rupert.* November 17, 2005.

M93 - HOUSE, Irene Bearskin. *Eenou/Eeyou Pimaatsiiun & Healing Practices Interview Presentation,* November 16, 2005. 9 p.

M94 - CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY (CBHSSJB). *The Issue of Mercury and Fish Consumption Advice to the James Bay Cree Population.* June 9, 2006. 9 p.

5.2 Documents submitted by the participants without an oral presentation

DAP1 - CREE REGIONAL AUTHORITY. *Poster - Ecological Instream Flow - Eastmain-1-A Powerhouse and Rupert Diversion.* April 2006. 1 p.

DAP2 - VILLE DE ROUYN-NORANDA. *Council resolution.* April 10, 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. *Position paper submitted at the public hearings.* 28 avril 2006. 17 p.

DAP5 - VILLE D'AMOS. *Excerpt from the minutes of May 1, 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. *Position paper submitted at the public hearings.* May 2, 2006. 11 p.
DAP8 - VILLE D'AMOS. *Letter of support from the Ville d'Amos for the construction of the Eastmain-1-A Powerhouse and the partial diversion of the Rupert River,* May 2, 2006. 1 p.
DAP9 - GROUPE RIVERIN. *Position paper submitted at the public hearings.* May 9, 2006. 3 p.
DAP10 - GROUPE GÉNETIQUE. *Position paper submitted at the public hearings.* May 15, 2006. 5 p.
DAP11 - CREE REGIONAL AUTHORITY. *Further observations on mercury in the light of exchanges during public hearings in Montreal on May 4, 2006.* May 19, 2006. 11 p.
DAP12 - CREE REGIONAL AUTHORITY. *Letter to Bernard Forestell, Federal Review Panel.* May 23, 2006. 7 p.
DAP12.1 - *Referendum Results – numbers supplied by James Diamond for 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. May 26, 2006. 4 p.
DAP14 - CREE REGIONAL AUTHORITY. *Brief Overview of Cree Participation in Traditional Activities.* June 2, 2006. 11 p.
DAP15 - LINTON, Reverend Larry. *Comments and questions*. June 2, 2006. 1 p.
DAP16 - CREE REGIONAL AUTHORITY- CREE REPRESENTATIVES ON THE HUNTING, FISHING AND TRAPPING COORDINATING COMMITTEE. *Issues for wildlife management in Eeyou Istchee and observations on the role of section 24 of the JBNQA of the Hunting, Fishing and Trapping Coordinating Committee.* June 4, 2006. 11 p.
DAP17 - MAYAPPO, Gordon. *Submission - Cree Trapper VC-35*. June 5, 2006. 5 p.
DAP18 - TOMATUK, Reggie – *Issues for the Public Hearings*. June 6, 2006. 2 p.
DAP19 - PEPABANO, Joseph. *Audio submission for the public hearings*. June 7, 2006.
DAP20 - CREE NATION OF CHISASIBI. *Water quality in La Grande.* Prepared by Matthew Chisamich. June 9, 2006. 7 p.
DAP21 - GAIA SCIENCE. *Submission for the public hearings.* June 9, 2006. 16 p.
DAP22 - FONDATION RIVIÈRES. *Position paper submitted at the public hearings.* June 9, 2006. 60 p.
DAP22.1 - *Tableau des puissances installées.* 2 p.
DAP22.2 - *Annex C - Coûts de construction.* 4 p.
DAP23 - TOMATUK, Reggie. *Questions to the proponent.* June 9, 2006. 2 p.
DAP24 - TOMATUK, Reggie. *Issues for Public Hearings on EM1-A/Rupert River Diversion.* June 9, 2006. 2 p.

5.3 Documents submitted by the participants during an oral presentation (no position papers submitted)

Eastmain

DPO1 - MOSES, Jamie. (Reference to session 9, page 40).
DPO1.1 - *Photograph of boy holding a fish.*
DPO1.2 - *Photograph of boy by a body of water.*

Wemindji

DPO2 - *Wemindji aerial photograph.*

Waskaganish

DPO3 - DIAMOND, I.
DPO3.1 - Portage Magazine. July 30, 1999.
DPO3.2 - Portage Magazine. August 31, 2000.
DPO3.3 - The 1995 Canoe Brigade " The Journey." July 30, 1999 (video file).
DPO4 - SMALL, Doris.
DPO4.1 - Question on behalf of family and in memory of brother Richard. June 2, 2006. 1 p.

Chisasibi

DPO5 - PECHABANO, R.
DPO5.1 - *Photograph of Capsaoui.* (Reference to session 37, page 81).
DPO5.2 - *Draft Report: Eelgrass in James Bay and Hudson Bay Ecosystem.* 6 p. (Reference to session 37, page 81).
DPO5.3 - GREEN, E. and F. SHORT. *World Atlas of Seagrasses.* 2003.
DPO5.4 - SHORT, F. et al. *A Manual for Community-Based Eelgrass Restoration.* July 15, 2002.
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 Interests in the Offshore Region of James Bay and Hudson Bays.* 1 p.

DPO6 - HOUSE, Kevin (Youth Chief of Chisasibi).
DPO6.1 - *Speech.* June 2006. 5 p. (Reference to session 39, page 57).
DPO7 - SAGANASH, Johnny.
DPO7.1 - HYDRO-QUÉBEC. *Map – Transportation network.*
DPO8 - TOMATUK, Reggie.
DPO8.1 - *Photograph of fish # 1.* 2006.
DPO8.2 - *Photograph of fish # 2.* 2006.
DPO8.3 - *Photograph of fish # 3.* 2006.

5.4 Documents submitted by the proponent during the sessions (HYDRO-QUÉBEC PRODUCTION)

Mistissini

PAP1 - *Presentation - A Project for Present and Future Generations.* March 15, 2006. 57 p. (Reference to session 1, page 19).
PAP1.1 - *Speech.* 27 p.
PAP2 - *Table - MeHg Exposure Levels in Quebec,* March 16, 2006. 1 p. (Reference to session 2, page 97).
PAP3 - *Map 10.5 - Spawning Grounds.* November 2004.

Nemaska

PAP4 - *Presentation - A Project for Present and Future Generations.* March 21, 2006. 57 p. (Reference to session 4, page 23).
PAP4.1 - *Speech.* 27 p.
PAP5 - *Table - Rupert-Instream Flow at Diversion Point.* March 21, 2006. (Reference to session 4, page 49).
PAP6 - *Graphique - Régime de débits réservés écologiques au point de coupure.* March 21, 2006. (Reference to session 4, page 49).
PAP7 - *Graphique - Débits annuels.* March 21, 2006.
PAP8 - *Drawing (by hand).* March 22, 2006.
PAP9 - *Figure 4-11. Present and Future Hydrographs at Nemiscau Closure Points.* (Reference to session 4, page 70).
PAP10 - *Map 3-2 - Extended Study Area - Human Environment.* November 2004.
PAP11 - *Map 7.3 - Community of Nemaska.* December 2005. (Reference to session 5, page 15).
PAP12 - *Plate 4-4: Transfer Tunnel and Forebay Weir, Plan Views, Sections and Profile.* December 2005. (Reference to session 5, page 15).
PAP13 - *Figure - Social Changes.* March 22, 2006. 3 p.
PAP14 - *Cree People: Trends 1970–2003.* March 22, 2006. 5 p. (Reference to session 6, page 23).
PAP15A - *Drawing of Evolution of Instream Flow Along the Rupert.* April 2006. (Reference to session 6, page 9).
PAP15B - *Table 15-1: Breakdown of Costs According to Main Project Components.* December 2005. (Reference to session 6, page 32).
PAP16 - *Table 15-3: Transmission Costs.* December 2005. (Reference to session 6, page 48).

Eastmain

PAP17 - *Presentation - A Project for Present and Future Generations.* April 4, 2006. 54 p. (Reference to session 8, page 22).
PAP17.1 - *Speech.* 25 p.
PAP18 - *Carte C1 - Bief Rupert amont - Synthèse de l'optimisation des ouvrages.* November 2005.
PAP19 - *Presentation - Cree Employment Agreement – Overview of the Welcoming and Integration Activities for the Cree Personnel.* 15 p. April 4, 2006. (Reference to session 8, page 98).
PAP20 - *Typical Cross-section of a Dam.* (Reference to session 9, page 38).
PAP21 - *Figure - Monitoring Program.* April 5, 2006. 2 p. (Reference to session 9, page 38).
PAP22 - *Map 232-2 Rupert Bay Boundaries of the Freshwater-Saltwater Interface Measures in Open Water.* December 2005. (Reference to session 9, page 68).
PAP23 - *Map 2-1- Longitudinal Profile of the Rupert River.* December 2005. (Reference to session 9, page 69).
PAP24 - *Figure - Evolution of Instream Flow and the Rupert.* April 5, 2006. (Reference to session 9, page 69).
PAP25 - BELLROSE, Frank C. *Ducks, Geese and Swans of North America.* (Reference to session 9, page 70).
PAP26 CANADIAN WILDLIFE SERVICE – 2005 WATERFOWL COMMITTEE. *Canada Goose (B.C. Interior).* May 2002. (Reference to session 9, page 70).
PAP27 - *Large and Medium Races of the Canada Goose - Migration corridor.* (Reference to session 9, page 71).
PAP28 - *Canada Goose - Range of Specific Population.* (Reference to session 9, page 73).

Wemindji

PAP29 - *Presentation – A Project for Present and Future Generations.* April 11, 2006. 54 p. (Reference to session 11, page 19).

PAP29.1 - *Speech.* 26 p

PAP30 - *Graph - Level and Flow (JBNQA maximum level).* April 11, 2006.
PAP31 - *Map 13-6 - Wabamisk Narrows and Other Points of Reference in the Eastmain River.* November 2004. (Reference to session 11, page 43).
PAP36 - *Plate 4-11-1 - Hydraulic Structure at Sakami Lake Outlet Plan View and Section,* December 2005. (Reference to session 11, page 52).
PAP35 - *Figure 13-15 - Rating Curves at Sakami Lake Outlet.* November 2004. (Reference to session 11, page 52).
PAP37 - *Map J - Cree Land Use Community of Wemindji.* November 2004. (Reference to session 12, page 89).

Chibougamau

PAP39 - *Presentation - Un projet conçu pour les générations actuelles et futures.* April 25, 2006. 54 p. (Reference to session 14, page 14).

PAP39.1 - *Speech.* 25 p.
PAP40 - *Presentation – Mercure – Problématique et gestion des risques pour la santé.* April 25, 2006. 23 p. (Reference to session 14, page 42).
PAP41 - *Presentation – Maximisation des retombées économiques régionales.* April 25, 2006. (Reference to session 14, page 158).
PAP42 - *Tableau - Exemple de clause de sous-traitance.* April 26, 2006. (Reference to session 16, page 136).
PAP43 - *Presentation - Développement de l'éolien en complémentarité avec l'hydroélectricité.* April 26, 2006. 6 p.
PAP44 - *Presentation - Omble de fontaine (souche Rupert).* April 26, 2006. 1 p.
PAP45 - *Graphique - Bilan en énergie - Hydro - Québec Distribution (prévisions).* April 26, 2006.
PAP46 - *Graphique - Besoins en puissance - Hydro-Québec Distribution (prévisions).* April 26, 2006.
PAP47 - *Graphique - Bilan en énergie - Hydro-Québec Production (prévisions).* April 26, 2006.
PAP48 - *Graphique - Besoins en puissance - Hydro-Québec Production (prévisions).* April 26, 2006.

Montréal

PAP49 - *Presentation - Un projet conçu pour les générations actuelles et futures.* May 1, 2006. 59 p. (Reference to session 17, page 19).

PAP49.1 - Speech. 29 p.
PAP50 - *Acétate - Omble de fontaine (souche Rupert).* May 1, 2006.
PAP51 - *Presentation – PGEÉ: Un plan évolutif.* May 1, 2006. 3 p. (Reference to session 17, page 57).
PAP52 - *Tableau C-2: Bilan en énergie d'Hydro-Québec Production (sans le projet de l'Eastmain-1-A Rupert.* May 1, 2006. (Reference to session 17, page 128).
PAP53 - *Tableau D-2: Bilan en puissance d'Hydro-Québec Production (sans le projet de l'Eastmain-1-A Rupert.* May 1, 2006. (Reference to session 17, page 128).
PAP54 - *Graphique - Bilan en énergie - Hydro-Québec Production (prévisions).* May 1, 2006. (Reference to session 17, page 128).
PAP55 - *Présentation - Régime de débits réservés écologiques - présentation générale.* May 2, 2006. 21 p. (Reference to session 19, page 7).
PAP56A - *Carte 1 - Sites d'aménagement proposés.* March 13, 2006. (Reference to session 19, page 7).
PAP56B - *Presentation - Qualité de l'eau.* May 2, 2006. 4 p. (Reference to session 20, page 126).
PAP56C - *Presentation - Impacts potentiels du projet sur les baies James et d'Hudson.* May 3, 2006. 31 p. (Reference to session 21, page 10).
PAP56D - *Presentation - Les études sur la truite souche Rupert.* May 3, 2006. 3 p.
PAP56E - *Presentation - Développement de l'éolien en complémentarité avec l'hydroélectricité.* May 3, 2006. 6 p. (Reference to session 22, page 28).
PAP57 - *Comparaison des options de production d'électricité.* May 3, 2006. 4 p. (Reference to session 22, page 50).
PAP58 - *Fonds versés par HQ/SEBJ à des entités cris.* May 3, 2006. 1 p. (Reference to session 22, page 50).
PAP59 - *Photograph - Transport routier d'une éolienne.* May 3, 2006. (Reference to session 22, page 55).
PAP60 - SPRINGER. *Mercury in the Biogeochemical Cycle - Natural Environment and Hydroelectric Reservoirs of Northern Québec.* (Reference to session 23, page 10).
PAP61 - *Presentation - Bilan de l'état de santé des Cris.* May 2006. 16 p. (Reference to session 23, page 11).
PAP62 - *Presentaton - Mercure - Problématique et gestion des risques pour la santé.* May 4, 2006. 21 p. (Reference to session 23, page 30).
PAP63 - *Presentation - Changements sociaux chez les Cris - 30 ans.* May 4, 2006. 11 p. (Reference to session 23, page 44).

PAP64 – *Response to Health Canada's comments on the conformity of the impact statement – mercury and human health component.* May 4, 2006. 5 p. (Reference to session 24, page 107).

PAP64.1 - INSTITUT NATIONAL DE SANTÉ PUBLIQUE DU QUÉBEC. *Exposure and preliminary health assessments of the Oujé-Bougamou Cree population to mine tailings residues. Report of the survey.* January 2005. 257 p. (Reference to session 23, page 10).

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PAP123 - *Presentation – Cree Employment Agreement – Overview of the Welcoming and Integration Activities for the Cree Personnel.* June 9, 2006. 15 p.

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PAP125 - *Presentation - Water Quality.* June 9, 2006. 9 p.

5.5 Supplementary documents submitted by the proponent (HYDRO-QUÉBEC PRODUCTION)

DCAP1 - *Response to the review bodies' public hearing requests – Part 1.* March 10, 2006. 3 p. Appendices: 380 p.
DCAP1.1 - *Map – Overview of the project.*
DCAP2 - *Response to the review bodies' public hearing requests - Part 2 (Question 365).* March 15, 2006. Various pagings.
DCAP2.1 - *Map – Proposed development sites.*
DCAP3 - *Suivi environnemental des projets La Grande 2A et La Grande 1 – Rapport synthèse pour la période 1988 à 2000 – La zostère marine pour la côte nord-est de la Baie James.* 2002. 92 p. Appendices.
DCAP 4 - *Environmental Follow-up Assessment of the La Grande Hydroelectric Complexe – Human Impacts Generated in the Eastern Sector - Marine Report.* 2004. 2 volumes.
DCAP5 - *Suivi environnemental du complexe La Grande – Rapport synthèse 1978-2000 – Évolution de la qualité de l'eau.* 2005. 168 p. Appendices.
DCAP6 - *Eastmain-1-A/Rupert Agreement with the Municipality of James Bay.* January 25, 2005. 23 p.
DCAP7 - *Fish Consumption Guide.* 2006. 46 p. (Reference to session 24, page 108).
DCAP8 - *Comparaison des options de production d'électricité – Biodiversité.* June 2000. 4 p.
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DCAP13 - RSW. *Centrale de l'Eastmain-1-A et dérivation Rupert - Rapport sectoriel complémentaire sur les baies James et d'Hudson.* June 2006. 61 p.
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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.* June 8, 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.
DCAP19 - *Answers to the Document Entitled: Preliminary Analysis of the Eastmain-1-A Powerhouse and Rupert Diversion Environmental Impact Statment Summary Report - Charles Esau for Waskaganish Environment Hearings.* June 9, 2006. 15 p.
DCAP20 - *Carte - Planche 2-1: Conditions de navigation dans la rivière Rupert en conditions futures.* June 9, 2006.
DCAP21 - *Comments related to the document submitted by Alan Penn (ARC) on mercury.* June 9, 2006. 4 p.
DCAP22 - *Meeting between Hydro-Québec and Fisheries and Oceans Canada – Highlights – May 11, 2006.* June 9, 2006. 4 p.
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.
DCAP24 - GROUPE ENVIRONNEMENTAL SHOONER - GÉNIVAR. *Étude de la communauté de poissons de l'estuaire de la rivière Eastmain 12 ans après la rédacation de débit fluvial annexes.* October 1993. 210 p.
DCAP25 - ENVIRONNEMENT ILLIMITÉ. *Biefs Rupert et zone à débit augmenté, Aménagement pour l'ichtyofaune - Schéma directeur.* April 2006. 112 p.
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DOE2 - *Summary – Technical meeting with Professor Grant Ingram (University of British Columbia).* April 19, 2006. 3 p.
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DOE4 - *Letter to Health Canada.* May 15, 2006. 1 p.
DOE5 - *Notes and Questions from Jocelyne Beaudet to Hydro-Québec (Waskaganish).* June 2, 2006. 2 p.

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DOE7 - INGRAM, Grant (University of British Columbia). *References to the report.* June 9, 2006. 2 p.
DOE8 - OFFICE NATIONALE DE L'ÉNERGIE (ONÉ). *Lettre à Bernard Forestell - Examen du projet Eastmain-1-A et dérivation Rupert.* June 9, 2006. 3 p.

5.7 Transcripts (verbatim) of the sessions

VAP1 - Mistissini (Volume 1). March 15, 2006. 117 p.
VAP2 - Mistissini (Volume 2). March 16, 2006. 121 p.
VAP3 - Mistissini (Volume 3). March 16, 2006. 191 p.
VAP4 - Nemaska (Volume 4). March 21, 2006. 121 p.
VAP5 - Nemaska (Volume 5). March 22, 2006. 115 p.
VAP6 - Nemaska (Volume 6). March 22, 2006. 105 p.
VAP7 - Nemaska (Volume 7). March 23, 2006. 173 p.
VAP8 - Eastmain (Volume 8). April 4, 2006. 124 p.
VAP9 - Eastmain (Volume 9). April 5, 2006. 96 p.
VAP10 - Eastmain (Volume 10). April 5, 2006. 109 p.
VAP11 - Wemindji (Volume 11). April 11, 2006. 114 p.
VAP12 - Wemindji (Volume 12). April 12, 2006. 104 p.
VAP13 - Wemindji (Volume 13). April 12, 2006. 86 p.
VAP14 - Chibougamau (Volume 14). April 25, 2006. 167 p.
VAP15 - Chibougamau (Volume 15). April 26, 2006. 181 p.
VAP16 - Chibougamau (Volume 16). April 27, 2006. 148 p.
VAP17 - Montreal (Volume 17). May 1, 2006. 181 p.
VAP18 - Montreal (Volume 18). May 2, 2006. 95 p.
VAP19 - Montreal (Volume 19). May 2, 2006. 152 p.
VAP20 - Montreal (Volume 20). May 2, 2006. 136 p.
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VAP35 - Waskaganish (Volume 35). June 2, 2006. 57 p.
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VAP37 - Chisasibi (Volume 37). June 6, 2006. 120 p.
VAP38 - Chisasibi (Volume 38). June 7, 2006. 117 p.
VAP39 - Chisasibi (Volume 39). June 7, 2006. 84 p.
VAP40 - Chisasibi (Volume 40). June 8, 2006. 106 p.
VAP41 - Chisasibi (Volume 41). June 8, 2006. 107 p.
VAP42 - Chisasibi (Volume 42). June 9, 2006. 68 p.
VAP43 - Chisasibi (Volume 43). June 9, 2006. 194 p.

6. DOCUMENTS SUBMITTED AFTER THE PUBLIC HEARINGS

6.1 Participants

D1 - CÔTÉ, Gérald. *Libre échange interculturel - En marge de la consultation publique de Chisasibi sur la dérivation de la Rupert.* June 11, 2006. 2 p.
D2 - ETTINGER, K., Ginette LAJOIE and R. BEAULIEU. *Wemindji Cree Knowledge of Eelgrass Distribution and*

Ecology. March 1995. 50 p.
D3 - VILLE DE MALARTIC. *Extrait du procès-verbal d'une séance ordinaire du conseil municipal du 12 juin 2006.* June 20, 2006. 1 p.
D4 - SIERRA CLUB OF CANADA. *Submission on the acceptability of Hydro-Quebec's Rupert River Diversion Project.* June 2006. 24 p.
D5 - CHIEFS OF THE CREE NATIONS OF NEMASKA – CHISASIBI – WASKAGANISH. *Statement.* June 2006. 22 p.
D5.1 - HELIOS. *Comments on the Justification of the Eastmain-1-A / Rupert Diversion Project.* June 30. 49 p.
D6 - CREES OF THE WASKAGANISH FIRST NATION. *Intervention to the Public Hearing on the Proposed Rupert River Diversion.* June 1, 2006. 11 p.
D7 - GRAND COUNCIL OF THE CREES – CREE REGIONAL AUTHORITY – HYDRO-QUÉBEC – JAMES BAY ENERGY CORPORATION. *Agreement regarding water management of the Rupert River reached between the parties in Montreal.* June 13, 2006. 7 p.
D8 - NATURAL RESOURCES CANADA. *Supplément d'information ci-joint portant sur la question du mercure.* July 18, 2006. 2 p.
D8.1 - MICHEL PARENT. *Rapport complémentaire soumis à la Commission fédérale d'examen et au Comité provincial d'examen dans le cadre du projet Eastmain-1-A/Dérivation Rupert.* 10 p.
D8.2 - GEOLOGICAL SURVEY OF CANADA. *Rapport complémentaire soumis à la Commission fédérale d'examen et au Comité provincial d'examen dans le cadre du projet Eastmain-1-A / Dérivation Rupert.* 3 p.
D9 - CREES OF THE WASKAGANISH FIRST NATION. *Follow-up – Backup study to the presentation made by Marvin Zylber – Rupert Diversion Hearings – Waskaganish - June 2, 2006, prepared by Marvin Zylber.* July 10, 2006. 1 p.
D9.1 - DESSAU-SOPRIN. *Comprehensive Studies for Water Distribution Network and Drinking Water Production Facility – Waskaganish.* July 4, 2006. 30 p. Appendices.
D10 - CHIEFS OF THE CREE NATIONS OF NEMASKA – CHISASIBI – WASKAGANISH. *Addendum to the Comments on the Justification of the Eastmain1A/Rupert Diversion Project.* August 13, 2006. 1 p.
D10.1 - HELIOS. *Addendum* 6 p.
D11 - NASR, Wren. *Integration of Traditional Knowledge in the Rupert River Diversion Environmental Impact Assessment.* September, 2006. 11 p.

6.2 Proponent

PD1 - HYDRO-QUÉBEC – ENVIRONMENT CANADA. *Highlights - Meeting.* June 13, 2006. 5 p.

PD2 - HYDRO-QUÉBEC – FISHERIES AND OCEANS CANADA – MINISTÈRE DU DEVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS DU QUÉBEC. *Highlights – Meeting.* June 19, 2006. 5 p.
PD3 - GÉNIVAR. *Étude de la communauté de poissons de l'estuaire de la rivière Eastmain – 12 ans après la réduction du débit fluvial.* Octobre 1993. 138 p. Annexes : 72 p.
PD4 - HYDRO-QUÉBEC PRODUCTION. *État des zostéraies de la cote nord-est de la Baie James – Été 2004.* December 2004. 46 p.
PD5 - HYDRO-QUÉBEC ÉQUIPEMENT. *Letter to Fisheries and Oceans Canada – Hydro-Québec's commitments and additional information.* August 7, 2006. 2 p.
PD5.1 - *Carte 1 et Index - Rivières Rupert - Conditions hydrauliques du tronçon entre le seuil PK 223 et le PK 288.* July 2006.
PD5.2 - *Étude complémentaire - Alimentation de l'esturgeon jaune dans le secteur des futurs biefs - Sommaire du protocole d'étude.* 2 p.
PD5.3 - GÉNIVAR. *Schéma directeur des aménagements piscicoles dans le secteur des rivières Rupert, Lemare et Nemiscau.* July 2006. 68 p. Appendices.
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 - JAMES BAY ENERGY CORPORATION. *Lettre à Bernard Forestell, commission fédérale d'examen et Clément Tremblay, COMEX - Exploitation de la rivière Rupert.* 15 août 2006. 2 p.
PD7 – JAMES BAY ENERGY CORPORATION. *Évaluation des impacts sur les anatidés.* March 2006. 5 p.
PD7.1 - *Tableau - Rapport sur la densité.*
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PD8 - CREE REGIONAL AUTHORITY (CRA) – INSTITUT NATIONAL DE LA RECHERCHE SCIENTIFIQUE (INRS). *Transmission, circulation et diffusion de l'information à Eastmain,Waskaganish, Nemaska et Mistissini – Projet de centrale de l'Eastmain-1-A et dérivation Rupert – Étude d'évaluation et de suivi.* September 20, 2006, 53 pages and appendices.
PD8.1 - JAMES BAY ENERGY CORPORATION. *Lettre à Bernard Forestell, Commission fédérale d'examen et Clément Tremblay, COMEX – Étude d'évaluation et de suivi présentée par l'INRS et l'ARC. September* 29, 2006. 3 p.

PD9 - HYDRO-QUÉBEC – FISHERIES AND OCEANS CANADA – MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L'ENVIRONNEMENT ET DES PARCS DU QUÉBEC – MINISTÈRE DES RESSOURCES NATURELLES ET DE LA FAUNE. *Highlights – Meeting*. September 6, 2006. 6 p.

PD9.1 - *Tableau 2 - Programme de suivi environnemental pour les poissons.*

PD9.2 - *Carte - Bief Rupert amont – Aménagement potentiel de frayèreà touladi au lac Cabot.*

PD9.3 - *Carte - Bief Rupert amont – Aménagement potentiel de frayèreà touladi au lac RP030.*

PD10 - HYDRO-QUÉBEC. *Centrale de l'Eastmain-1-A et dérivation Rupert - Prévisions organisationnellesdes services médicaux des campements 2006-2011*. September 22, 2006, 8 p.

PD11 - HYDRO-QUÉBEC. *Centrale de l'Eastmain-1-A et dérivation Rupert: rectificatif de l'analyse d'impact sur l'habitat de la faune terrestre*. October 2006. 2 p.

PD12 - TECSULT. *Centrale de l'Eastmain-1-A et dérivation Rupert – Étude complémentaire en phase d'autorisation gouvernementales – Inventaires de la sauvagine sur les rivières Rupert, Eastmain, Opinaca et Petite Opinaca*. 2006. 170 p. and appendices.

6.3 Review bodies

OED1 - FISHERIES AND OCEANS CANADA. *Hypothèses reliées aux effets environnementaux du projet Grande Baleine sur l'écosystème marin côtier du sud-est de la baie d'Hudson*. 1996. 67 p.

OED2 - FISHERIES AND OCEANS CANADA. *Proceedings of a Workshopon the Potential Cumulative Impacts of Development in the Region of Hudson and James Bays – June 17–19, 1992*. August 1992. 39 p.

OED3 - FEDERAL REVIEW PANEL. *Summary – Conference call with Fisheries and Oceans Canada.* July 10, 2006. 3 p.

OED4 - ANALYSIS GROUP. *The Impact of the James Bay Development on the Canadian Economy.* July 24, 2006. 44 p.

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*. September 2004. 5 p.

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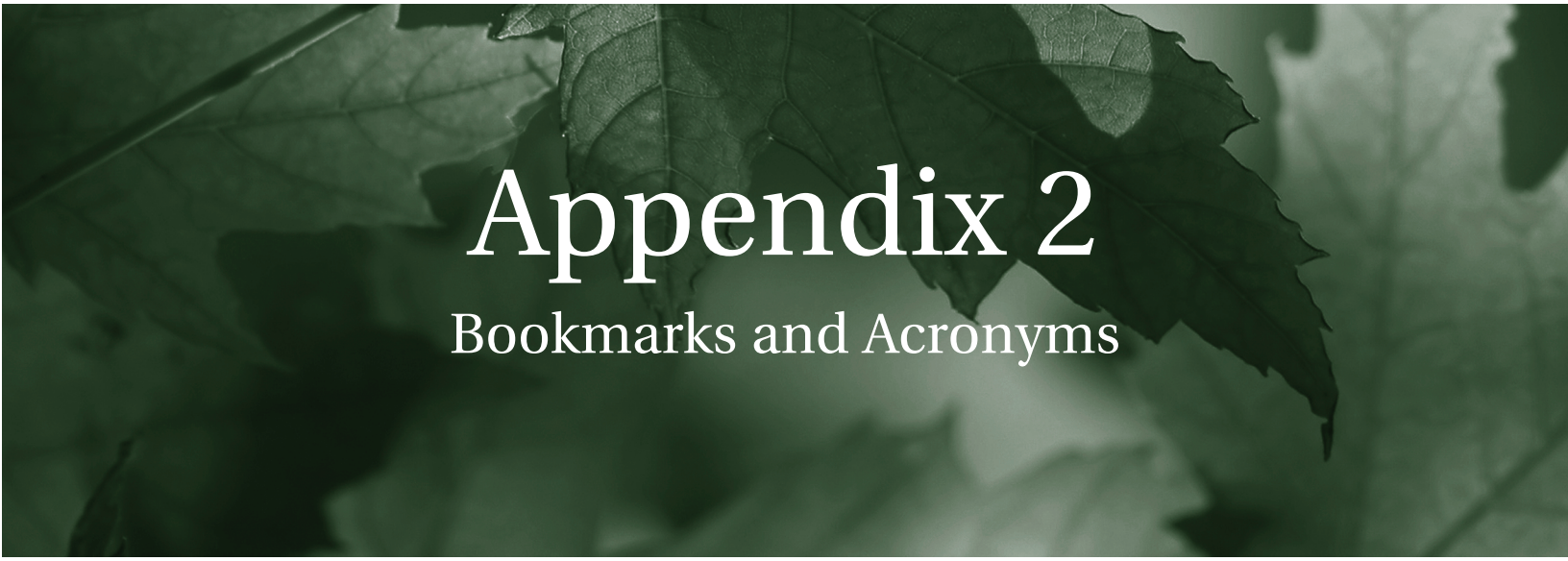
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Appendix 2

Bookmarks and Acronyms

ACRGTQ	*Association de constructeurs de routes et grands travaux du Québec*
ATV	All-terrain vehicle
CBHSSJB	Cree Board of Health and Social Services of James Bay
CCQ	Commission de la construction du Québec
CEAA	Canadian Environmental Assessment Act
CEHQ	Centre d'expertise hydrique du Qué*bec*
CNACA	Cree Native Arts and Crafts Association
COMEV	Evaluating Committee (Section 22 of the JBNQA)
COMEX	Provincial Review Committee (Section 22 of the JBNQA)
COTA	Cree Outfitting and Tourism Association
CRA	Cree Regional Authority
CREBJ	*Conférence régionale des élus de la Baie-James*
EOL	Eastmain, Opinaca, La Grande
EQA	*Environment Quality Act*
FQCK	Fédération québécoise du canot et du kayak
GCC	Grand Council of the Crees of Quebec
GRAME	*Groupe de recherche appliquée en macroécologie*

HBC	Hudson's Bay Company
HPI	Habitat Probalistic Index
HQD	Hydro-Québec Distribution
HQP	Hydro-Québec Production
HSI	Habitat Suitability Index
ISP	Income Security Program
JBNQA	James Bay and Northern Quebec Agreement
MBJ	*Municipalité de la Baie-James*
MHM	Microhabitat modeling
NBR	Nottaway–Broadback–Rupert
NTU	Nephelemetric turbidity unit
PK	Kilometre point
SEBJ	Société d'énergie de la Baie James
TOC	Total organic carbon
UQCN–Nature Québec	*Nature Québec/Union québécoise pour la conservation de la nature*
VEC	Valued Ecosystem Component
WUA	Weighted usable area



Appendix 3

Mandate and Members of the Panel

1. MANDATE

INTRODUCTION

At the request of Fisheries and Oceans Canada, Environment Canada has referred the environmental assessment of the Eastmain-1-A and Rupert Diversion Project (the "Project") to an Environmental Assessment Panel (the "Panel") in accordance with *the Canadian Environmental Assessment Act* (the "Act"). The Panel is required to conduct an independent public review of the environmental impacts of the Project, which comprises the construction of the Eastmain-1-A powerhouse, the diversion of the Rupert River, the construction of a regulating structure at the Sarcelle site, and the construction of an east-west roadway linking the Muskeg substation with the Eastmain-1 and Eastmain-1-A powerhouses.

The Panel's mandate takes into account the *Agreement Concerning the Environmental Assessments of The Eastmain-1-A and Rupert Diversion Project*. Furthermore, the Panel's mandate was prepared in cooperation with Fisheries and Oceans Canada and Transport Canada—in their capacity as the responsible authorities for the project—and issued by Environment Canada.

MANDATE

The Panel has been asked to conduct an assessment of the Project's environmental effects and to submit a report to the Minister of the Environment and the responsible authorities in accordance with section 34 of the Act. In accordance with the Agreement, the Panel must fully take into account, at the very least, all aspects provided for under Chapter 22 of the *James Bay and Northern Quebec Agreement* (the "JBNQA"), and Division II of Chapter II of the Environment Quality Act (the "EQA"), including the environmental and social impacts of the Project and the Project rationale. The Panel must also obtain the information required in order to conduct the environmental assessment, including the information requested of the proponents in the *Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert Diversion Project*.

SCOPE OF THE PROJECT

The scope of the Project established for environmental assessment purposes comprises the various Project components as described by the Proponents in the document entitled "Preliminary Information – Eastmain-1-A Powerhouse and Rupert Diversion, October 2002," as well as the activities and works described in the *Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert Diversion Project*.

The Project includes the diversion of a portion of the flow of the Rupert River from a location known as km 314 (314 km upstream from the mouth of the Rupert River in Rupert Bay), towards the Eastmain-1 reservoir. More precisely, the water diverted would bypass Cramoisy Lake to the east to flow into Arques Lake, then into Nemiscau River, to then pass through Caché Nord stream before reaching the Eastmain 1 reservoir at about km 270 of the Eastmain River. There are also plans to build a powerhouse, Eastmain-1-A, on the Eastmain River near the Eastmain-1 powerhouse currently under construction, upstream from the Opinaca reservoir on the James Bay Territory. After passing through the turbines of the Eastmain-1-A and Eastmain-1 powerhouses, the waters diverted from the Rupert would flow north toward the Robert-Bourassa and La Grande-1 reservoirs by the existing Eastmain-Opinaca-La Grande diversion route.

The scope of the Project includes the construction, operation, maintenance, the foreseeable modifications and, where relevant, the closure, decommissioning and restoration of the following works and activities:

- the Eastmain-1-A powerhouse with a maximum capacity of about 770 MW, including the water intake and tail race canal, located between the Eastmain-1 powerhouse and the Eastmain-1 spillway. The Eastmain-1-A powerhouse would be integrated to the 315 kV transmission line by way of the Eastmain-1 site;
- modification of the Sarcelle facility to take into account the increased flow, through the addition of a gate to the three existing ones or the addition of a powerhouse of a capacity of about 130 MW. In the latter case, a 315 kV transmission line would link the Sarcelle powerhouse to the Eastmain sending-end substation via the Muskeg substation;
- the partial diversion of watercourses, mainly the Rupert, Lemare and Nemiscau rivers including:
  - the required dams and dikes;
  - the works permitting the restitution of a minimum flow;
  - the control structures and spillways;
  - the set of diversion canals or tunnels;
  - the corrective and mitigation works, such as weirs on Rupert River;

- all of the flooded areas, including the expansion of the Eastmain-1 reservoir associated with the Project;
- the modifications to certain works, including the work to move certain existing power transmission lines;
- the modifications to the management of existing works and reservoirs;
- a temporary 69 kV line from the Arbanel substation up to the construction zone, and a permanent line up to the spillway on Rupert River and the control structure;
- all of the related works and activities including, when relevant, the decommissioning and restoration of the sites of all temporary facilities required for the construction of the previously mentioned facilities, in particular:
  - permanent and temporary work camps;
  - permanent and temporary access roads;
  - bridges and watercourse crossings;
  - the construction or modification of all transport infrastructures;
  - the treatment of wastewaters and waste management;
  - drinking water supply;
  - borrow pits and quarries;
  - management of excavation material;
  - construction worksites and storage areas;
  - the handling and storage of petroleum products and hazardous materials;
- any other modification to the mentioned works that may result from the pre-project studies currently underway.

Finally, it is understood that several elements of the Project must still be clarified and that it will be necessary to include in the scope of the Project the environmental and social mitigation measures that would require the construction of works that may cause impacts (e.g. weirs, spurs, etc.).

SCOPE OF THE ASSESSMENT

- In its assessment, the Panel must take into account the following elements, which are listed in paragraphs 16(1)(a) to (d) and in subsection 16(2) of the Act:
- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities;
- the significance of the effects referred to in the preceding paragraph;
- comments made by the public in the course of the public review;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the purpose of the Project;
- alternative means of carrying out the Project that are technically and economically feasible, including other roads and effluent outlets, and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the Project;
- the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.

In accordance with paragraph 16(1)(*e*) of the Act and the Agreement, the assessment carried out by the Panel must also address all the other elements contained in the *Directives for the Preparation of the Impact Statement for the Eastmain-1-A and Rupert Diversion Project*.

These Directives stipulate the manner and extent to which Proponents must address the elements to be included in their impact statement.

PUBLIC PARTICIPATION

The Panel must ensure that the information required for its assessment is obtained and made available to the public. It must also ensure that the public has an opportunity to participate in the assessment, particularly at the stage at which the adequacy of the impact statement is assessed, as well as during the public hearings into the environmental effects of the Project and the issues raised by the impact statement.

REVIEW PROCESS

The Panel must make every possible effort to consult with the Review Committee—the standing body responsible for the environmental and social assessment, among other things, of this project under the JBNQA—in order to harmonize the various stages of the assessment process and coordinate technical and other requirements so as to avoid duplication of effort and overlap. Any coordination or harmonization measures implemented shall be consistent with the principles and provisions outlined in the Act, the JBNQA and the EQA and shall in no way restrict the Panel's responsibilities

and prerogatives. Upon being designated, the Panel, in cooperation with the Review Committee, is required to publish operational procedures for the purposes of conducting an independent public review of the Project. Insofar as it is possible to do so, the review is to be carried out based on the stages described below.

Public consultation regarding the adequacy of the impact statement: The Panel must make the both versions of the impact statement public, in French and in English, at the same time and must enter them into the public registry. The public is to be given at least 90 days to examine the material and submit its written comments on the adequacy and appropriateness of the information contained in the impact statement, in accordance with the directives concerning the preparation of an impact statement.

Determining the adequacy of the impact statement

- The Panel shall determine whether the impact statement contains adequate and relevant information which enables it to proceed with public hearings, taking into account the written comments it has received and its own review of the impact statement.
- If the Panel determines that it has adequate and relevant information which enables it to proceed with public hearings, it shall establish a calendar and announce that public hearings are to be held in accordance with step 3 of this section.
- If the Panel determines that it is unable to hold public hearings because the impact statement contains significant information gaps, it shall issue a statement concerning these gaps, enter this statement into the public registry, and request that the Proponents submit the additional information which is needed.
- Upon receipt of the additional information submitted by the Proponents, the Panel shall ensure that this information is made available to the public by entering it into the public registry. The Panel shall determine whether it would be appropriate to receive written comments concerning the relevance and adequacy of the additional information.
- The Panel shall determine whether it has adequate information to proceed with public hearings, taking into account the written comments it has received, if any, and its own review of the additional information.
- If the Panel determines that the impact statement and the additional information are adequate to proceed to public hearings, it shall establish a calendar and announce that public hearings are to be held, in accordance with step 3 of this section.
- If the Panel determines that the additional information does not adequately address the gaps contained in the impact statement, it shall issue a new statement regarding these gaps, enter this statement into the public registry and ask the Proponents to provide it with other additional information. Paragraphs (d) to (g) shall apply to the review of any additional information provided by the Proponents.

Notice and procedure of public hearings: After determining that it has sufficient information to proceed with public hearings and after preparing detailed procedures for these hearings, the Panel shall notify the public of the schedule and location of the hearings, giving a minimum of 45 days notice. The Panel shall also publish the detailed procedures for these hearings. Public hearings must be held, at the very least, in the communities of Mistissini, Nemaska, Waskaganish, Wemindji, Eastmain and Chisasibi, as well as Chibougamau and Montréal. The public hearings shall provide an opportunity for Proponents, responsible authorities and the public to express their views on the Project. These hearings must ensure that all issues connected with the Panel's mandate, including those of a technical nature, receive a full and thorough review.

Report: Upon completion of the public hearings, the Panel shall draft a report in both official languages and submit it to the Minister of the Environment and the responsible authorities. This report shall include, without being limited thereto, a description of the Panel review process, a summary of public comments, and the Panel's rationale, conclusions and recommendations. The Minister of the Environment shall make the report available to the public through the public registry and shall ensure that the public is aware that the report is available.

DURATION OF THE REVIEW

The duration of the review, from the time the impact statement is submitted by the Proponents, and excluding the time required for the Proponents to prepare any additional information, should not normally exceed 15 months.

DOCUMENTATION AND INFORMATION

All documents prepared by the Panel must be produced in both official languages. Some of these documents may be translated into Cree when the Panel deems it appropriate to do so.

SPECIAL ADVISORS TO THE PANEL

The scientific and technical expertise the Panel may require will primarily be provided by the federal departments and agencies which have the appropriate expertise. If adequate scientific or technical expertise is not available from among the resources of the Government of Canada, non-governmental experts may be enlisted, at the request of the Panel, in order to provide advice on specific subjects related to the assessment and review of the Project.

2. BIOGRAPHIES OF THE MEMBERS

Bernard Forestell, Chairman

Mr. Forestell is a senior associate of Dixon & Associates Management Consultants and of the Corporate Research Group in Ottawa and, in this capacity, he presently directs and conducts management consulting assignments (planning, business case and resource management). Mr. Forestell's areas of professional expertise include legislative and regulatory development, policy and program design, strategic planning, information needs analysis, organizational and business process redesign and cost analysis, negotiation, crisis management and media relations.

From 1991 to 1996, Mr. Forestell worked at the Federal Environmental Assessment and Review Office/Canadian Environmental Assessment Agency. He was Director General responsible for the environmental assessment provisions of the *James Bay and Northern Quebec Agreement*. He led negotiations which concluded in an agreement between Canada, Quebec and the Cree and Inuit of Quebec for the environmental assessment of the Great Whale project.

Mr. Forestell also worked at Treasury Board Secretariat, Natural Resources Canada and Agriculture and Agri-Food Canada. He holds a bachelor's degree from Wilfrid Laurier University and a master's degree from the University of Toronto.

Philip Awashish

Philip Awashish studied at McGill University. During this time he participated in the initiation of a Native Studies Program and was instrumental in promoting public awareness of the pending hydro-electric development in James Bay, Quebec, and the related impact on the Cree traditional way of life.

In Mistissini, in 1971, he was chief negotiator, representing Cree First Nations of Quebec, and a signatory of the *James Bay and Northern Quebec Agreement*. Mr. Awashish was also a chief negotiator on the Cree-Naskapi negotiations which led to the enactment of the *Cree-Naskapi (of Quebec) Act*. He was the chief negotiator for amendments to the Cree Hunters and Trappers Income Security Program. In 1994, Mr. Awashish was appointed by the Government of Canada to the Canadian negotiation team responsible for successfully negotiating the amendments to the *Migratory Birds Convention* with the United States.

Mr. Awashish was Executive Chief (Deputy Grand Chief) and Vice-chairman of the Grand Council of the Crees (Eeyou lstchee)/Cree Regional Authority for twelve years and continued, until early 1997, as a member of the Board of Directors and the regional Council of the Cree authorities. Mr. Awashish was also Chief of the Mistissini Band Council in 1978, and a member of the Band Council, holding the position of Councillor until 1996. Mr. Awashish has been a commissioner appointed to the Cree-Naskapi Commission by the Government of Canada since 1997.

Jocelyne Beaudet

As a communications consultant, Jocelyne Beaudet has more than twenty years of experience in various fields related to the environment and public participation. She has provided consulting services for policy development on sustainable transportation for the National Round Table on the Environment and the Economy. In July 1998, she became a member of Hydro-Quebec's *Comité d'information et de consultation publiques sur le projet Hertel-Des Cantons*.

From 1990 to 1995, Jocelyne Beaudet worked as an analyst for the *Bureau d'audiences publiques sur l'environnement du Québec* (BAPE) on more than twenty projects including Hydro-Quebec's Sainte-Marguerite-3 project. In 1994-1995, she acted as the Provincial Executive Co-Secretary of the Joint Environmental Assessment Panel for the Lachine Canal Decontamination Project. She has been appointed three

times for three-year mandates to serve as a part-time member at the BAPE since 1995. In this capacity, she has been on five panels, chairing the last three including the panel on the diversion of the Manouane River by Hydro-Québec. In August 2002, she accepted a four-year term as an ad hoc commissioner with the *Office de consultation publique de Montréal*. In addition, Jocelyne Beaudet worked for six years with the TECSULT firm (1995-1999 and 2002-2004) on various environmental communication mandates. Jocelyne Beaudet holds a bachelor's degree in physical anthropology from the University of Montréal and a master's degree in cultural anthropology from McGill University.

Brian Craik

Since 1972, Mr. Craik has worked primarily on contemporary Aboriginal issues. He was nominated by the Cree community of Waskaganish for discussions on the proposed Nottaway-Broadback-Rupert Project, in 1979. Mr. Craik joined the Department of Indian Affairs and Northern Development in 1984 to work on the implementation of the *James Bay and Northern Quebec Agreement*. From 1987 to 1989, he worked as resident anthropologist with Byers Casgrain of Montréal.

Mr. Craik became a private consultant in 1989. He advised the James Bay Crees on relations with the federal government and on the environmental and social issues related to the Great Whale project. He was named by the Crees to two of the environmental committees (the Evaluating Committee and the Cree-Quebec Review Committee) that reviewed the project.

Since 1994, Mr. Craik has worked on environmental matters for the Crees and in 1997-1999 negotiated an Agreement between the Crees and Canada on Canada Manpower Services. He has also provided some oversight of the communications aspects of Grand Council work. Mr. Craik graduated from McMaster University in Anthropology and speaks English, Cree and French.

Pierre Magnan

Pierre Magnan obtained a Bachelor of Science degree in Biology (B.Sc.) at the Université du Québec at Trois-Rivières in 1978, and a Ph.D. in Biology at Laval University in 1984. He became a professor at the Université du Québec at Trois-Rivières in 1984. Professor Magnan's main fields of expertise are aquatic ecology, the evolutionary ecology of fish, the impact of various human interventions on fish populations and communities as well as restoring and protecting fish habitat.

Professor Magnan has held the Canada Research Chair in fresh water ecosystems since 2001. He is the director of the Research Group on Aquatic Ecosystems since 1989. He is also one of the founding members of the Group for Interuniversity Research in Limnology and Aquatic Environment, as well as a member of the Sustainable Forest Management Network (Centre of excellence, National Research Council of Canada).

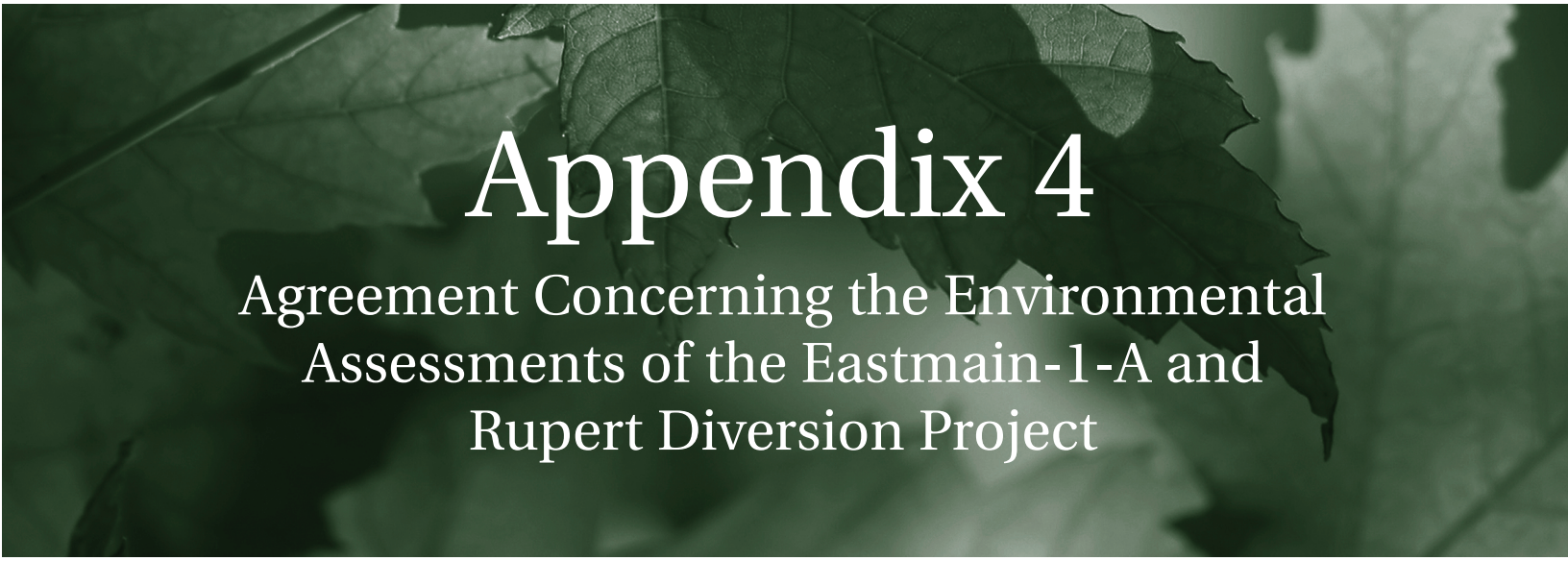
Professor Magnan was welcomed into the *Cercle d'excellence du réseau de l'Université du Québec* in August 2004 and was the first member to receive the Award of Excellence in research from the Université du Québec at Trois-Rivières in April 2004. He also received the Prix Radisson Tourisme d'affaires in 2000 from the Town of Trois-Rivières, for the organization of the Fourth International Charr Symposium at Trois-Rivières. Lastly, in 1999, the magazine *Québec Science* chose one of his breakthroughs on evolutionary ecology as one of the ten discoveries of the year.

3. BIOGRAPHY OF THE PANEL MANAGER

Éric Giroux

Eric Giroux obtained a bachelor's degree in geological engineering in 1992 and a master's degree in hydrogeology at Université Laval in 1994. For eight years, Mr. Giroux served as an environmental consultant for various engineering firms and has been with the Canadian Environmental Assessment Agency since 2001. He serves as senior advisor to the Agency and the federal administrator responsible for the application of the *Canadian Environmental Assessment Act* (CEAA) and environmental and social assessment processes under the *James Bay and Northern Quebec Agreement* (JBNQA).

Mr. Giroux is a member of the Evaluating Committee (COMEV) and serves as the Executive Secretary for federal review panels (COFEX) under the JBNQA.



Appendix 4

Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project

Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project

WHEREAS Hydro-Québec with its affiliate the Société d'énergie de la Baie James (collectively referred to as the "Proponents") propose to carry out the Eastmain-1-A and Rupert diversion project as described in the attached description submitted by the Proponents (the "Project");

WHEREAS on February 7, 2002, Québec and the Crees of Québec entered into an agreement concerning a New Relationship (the "New Relationship Agreement");

WHEREAS the Project is 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 (the "JBNQA") according to the terms of that section;

WHEREAS the Government of Québec has authorized its representatives to sign this agreement (the "Agreement") (decree number 218-2003);

WHEREAS the Cree Regional Authority (the "CRA") has authorized by resolution its Director General to sign this Agreement;

WHEREAS the Project has been referred to the Minister of the Environment of Canada for the establishment of a review panel under the Canadian Environmental Assessment Act (S.C., 1992, c. 37) (the "CEAA") and whereas in such circumstances it is desirable that the environmental assessment of the Project be carried out under the CEAA in a manner that a) provides a special involvement for the Cree people, and b) will reduce duplication and facilitate and encourage cooperation with the impact assessment and review process under the JBNQA;

WHEREAS in accordance with subsection 65(2) of the CEAA, the Minister of the Environment of Canada has authorized the President of the Canadian Environmental Assessment Agency (the "Agency") to sign this Agreement;

WHEREAS the New Relationship Agreement provides that the parties to that agreement will endeavour to harmonize insofar as possible the assessment processes applicable to the Project in order to avoid duplication and to facilitate cooperation to ensure efficient and proper evaluations of this Project;

WHEREAS the parties disagree as to the scope of, or application (or non-application) of, the assessment and review processes applicable to the Project but have nevertheless agreed to practical means in order to resolve their differences without prejudice to their respective rights, claims, recourses and positions as further described in sections 18 to 20 hereof.

NOW THEREFORE:

PREAMBLE

1. The preamble forms an integral part of this Agreement.

GLOBAL REVIEW

2. The Project shall be assessed and reviewed globally as a single project.

ASSESSMENT AND REVIEW PROCESSES

3. The assessment and review of the Project will include:

a. the preparation, by the Evaluating Committee established pursuant to Section 22 of the JBNQA (the "Evaluating Committee") of recommendations respecting the scope of the impact statement to be prepared by the Proponents;

b. the assessment and review of the Project by

   i. the Environmental and Social Impact Review Committee (the "Review Committee") established pursuant to paragraph 22.6.1 of the JBNQA and section 151 of the Environment Quality Act (R.S.Q., c. Q-2) (the "EQA"), which committee shall prepare and submit recommendations to the Provincial Administrator in accordance with the terms of the JBNQA and of the EQA; and

   ii. a review panel (the "Review Panel") established pursuant to section 33 of the CEAA, which Review Panel shall prepare and submit a report to the Minister of the Environment of Canada and to the responsible authorities in accordance with section 34 of the CEAA;

these Committees and Panel being collectively designated the "Review and Assessment Bodies.

4. The assessment and review of the Project by all the Review and Assessment Bodies will include and fully take into account, as a minimum, all the elements provided by Section 22 of the JBNQA and by section II of Chapter II of the EQA, including the environmen-

tal and sociological impacts of the Project and the justification of the Project. The assessment and review of the Project by all the Review and Assessment Bodies will also include and fully take into account the elements to be considered pursuant to the CEAA.

5. The directives respecting the scope of the impact statement to be submitted by the Proponents shall be prepared and recommended by the Evaluating Committee. The Evaluating Committee will work with the Agency to ensure that these directives will meet the requirements of the CEAA. The directives will be submitted for approval to the Provincial Administrator and to the Minister of the Environment of Canada. Insofar as possible, there shall be the same directives for both assessments and reviews of the Project. In the event the Minister of the Environment of Canada cannot accept the recommendations of the Evaluating Committee or wishes to modify such recommendations, he shall, before deciding, consult with the Evaluating Committee so as to explain his position and discuss same before the directives are formally issued to the Proponents.
6. The Cree Regional Authority ("CRA") will nominate members to the Review Panel, and the Review Panel shall comprise five (5) members appointed by the Minister of the Environment of Canada, including two (2) CRA nominees.

CO-ORDINATION

7. The Review and Assessment Bodies shall each act as an independent body. However, when it is practical, every effort shall be made to avoid duplication and overlaps and to coordinate and harmonize the assessment and review processes, as well as to coordinate access to technical and other support required by the Review and Assessment Bodies.
8. The coordination and harmonization measures provided herein must be in accordance with the principles and provisions set out in the JBNQA, the EQA and the CEAA and must not in any way reduce the responsibilities and prerogatives of the Review and Assessment Bodies.
9. A coordination committee (the "Coordination Committee") comprising one (1) representative each from the Agency, the ministère de l'Environnement du Québec (the "MENV") and the CRA shall be established to follow the assessment and review processes, to facilitate the coordination of these processes, to assist and support when required the Chairpersons of the Review and Assessment Bodies in coordinating their activities, and to ensure that information requests from the public are addressed via a public information office capable of communicating in the French, English and Cree languages.
10. In accordance with the cost-sharing arrangements they shall determine, the MENV and the Agency will share the costs of the common services, of the common public information office, and of any other related joint organizational and technical support needs required for the coordination of the assessment and review processes, and will also provide the financial, material and human resources required to ensure that the Review and Assessment Bodies can carry out their functions adequately, notably in regard to translation and interpretation, organization and logistics of public meetings and hearings, documentation, information, and scientific and technical expertise.
11. The scientific and technical expertise which the Review and Assessment Bodies may require will be provided for the most part from the resources of the governments of Québec and Canada. If adequate scientific and technical expertise is not available from government resources, upon request from any of the Review and Assessment Bodies, non-governmental expertise may be retained in order to provide advice on specific subjects related to the assessment and review of the Project.

PARTICIPATION OF THE PUBLIC

12. The public will be given an opportunity to participate in the assessment and review processes concerning the Project in regard to:

a. consultations on the issues to be addressed in the directives respecting the scope of the impact statement to be prepared by the Proponents and the impact statement submitted by the Proponents;
b. public hearings on the impacts of the Project and on the issues raised by the impact statement submitted by the Proponents.

13. In conformity with the CEAA, a participant funding program to facilitate the participation of the public in the assessment and review of the Project, including the participation of the public in the development of directives respecting the scope of the impact statement to be prepared by the Proponents, shall be made available by the Agency. The MENV shall also

provide a participant funding program in regard to the assessment and review of the Project, including the participation of the public in the development of directives respecting the scope of the impact statement to be prepared by the Proponents.

14. The participant funding made available by the MENV shall be allocated in consultation with the CRA, which shall designate a representative for such purposes. Requests from persons and groups living in the territory most directly impacted by the Project will be considered in priority. The participant funding made available by the Agency will be allocated in accordance with its participant funding program.

SCHEDULE

15. The schedule of the assessment and review processes concerning the Project will take into account various steps, including notably: the preparation of draft directives, public input into the development of directives, the issuance of directives, the preparation of the impact statement, the review of the quality of this impact statement including, if need be, additional information requests to the Proponents, the analysis of this impact statement, public hearings on the Project, and the drafting of reports and recommendations. In this regard, it is recognized and recommended that time limits stipulated in the JBNQA will be extended in order to generally conform to the following:

a. the time period for the assessment and review , from the submission of the information relative to the Project from the Provincial Administrator to the Evaluating Committee up to the submission of the final recommendations from the Review Committee to the Provincial Administrator regarding the Project, should not normally exceed 20 months (620 days). This overall time period does not include the time required for the Proponents to prepare the information required for the assessment and review and to prepare their impact statement;

b. the overall time between the submission of the information relative to the Project from the Provincial Administrator to the Evaluating Committee and the final recommendations of the Evaluating Committee to the Provincial Administrator on the directives respecting the scope of the impact statement to be prepared by the Proponents shall not normally exceed 150 days. Moreover, included in this period, the minimum time allocated for the public to review the draft directives shall be 60 days from the time such draft directives are made available to the public in both French and English;

c. participants shall be given a minimum of 90 days in order to provide written comments on the impact statement submitted by the Proponents from the time this statement has been made available to the public in both French and English;

d. public hearings focused on the impacts of the Project shall be held at least in the communities of Mistissini, Nemaska, Waskaganish, Wemindji, Eastmain, Chisasibi, as well as in Chibougamau and Montréal, and each of these hearings shall be preceded by a minimum of 45 days advance notice.

16. Taking into account the firm commitment of the parties to coordinate the assessment and review processes relating to the Project, and the desire of the parties to work together for the purpose of ensuring an efficient and proper assessment and review of the Project which takes into account their respective concerns, the schedule for the assessment and review set out in the Guideline issued in November 1997 by the Minister of the Environment of Canada and entitled “Procedures for an Assessment by a Review Panel” will be adapted in order to be synchronized with the steps and time lines set out in section 15 above.

DOCUMENTATION AND INFORMATION

17. Key documents and information concerning the assessment and review of the Project from the Proponents, or the Review and Assessment Bodies, and which are identified for these purposes by either one of these Bodies, shall be made publicly available in French and English. The draft and final directives respecting the impact statement to be prepared by the Proponents, as well as this statement itself, shall be made available to the public at the same time in French and English. Such documents, or summaries thereof, shall be made available in Cree where, in the opinion of any of the Review and Assessment Bodies, it is appropriate and practical to do so. It is recognized, however, that not all documents will be made available in the three languages.

WITHOUT PREJUDICE

18. This Agreement, as well as the assessment and review of the Project carried out by the Review and Assessment Bodies, are without prejudice to, without admission in regard to, and under reserve of the

respective rights, claims, recourses and positions of the parties, of the Proponents and of the beneficiaries of the JBNQA concerning the scope of, or application (or non-application) of, any assessment and review process to any other project, including assessment and review by the Environmental and Social Impact Review Panel provided for in Section 22 of the JBNQA.

19. This Agreement applies only to the Project and may not be raised as a precedent in the courts or elsewhere, nor referred to, in regard to any other project.

20. This Agreement does not affect any right, privilege or interest under the JBNQA, the CEAA, the EQA or the New Relationship Agreement and must not be interpreted as extinguishing, diminishing or affecting rights, privileges or interests thereunder or creating new rights thereunder.

THIS AGREEMENT IS DULY EXECUTED BY:

The President of the Canadian Environmental Assessment Agency

Original signed on April 3, 2003

Sid Gershberg Date

La sous-ministre du ministère de l'Environnement du Québec

Original signed on April 8, 2003

Madeleine Paulin Date

Le secrétaire général associé du Secrétariat aux affaires intergouvernementales canadiennes

Original signed on April 16, 2003

Gilbert Charland Date

Le secrétaire général associé du Secrétariat aux affaires autochtones du Québec

Original signed on April 17, 2003

Rémy Girard Date

The Director General of the Cree Regional Authority

Original signed on April 28, 2003

Eddie Diamond Date

Appendix – Project Description – Eastmain-1-A and Rupert Diversion

This project description is being submitted by the Proponents with the sole purpose of providing the public with basic information with which to better understand the Agreement, and therefore does not constitute a final project description for environmental assessment purposes. It is understood that a number of elements remain to be confirmed and will have to include, among other things, the environmental and social mitigating measures already identified.

Hydro-Québec plans to divert a portion of the flow in the Rupert River from a point known as km 314 (i.e. 314 km upstream of where the Rupert River empties into Rupert Bay) into Eastmain 1 reservoir. It also plans to build a powerhouse (Eastmain-1-A) on the Eastmain River near the Eastmain-1 powerhouse already under construction, upstream of the existing Opinaca reservoir in the La Grande Complex. These facilities (under construction and planned) are located in the James Bay region, north of the 45th parallel. Once turbined at the Eastmain-1-A and Eastmain-1 powerhouses, the diverted waters of the Rupert River would be channelled north into Robert-Bourassa and La Grande 1 reservoirs through the existing Eastmain-Opinaca-La Grande diversion. The route chosen for the Rupert River diversion would limit the flooded areas in the newly created tailbay, since a series of dikes would channel the diverted waters to the east around Cramoisy Lake, then through Arques Lake, the Nemiscau River and the Caché Nord stream and finally, into Eastmain 1 reservoir near km 270 of the Eastmain River. Under the currently planned diversion scenario, neither Cramoisy Lake nor Lake Mesgouez would be flooded. The partial diversion of the Rupert River would include the following structures, which would be validated by the study.

- An inclined forebay (approximate area 254 km^2) consisting of:
  - a dam on the Rupert River at km 314 (Rupert C-1 main dam) with a spillway that will also be used to release instream flows;
  - a 3,750 m canal in four reaches (canal S-73) in the Rupert-Lemare watershed divide to minimize the area to be flooded by the forebay;
  - a dam on the Lemare River (C-R-21A secondary dam) and an instream flow release structure at a dike near the dam;
  - approximately 27 containment dikes; and

- a control structure (design flow 800 m^3/s) embedded in a 5,700 m transfer canal in six reaches in the Lemare-Nemiscau divide, or at the entrance of a tunnel approximately 3.6 km long (choice to be determined).

- An inclined tailbay (approximate area 141 km2) passing through Arques Lake and the Nemsicau River to channel the water into the Eastmain River. The tailbay would include the following structures, among others:
  - Two dams on the Nemiscau River (C-108 and C-76) and 3 instream flow release structures at dams C-108, C-76 and C-104
  - Approximately 24 containment dikes
  - A 1,000 m canal (canal 12) in 3 reaches
  - A 1,115 m canal (canal 4) in 2 reaches
  - A 250 m canal (canal 5)
  - A 150 m canal (canal C)

A total area of 395 km^2 would be flooded, including 165 km^2 already under water and 230 km^2 of land.

Volume for the diversion is estimated at 14.4 million m^3 of fill and excavated material and 25,000 m^3 of concrete.

The construction of the tailbay would involve relocating some of the existing power transmission lines. This would require dismantling 9 towers, reconstructing 9 towers and building 5 islands.

The partial diversion of the Rupert River would also call for the construction of temporary workcamps, permanent access roads from Albanel substation and from an existing secondary road, a temporary 69-kV transmission line from Albanel substation to the construction site, and a permanent transmission line to the spillway on the Rupert River and the control structure.

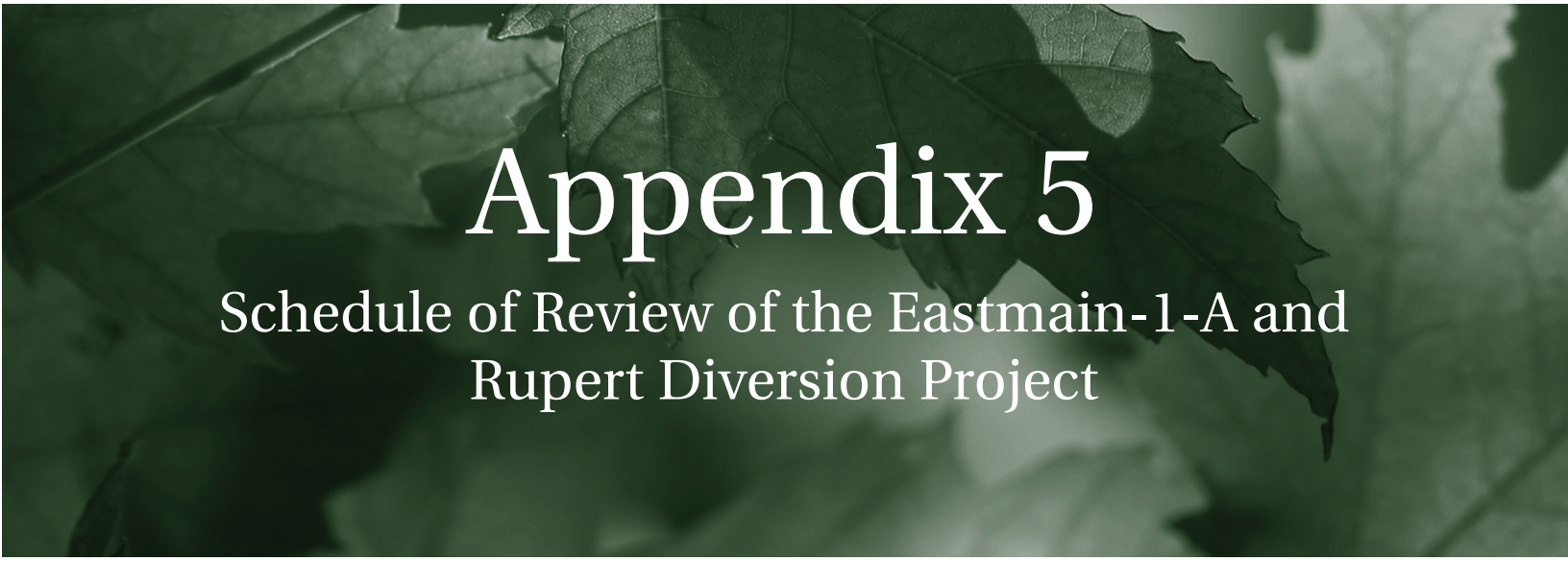
The partial diversion project would also involve the implementation of measures to remedy or mitigate ecological impacts. Such works could include the construction or correction of sills and/or weirs on the Rupert River.

However, the average annual flow will be maintained in the Lemare and Nemiscau rivers.

The Eastmain-1-A powerhouse would be situated between the Eastmain-1 powerhouse and the Eastmain-1 spillway, and would have an installed capacity of up to 770 MW. Although parallel to one another, the powerhouses would use separate intakes and tailrace channels. The Eastmain-1-A powerhouse would be integrated into the of 315-kV power transmission system via Eastmain-1.

A permanent access road would be built to run west to east between Muskeg substation and the Eastmain-1 and Eastmain-1-A powerhouses.

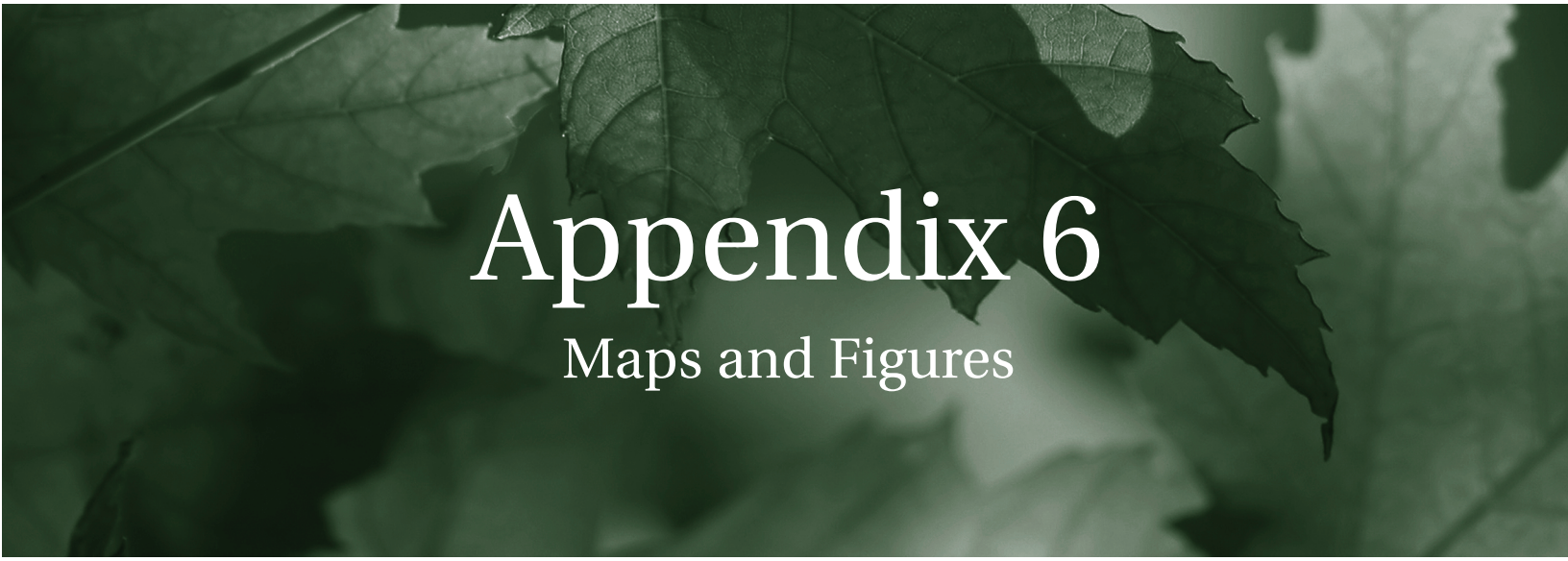
In order to factor in the increased inflows, the Sarcelle site would be modified, either to include the addition of a fourth gate to the existing control structure, or through the construction of a powerhouse with a capacity of some 130 MW, if the Crees choose to exercise this option, which is available to them. In the latter case, a 315-kV transmission line would link the Sarcelle powerhouse to the Eastmain generating substation via Muskeg substation.



Appendix 5

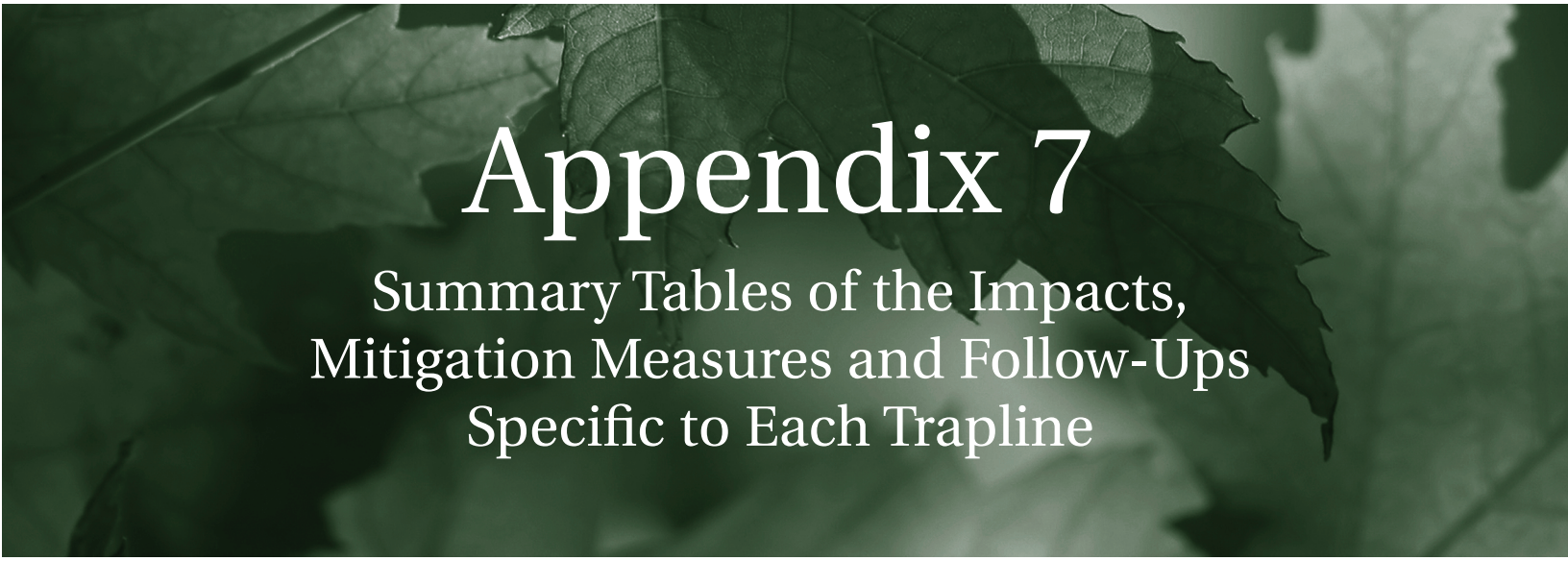
Schedule of Review of the Eastmain-1-A and Rupert Diversion Project

Main Phases of the Review	Date
Submission of notice of the project by the proponent	November 29, 2002
Department of the Environment issues Evaluating Committee (COMEV) directives to the proponent	August 14, 2003
Signing of the Agreement Concerning the Environmental Assessments for the Eastmain-1-A Project and Rupert Diversion	April 28, 2003
Appointment of Federal Panel members and issuing of mandate	November 1, 2004
Proponent submits part of the impact study (including sectoral studies and the summary report)	January 31, 2005
Public consultations on compliance of the environmental impact statement and issuing of operational procedures	February 7 to May 9, 2005
Technical meeting with the proponent and the public	April 20 and 21, 2005
Technical meeting with the proponent	June 8, 2005
Request for additional information from the proponent (preliminary)	June 23, 2005
Technical meeting with the proponent	July 12, 2005
Request for additional information (final)	August 2, 2005
Technical meeting with the proponent	August 9, 2005
Proponent submits additional information	September 27, 2005 to January 24, 2006
Technical meeting with the proponent	October 12, 2005
Technical meeting with the proponent	January 24, 2006
Announcement of public hearings and issuing of additional operational procedures	January 27, 2006
Technical meeting with the proponent	February 8, 2006
Public hearings	March 15 to June 9, 2006
Submission of the report to federal authorities	November 30, 2006



Appendix 6

Maps and Figures



Appendix 7

Summary Tables of the Impacts, Mitigation Measures and Follow-Ups Specific to Each Trapline

Impacts by Trapline – MISTISSINI
Trapline M18 (North of the Tailbay)

Existing infrastructure	• About 30 km of the 735 kV maintenance road (7069-7070), ~30 km of the 735 kV line (7059) and two non-Cree camps.
Infrastructure and sandpits	• Dams and minimum flow works of Nemiscau-1 and Nemiscau-2 (on the boundary of trapline M25); • 12 dikes; • Canals C and Z; • 2 possible quarries + 26 possible sandpits; • Permanent highway to the tailbay (12 km); • Relocation of 4.6 km of the 735 kV maintenance road (7069 7070) (including a bridge 160 m long); • About 20 km of temporary and secondary roads.
Impacts on the natural environment	• Flooding of 56.4 km^2 by the Rupert tailbay, covering 4.9% of the trapline; • Raised water levels on part of the Nemiscau River, presence of the Nemiscau-1 and 2 dams and restoration of flow regulated to the average natural hydrograph of the river (Nemiscau-1 at 11.6 m^3/s; Nemiscau-2 at 2.0 m^3/s); • Increased flow in Caché Brook; • Average June to September fluctuation should vary between 0.5 and 0.8 m; • Increased mercury levels in fish in the tailbay and below the outlet strutures of Nemiscau-1 and 2.
Impacts on the human environment	• 2 permanent camps flooded (located in trapline M25 – at 50 km and 53 km from the diversion); • 1 temporary camp flooded (44 km from the diversion); • The territory is opened up; • Restrictions on eating fish; • Changes to goose-hunting areas and fishing locations in the area of the tailbays between KP 43 and KP 50; • Difficult navigation (strong currents) in the area below Canal C; • Danger to snowmobiles crossing the entrance of the Eastmain 1 Reservoir (between KP 20 and KP 30 and between KP 51.3 and KP 55 from the diversion because the rapid flow will impede ice formation and some stretches will stay open all winter).
Mitigation measures	• Development of multi-species spawning grounds below the Nemiscau-1 and 2 tailbay works; • Relocation of a permanent camp to the shore of Kattishabocau Lake; • Relocation of a spring goose-hunt camp to the shore of Cramoisy Lake; • Building an access road to reach these camps (lakes Kattishabocau and Cramoisy) (HQ will study the feasibility of this); • Program to trap or relocate beaver and bears; • HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; • Build a portage to safely pass the dams (Nemiscau-1 and 2).

Trapline M25 (Forebay and South of the Tailbay)

Existing infrastructure	• About 30 km of the 735 kV maintenance road (7069-7070), ~30 km of the 735 kV line (7069-7070).
Infrastructure and sandpits	• Rupert camp; • Dams and minimum flow works on Nemiscau-2 (on the boundary of trapline M18), Arques Brook and Lemare River; • Minimum flow works on Kayechischekaw Brook; • 44 dikes (17 in the tailbay, 27 in the forebay); • 1 transfer tunnel + 9 canals (4 in the forebay, 5 in the tailbay); • Large amount of material left over from digging the transfer tunnel and canals. Must be disposed of on the trapline; • 6 possible quarries + 103 possible sandpits; • 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); • ~32 km of temporary access roads to the canals and dikes.
Impacts on the natural environment	• Flooding of 214.9 km^2 by the Rupert forebay and tailbay, covering 15.46% of the trapline; • 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^3/s); • Raised water levels on part of Arques Brook, presence of the Arques Brook dike and annual average return flow of 2.3 m^3/s; • Raised water levels on part of Kayechischekaw Brook, presence of a dike and annual average return flow of 0.4 m^3/s; • Raised water levels on part of the Lemare River, presence of a dam and annual average return flow of 16.2 m^3/s; • Raised water levels on part of the Mistikawissich River; • Average June to September fluctuation should vary between 0.5 and 0.8 m in the tailbay; • Average June to September fluctuation is estimated at 0.6 m in the forebay; • Increased mercury levels in fish in the forebay and tailbay and below the outlet works of Nemiscau-2, Arques Brook and Lemare River; • Destruction of a northern pike spawning ground by the building of the Lemare River dam; • Destruction of a lake whitefish spawning ground by the building of the Arques Brook dike; • Raised water levels in a lake trout spawning ground on Des Champs Lake, three others on Arques Lake and two on Lake RP030; • Raised water levels in a lake sturgeon spawning ground located at KP 14 on the Misticawissich River (boundary with trapline M26).
Impacts on the human environment	• Raised water levels at 2 permanent camps (KP 77 and KP 107 – the latter having burned down in recent years); • Relocation of a permanent camp – construction of dike C-105; Nearly 35 temporary camps flooded; • Flooding of 6 birthplaces and 8 graves;

Impacts on the human environment (continued)	• 5 float-plane landings lost; • The territory is opened up; • Restrictions on eating fish; • 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 KP 78 of the diversion; • Danger to snowmobiles crossing below Canals S73, since freeze-up will likely take place a bit later; • The area between Misticawissich River and the south of Goulde Lake (between KP 90 and KP 100 from the diversion) will become inaccessible by snowmobile because the faster current will prevent solid ice from forming; • Danger to snowmobiles traveling in the area of Canals 4 and 5 (between KP 51 and KP 55 from the diversion) because the faster current will prevent solid ice from forming; • In some winters, danger to snowmobiles below the transfer tunnel.
Mitigation measures	• 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 dike minimum flow works; • Development of lake trout spawning grounds on Des Champs Lake and the lake with no name (RP030); • Development of a new lake sturgeon spawning ground on the Misticawissich River (slightly above the existing spawning ground, on the boundary with trapline M26); • Building of 2 new camps (one on the western shore of Lake Lemare, the other in the eastern part of the ground); • Payment for a recently built camp along the 735 kV line (7069 and 7070); • 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); • Construction of an access road leading to the new camp (HQ agrees to study the feasibility of this); • Installation of a gatehouse immediately north of Albanel station (construction period); • Construction of a launching ramp on the eastern shore of Lake Lemare; • Program to trap or relocate beaver and bears; • 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); • Build a portage to safely pass the dams (Nemiscau-2 and Lemare); • Follow-up on boating conditions in the forebays and tailbays; • Follow-up on ice conditions at snowmobile crossings at the forebays and tailbays.

Trapline M26 (Forebay)

Existing infrastructure	• A non-Cree camp.
Infrastructure and sandpits	
Impacts on the biophysical environment	• Flooding of 15.8 km^2 by the Rupert forebay, covering 2.3% of the trapline; • 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 a lake sturgeon spawning ground located at KP 14 on the Misticawissich River (on the boundary with trapline M25).
Impacts on the human environment	• Restrictions on eating fish; • Changes to goose-hunting areas and fishing locations along the Rupert and Misticawissich rivers (on the boundary with M33).
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 trapline M25); • Program to trap or relocate beavers 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.

Trapline 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	
Impacts on the biophysical environment	• Flooding of 34.8 km^2 by the Rupert forebay, covering 1.52% of the trapline; • 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 KP 325 on the Rupert River.

Impacts on the human environment	• 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 KP 332 on the Rupert River to replace the flooded spawning ground at KP 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 by Trapline – NEMASKA
Trapline N23 (South Side of the Rupert River)

Existing infrastructure	• Old Nemaska, ~40 km of the James Bay highway, ~12 km of the Waskaganish highway, the truck stop at KP 257, the rest area at KP 257 (Oatmeal Rapids), some 4 km of an access road to a municipal campground and a boat launching ramp, and 3 non-Cree camps.
Infrastructure and sandpits	• Enlargement of the camp at KP 257 of the James Bay highway (truck stop at KP 257); • Weirs at KP 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 KP 110.3 on the Rupert River).
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Water level of Lake Nemiscau protected (eastern boundary of the trapline); • Water levels below the Oatmeal Rapids (between KP 104 and 107) lowered by 1.9 m in summer and 1.5 m in the spring; • Impassible waterfalls at KP 103 and 156 will become passable to fish or passable with reservations; • The partially passable obstacle at KP 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 weir at KP 170; • Tributary streams at KP 101.5, 107 and 136.5 on the Rupert River may become inaccessible to fish.

Impacts on the human environment	• The territory is opened up; • Disturbance of hunting in the areas around construction of the hydraulic structures; • Displacement of fishing locations below KP 110.3 and between KP 136 and 137 on the Rupert River due to lower water levels; • The stretch between KP 131 and 132 may become hard to navigate.
Mitigation measures	• Development of a multi-species spawning ground below the weir at KP 110.3; • Compensation for the loss of a walleye spawning ground by the enlargement of an existing walleye spawning ground near the weir at KP 170; • Stock lake sturgeon on the stretch between KP 110 and 170; • Monitor the tributary streams entering the Rupert River at KP 101.5, 107 and 136.5 (accessibility for fish); • Seed certain newly exposed riverbanks (KP 107 and 120 to 155); • Program to trap or relocate beaver; • HQ agrees to recommend to the responsible authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; • Improved access to the camp at KP 244 on the James Bay highway; • Improvement of the boat launching ramp on the south shore of the Rupert River behind the camp at KP 257 and construction of another on the south shore above the weir at KP 110; • Construction of another path if the portage at KP 150 on the Rupert cannot be rebuilt in a satisfactory way; • Follow-up on boating conditions on the Rupert River, particularly between KP 131 and 132; • Follow-up on ice cover for snowmobiling.

Trapline N24 (South Side of the Rupert River)

Existing infrastructure	• About 50 km of the 450 kV line (4003-4004) and one non-Cree camp.
Infrastructure and sandpits	• Weir at KP 223 on the Rupert River.
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Natural flow maintained on the La Martre River; • Loss of fish habitat (weirs).
Impacts on the human environment	• Changes to hunting and trapping activity in stretches not influenced by the hydraulic structures (between KP 219 and 223 and 251 and 261); • Disturbance of hunting in the areas around construction of the hydraulic structures; • Displacement of fishing locations between KP 250 and 260 on the Rupert • River due to lower water levels.

Mitigation measures	• Development of a multi-species spawning ground below the weir at KP 223; • Monitor the lake sturgeon spawning ground at KP 216 during and after the work; • Changes to the tributary at KP 191 to improve its potential for brook trout; • Seed certain newly exposed riverbanks (between KP 205 and 218 and between KP 235 and 290); • Relocation of three camps inland(tallyman will decide after the diversion); • Arrangements with the tallyman to prevent the work from interfering with hunting; • Limited access to the shoreline connecting the dock at KP 6 on the Nemiscau River and the access road to the weir at KP 223 during the work; • Rebuilding the portage at KP 217.5 to ensure access to the fishing site at KP 216; • Follow-up on ice cover for snowmobiling; • If needed, build other snowmobile trails inland, parallel to the river.

Trapline N24A (South Side of the Rupert River)

Existing infrastructure	• About 6 km of the 735 kV line (7080), ~20 km of the 735 kV line (7081-7082) and 1 non-Cree camp.
Infrastructure and sandpits	
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Natural flow maintained on the La Martre River.
Impacts on the human environment	• Increased distance between landings and camps at KP 255 and 258 on the Rupert River because of the new shoreline exposed; • Changes to hunting and trapping activity in stretches not influenced by the hydraulic structures (between KP 251 and 261 and 275 and 279); • Displacement of fishing locations between KP 240 and 260 on the Rupert River due to lower water levels.
Mitigation measures	• Seed certain newly exposed riverbanks (between KP 235 and 290); • Move a camp located on trapline N25 to a place of his choice (or build a new camp); • Improve the old winter road located to the south of trapline N25 to provide access to the La Martre River (if the tallyman of trapline N25 agrees); • Move the camp at KP 258 on the Rupert River to a place the tallyman chooses if the newly exposed riverbanks interfere with using it; • Follow-up on ice cover for snowmobiling.

Trapline N25 (South Side of the Rupert River)

Existing infrastructure	• About 18 km plus ~3 km of the Route du Nord highway, ~12 km of a drive-able 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 KP 290 on the Rupert River; • Jolly Bay dike (KP 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 trapline (or on trapline M25); • Permanent access highway to the Rupert River dam (4 km).
Impacts on the biophysical environment	• Flooding of 1.5 km^2 of land by the Rupert forebay, covering ~0.1% of the trapline; • 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 (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); water levels directly below the dam will go down by 2.1 m between KP 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 KP 290; • The tributary at KP 299.5 may become inaccessible to fish; • The partly passable obstacles at KP 308.5 and 310 will become fully passable to fish; • Falls at KP 309 that fish cannot pass will become passable or passable with reservations.
Impacts on the human environment	• 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 KP 280 on the Rupert River because of the new shoreline exposed; • 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 KP 314;

Impacts on the human environment (continued)	• Changes to hunting and trapping activity in stretches not influenced by the hydraulic structures (between KP 310 and 314); • Boating impossible on parts of the Rupert River above KP 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 KP 314; • Follow-up and if needed improve the lake sturgeon spawning ground below the spur dike at KP 290; • Follow-up the lake sturgeon spawning ground at KP 281; • Follow-up fish populations on Sipastikw Arm; • Changes to the tributary at KP 311 to improve its potential for brook trout; • Improvements to brook trout habitats in the lakes south of the camp at KP 311 on the Rupert River; • Monitor on the tributary at KP 299.5 (accessibility to fish); • Seed certain newly exposed riverbanks (between KP 235 and 290); • Move the camp at KP 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 KP 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 KP 281 and 290; • Follow-up on ice cover for snowmobiling.

Trapline R16 (North Side of the Nemiscau River)

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 KP 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 KP 170 and 223 on the Rupert River and at Lac Jolliet camp).

Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Restored flow on the Nemiscau River (restored natural flow of 11.6 m^3/s at the Nemiscau-1 worksite and 2.0 m^3/s at Nemiscau-2); • Loss of fish habitat (weir); • Destruction of a walleye spawning ground by construction of the weir at KP 170.
Impacts on the human environment	• 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 KP 170; • Installation of a security fence near the weir at KP 170; • Maintenance of the access road to the weir at KP 170; • Construction of an ATV (all-terrain vehicle) trail ~2 km long to reach new camps at KP 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 KP 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.

Trapline (North Side of the Rupert River)

Existing infrastructure	• 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.
Infrastructure and sandpits	• Lac Jolliet camp (at the boundary of trapline 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).
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/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 KP 170; • Impassible waterfalls at KP 156 will become passable to fish or passable with reservations; • The partly passable obstacle at KP 164.5 will become fully passable to fish; • The tributary at KP 136.5 may become inaccessible to fish.

Impacts on the human environment	• Boating may become difficult between KP 131 and 132; • Displacement of the fishing location between KP 136 and 137 due to lower water levels.
Mitigation measures	• Compensation for the loss of a walleye spawning ground by enlargement of an existing walleye spawning ground located near the weir at KP 170; • Stocking of the stretch between KP 110 and 170 with lake sturgeon fry; • Seed certain newly exposed riverbanks (between KP 120 and 155); • Follow-up the tributary at KP 136.5 (accessibility to fish, boating difficulties); • Measures needed to ensure that the camps at KP 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 KP 131 and 132; • Follow-up on ice cover for snowmobiling.

Trapline R18 (Between the Rupert and Nemiscau Rivers)

Existing infrastructure	• 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.
Infrastructure and sandpits	• Weirs at KP 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 KP 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 KP 223).
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/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 m^3/s at the Nemiscau-1 worksite and 2.0 m^3/s at Nemiscau-2); • Loss of fish habitat (weirs); • Destruction of a walleye spawning ground by the construction of the weir at KP 170; • The tributary at KP 254.3 may become inaccessible to fish.

Impacts on the human environment	• The territory is opened up; • Disturbance of hunting in the areas around hydraulic structure construction sites; • Increased distance between the landing and the camp at KP 205 on the Rupert River because of the new shoreline exposed; • Changes in hunting and trapping on the stretches not affected by hydraulic structures (between KP 219 and 223, 251 and 261, 275 and 279); • Displacement of fishing locations located below KP 223 and between KP 250 to 260 due to lower water levels.
Mitigation measures	• Development of a multi-species spawning ground below the weir at KP 223; • Changes to the tributary at KP 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 KP 170; • Follow-up on the lake sturgeon spawning ground at KP 216 during and after the work; • Follow-up on the tributary at KP 254.3 (accessibility to fish); • Seed certain newly exposed riverbanks (between KP 235 and 290); • Limited access to the shoreline connecting the dock at KP 6 on the Nemiscau River and the access road to the weir at KP 223 of the Rupert River during the work; • Flyover of the trapline 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.

Trapline 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 environment	• Flooding of 4.9 km^2 by the Rupert tailbay, covering 0.4% of the trapline; • Raised water levels and increased flow in part of Caché Brook; • Flooding of ~5% to 10% of the trapline by the Eastmain 1 Reservoir; • Increased flow in the Eastmain River; • Restored flow on the Nemiscau River (restored average natural flow of 11.6 m^3/s at the Nemiscau-1 worksite and 2.0 m^3/s at Nemiscau-2); • Increased mercury levels in fish in the forebay and Eastmain 1 Reservoir.

Impacts on the human environment	• 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).

Trapline R20 (North Side of the Rupert River)

Existing infrastructure	• 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.
Infrastructure and sandpits	• 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).
Impacts on the biophysical environment	• Restored flow on the Nemiscau River (restored average natural flow of 11.6 m^3/s at the Nemiscau-1 worksite and 2.0 m^3/s at Nemiscau-2); • Increased mercury levels in fish below the Nemiscau-1 and 2 outlet works.
Impacts on the human environment	• Restrictions on eating fish from directly below the Nemiscau-1 and 2 outlet works.
Mitigation measures	• 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.

Trapline R21 (North Side of the Rupert River)

Existing infrastructure	• 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).
Infrastructure and sandpits	• Rupert River dam; • Spur dike at KP 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 KP 290 + ~8 km to extend the road to KP 281 on the Rupert River.

Impacts on the biophysical environment	• Flooding of 11.5 km^2 by the Rupert tailbay, covering 1.7% of the trapline; • 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 (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); water level down 2.1 m directly below the dam between KP 314 and 294 (August to September); • Raised water levels on part of the Misticawissich River (boundary with trapline M25); • Restored flow on the Lemare River (restored average annual flow of 16.2 m^3/s); • Restored flow on Kayechischekaw Brook (restored average annual flow of 0.4 m^3/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 KP 308.5 and 310 will become fully passable to fish; • Impassible waterfalls at KP 309 will become passable to fishor passable with reservations; • Possible changes in flow conditions on the lake sturgeon spawning ground below the spur at KP 290; • Disturbance of two walleye and longnose sucker spawning grounds directly below the Rupert dam.
Impacts on the human environment	• 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 KP 314 and on lakes Goulde and Des Champs; • Lost fishing grounds on the Rupert River above KP 314; • Disturbance of hunting in the areas around construction sites; 3 grave sites flooded (on trapline M25); • Changes to boating conditions in the head and tailbays; • Boating may become difficult between KP 281 and 290; • Increased distance between the landing and the camp at KP 304 on the Rupert River because of the new shoreline exposed; • Changes in hunting and trapping on the stretches not affected by hydraulic structures (between KP 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 KP 290; • Follow-up on the lake sturgeon spawning ground at KP 281; • Seed certain newly exposed riverbanks (between KP 235 and 290); • Construction of a new camp in the western part of the trapline; • Moving of equipment from flooded temporary camps; • Extending access to the weir at KP 290 with a road to KP 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;

Mitigation measures (continued)	• 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 KP 281 and 290 and on Kayechischekaw Brook (North Arm); • Follow-up on ice cover for snowmobiling.

Impacts by Trapline – WASKAGANISH
Trapline 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 KP 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 KP 33, ~5.3 km of access road to the weir at KP 49, ~12.6 km of access road to the weir at KP 85); • 6 possible quarries + 15 possible sandpits.
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Present summer water level in Kapeshi Eputupeyach Bay (KP 47.8) maintained by the weir at KP 33; • Change of ~1.5 m in average summer levels between KP 66 and 77; • Water levels lowered between KP 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 KP 49 and 85; • Loss of fish habitat (weirs); • Impassible waterfalls at KP 49 will become passable to fish or passable with reservations; • The partly passable obstacles at KP 65.9 and 77 will become fully passable to fish; • Reduced water quality in the Rupert River (increase in turbidity).
Impacts on the human environment	• The territory is opened up; • Disturbance of hunting in the areas around hydraulic structure construction sites; • Displacement of fishing locations located between KP 78 and 79 on the Rupert River due to lower water levels. • Tributary at KP 74.5 may become inaccessible.
Mitigation measures	• Changes to the tributary at KP 41 to improve its potential for brook trout; • Construction of a new camp away from the area of the weir worksite (vicinity of KP 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);

Mitigation measures (continued)	• Recover the remnants of past use of a sandpit beside a lake located southeast of the weir at KP 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 KP 74.5 (navigability).

Trapline 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 KP 20.4 on the Rupert River; • ~3 km of temporary road leading to the rock blanket at KP 20.4 (parallel to the Gravel Pit road); • 2 possible quarries + 7 possible sandpits.
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • The rock blanket at KP 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 KP 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).
Impacts on the human environment	• Opening up of the area; • Disturbance caused by hunting near the construction of hydraulic structures; • Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by hydraulic structures (between KP 27 and 29).
Mitigation measures	• Preservation of the access road to the rock blanket; • 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; • Construction of an access road to the new fishing grounds (mandatory consultation with Gravel Pit users); • Construction of a launch ramp in the rock blanket sector; • Development of goose-hunting ponds in the sandpits if the tallyman agrees; • Program to trap or relocate beaver; • Monitor boating conditions on the Rupert River; • Monitor ice cover for snowmobiling.

Trapline N9 (South Side of the Rupert River)

Existing infrastructure	• 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.
Infrastructure and sandpits	• 6 possible sandpits
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream 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).
Impacts on the human environment	• Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by hydraulic structures (between KP 5 and 15).
Mitigation measures	• Improvement of ATV access to the camp (HQ agrees to study the feasibility of this); • Program to trap or relocate beaver; • Monitoring of boating conditions on the Rupert River; • Monitoring of ice cover for snowmobiling.

Trapline R4 (North Side of the Rupert River)

Existing infrastructure	
Infrastructure and sandpits	
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Reduced water quality in the Rupert River (increase in turbidity).
Impacts on the human environment	• Presence of the planned Waskaganish Biodiversity Reserve.
Mitigation measures	• Site visits after the rehabilitation and clean-up; • Monitoring of water quality and measures, as needed, if users cannot get their water supply from the Rupert River; • Program to trap or relocate beaver; • Monitoring of boating conditions on the Rupert River and the channels on the north shore at the mouth; • Monitoring of ice cover for snowmobiling.
Impacts sur le milieu humain	

Trapline R5 (North Side of the Rupert River)

Existing infrastructure	
Infrastructure and sandpits	
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Reduced water quality in the Rupert River (increase in turbidity).
Impacts on the human environment	• Presence of the planned Waskaganish Biodiversity Reserve.; • Changes to goose-hunting and displacement of fishing grounds on the stretch not affected by hydraulic structures (between KP 5 and 15).
Mitigation measures	• Construction of another camp if the new camp at KP 5 is no longer accessible due to boating conditions; • Program to trap or relocate beaver; • Monitoring of boating conditions on the Rupert River and the channels on the north shore at the mouth; • Monitoring of ice cover for snowmobiling.

Trapline R11 (North Side of the Rupert River)

Existing infrastructure	
Infrastructure and sandpits	• Rock blanket at KP 20.4 on the Rupert River and weirs of KP 33, 49 of the Rupert River.
Impacts on the biophysical environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Rock blanket at KP 20.4 should 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 KP 20.4, conserving the visual appearance of the area and reducing the risk of freezing in spawning areas in winter; • Current summer water level in Kapeshi Eputupeyach Bay (KP 47.8) maintained by the weir at KP 33; • Average summer water levels will change by ~1.5 m between KP 66 and KP 77; • Temporary (1 year) exposure above water of a northern pike spawning ground below the weir at KP 49; • Modification (rock blanket) and loss of fish habitat (weirs); • Reduced water quality in the Rupert River (increase in turbidity); • Impassible waterfalls at KP 49 will become passable to fish or passable with reservations; • The partly passable obstacle at KP 65.9 will become fully passable to fish.

Impacts on the human environment	• Presence of the Smokey Hill site and the planned Waskaganish Biodiversity Reserve; • Disturbance of hunting in the areas around hydraulic structure construction sites; • Increased distance between the landing and the camp at KP 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 hydraulic structures (between KP 27 and 29).
Mitigation measures	• Changes to the tributary at KP 41 to improve its potential for brook trout; • Seed certain newly exposed riverbanks (between KP 27 and 30; • Move a goose-hunting camp on hunting ground R5 to KP 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.

Trapline R12 (North Side of the Rupert River)

Existing infrastructure	• About 10 km of the Waskaganish 69 kV line (under construction)
Infrastructure and sandpits	• Weir at KP 85 of the Rupert River; • About 4 km of temporary roads (~14 km of access road to the weir at KP 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 environment	• Reduced flow on the Rupert River (instream flow equivalent to 29% of the average annual flow at the diversion point, i.e. 184.7 m^3/s); • Lower water levels in stretches not controlled by weirs; • Water levels lowered between KP 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 KP 85; • Loss of fish habitat (weir); • The tributary at KP 74.5 may become blocked to fish; • The partly passable obstacle at KP 77 will become fully passable to fish; • Reduced water quality in the Rupert River (increase in turbidity).
Impacts on the human environment	• Presence of the planned Waskaganish Biodiversity Reserve; • The territory is opened up; • Disturbance of hunting in the areas around hydraulic structure construction sites; • Displacement of fishing locations located between KP 78 and 79 on the Rupert River due to lower water levels.

Mitigation measures	• Follow-up on the tributary at KP 74.5 (accessibility to fish); • Build a snowmobile trail from the camp at KP 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; • Monitoring of boating conditions on the Rupert River; • Monitoring of ice cover for snowmobiling.

Trapline R13 (North Shore of Rupert River)

Existing infrastructure	• About 21 km of the James Bay highway, ~25 km of the Route du Nord, ~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 KP 257 (on the border of the area); • Weir at KP 110.3 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 weir at KP 110.3; • 4 potential sand pits.
Impacts on the biophysical environment	• Reduced flow in Rupert River (reserved flow equivalent to 29% of the average annual flow at the damming point, i.e. 184.7 m^3/s); • Reduction of water levels in the sections not controlled by the weirs; • Lowering of water levels below the Oatmeal Rapids (between KP 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 KP 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 environment	• 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 KP 128 on the Rupert River, due to exposure of the banks.
Mitigation measures	• Development of a multi-species spawning ground downstream from the weir at KP 110.3; • Stocking of yellow sturgeon fry between KP 110 and 170; • Installation of security fences near the KP 110.3 weir; • Replacement of the workcamp situated at KP 109.3 with a new one located ~600 m upriver from the weir; • Maintenance and extension of the access road from the weir at KP 110.3 to the site of the new workcamp;

Mitigation measures (continued)	• 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 KP 101.5 and 107 (boating); • Monitoring of ice cover for snowmobiling.

Impacts by Trapline – EASTMAIN
Trapline RE1 (West of the Eastmain-1 Reservoir)

Existing infrastructure	• About 30 km of the Nemiscau-Eastmain-1 route, the dam and the Eastmain 1 powerhouse (under construction), ~30 km of the Eastmain-1-Nemiscau 315-kV line (under construction), the spillway at Eastmain, the Muskeg station, ~25 km of the 69 kV line (614), ~40 km of the 69-kV line (615), ~50 km of temporary road for the construction of the 69-kV line (615), ~30 km of the 69 kV line paired with the 735-kV line (7062-7063) and the 735-kV line (7061) for ~45 km, ~30 km of the 450-kV line (4003-4004) and two non-Cree encampments.
Infrastructure and sandpits	• Eastmain workcamp; • Eastmain-1-A powerhouse; • 18 potential sand pits; • Permanent road from Muskeg-Eastmain-1 (~40 km); • Temporary road for construction of the 315-kV Sarcelle-Eastmain-1-A line (~50 km); • 315-kV line Sarcelle-Eastmain-1A (~50 km).
Impacts on the biophysical environment	• ~10% of the area will be flooded by the Eastmain 1 Reservoir; • Increase in the flow of the Eastmain 1 Reservoir; • 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-KP217 and KP203) and ~24 km (between the OA-11 dam and weir 5); • 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); • Loss of fish habitat (tailrace of the Eastmain 1-A generating station); • Increase in mercury content of fish in the Eastmain River below the Eastmain-1 and Eastmain-1-A powerhouses; • Increase in mercury content of fish in the Eastmain 1 Reservoir.
Impacts on the human environment	• Restriction on eating fish in the Eastmain 1 Reservoir and in the Eastmain River downstream from the powerhouse; • The territory is opened up; • Presence of areas opened for community goose-hunting (Eastmain River downstream of the OA-11 dam to weir 5); • Changes in boating conditions on the Eastmain River with reduced flow; • Eastmain River between the Eastmain-1 powerhouse and the head of the Opinaca Reservoir (KP 193) inaccessible to snowmobiles due to unstable ice cover;

Impacts on the human environment (continued)	• Dangerous snowmobile travel between the entrance to the Eastmain 1 Reservoir (between KP 20 and 30 and between KP 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.
Mitigation measures	• HQ agrees to recommend to the appropriate authorities that the mandate of the Weh-Sees Indohoun Corporation be renewed within this zone; • 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 ; • 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; • Program to trap or relocate beaver; • Follow-up on ice conditions on the Eastmain River and at the points crossed by the Opinaca reservoir.

Trapline VC33 (Not Included in the 36 Traplines Affected by the Project According to HQ)

Existing infrastructure	• About 30 km of the James Bay highway, ~18 km of the 450-kV line (4003-4004) and the relay station of KP 381 of the James Bay highway.
Infrastructure and sandpits	• ~20 km of permanent road to be improved.
Impacts on the biophysical environment	• Reduced flow on the Opinaca River. • Reduced flow on the Eastmain River.
Impacts on the human environment	
Mitigation measures	

Trapline 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 powerhouse (bordering trapline 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 environment	• Presence of the Opinaca reservoir (closure of the Opinaca River - dam OA-05 – at the boundary of traplines VC34 and VC23); • Increase in the water level of the Opinaca reservoir;

Impacts on the biophysical environment (continued)	• 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 powerhouse) affecting reproduction of walleye, longnose suckers and lake whitefish.
Impacts on the human environment	• 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 trapline during work periods; • Cleanup of debris on the banks of the Opinaca reservoir southwest of the Sarcelle powerhouse to facilitate goose-hunting activities on the island south of the powerhouse 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.

Trapline VC35 (South of 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 environment	• 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;

Impacts on the biophysical environment (continued)	• Increased flow in the Eastmain River over ~30 km (between KP 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 powerhouses.
Impacts on the human environment	• Restiction on eating fish from the Eastmain River below the powerhouse; • 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 powerhouse and the head of the Opinaca reservoir (KP 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.

Trapline VC37 (Eastern Part of the Eastmain-1 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 environment	• 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 7.51m); • Increased levels of mercury in the fish in the Eastmain 1 Reservoir; • Eastmain River has reduced flow (between KP 217 and 203) and increased flow (between KP 203 and 193); • Increased levels of mercury in fish below the Eastmain-1 and Eastmain-1-A powerhouses; • Loss of fish habitat (tailrace canal Eastmain-1-A).

Impacts on the human environment	• Restrictions on eating fish; • Changes in fishing activities along the excavated section of the Eastmain River with reduced flow from KP 217 to 193); • Changes in boating conditions along the excavated section of the Eastmain River with reduced flow from KP 217 to 193); • Eastmain River between the Eastmain-1 powerhouse and the mouth of the Opinaca reservoir (KP 193) inaccessible for snowmobiling due to inconsistent ice cover.
Mitigation measures	• Program to trap or relocate beaver.

Impacts By Trapline – WEMINDJI
Trapline VC20 (North of Lake Sakami)

Existing infrastructure	• About 95 km of the Trans-Taiga Road, the La Grande-3 airport, ~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.
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 environment	• 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 environment	• The territory is opened up; • Boating on the Sakami River remains difficult; • Sakami River (between KP 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 Infrastructures et bancs d'emprunts	• 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);

Mitigation measures (continued)	• 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.

Trapline VC21 (South of Lake Sakami)

Existing infrastructure	• About 30 km of 735-kV line (7059), ~6 km of 735-kV line (7069-7070), 1 non-Cree camp and 1 telecommunications tower.
Infrastructure and sandpits	
Impacts on the biophysical environment	• 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.
Impacts on the human environment	• Boating on Sakami Lake remains difficult.
Mitigation measures	• Follow-up on water levels near the camp located to the east of the Amunischiminanuch 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 KP 18 and 25D, KP 65 and 75 and in the vicinity of KP 50.

Trapline VC22 (Boyd Lake)

Existing infrastructure	• The Sarcelle regulatory facility (overlap with trapline 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.
Infrastructure and sandpits	• Sarcelle workcamp (bordering trapline VC23); • Sarcelle powerhouse (overlap with trapline VC34 of the Eastmain community); • ~7 km of permanent road to be improved; • ~10 km of the 735-kV Sarcelle-Eastmain-1 line (overlap with trapline VC34 of the Eastmain community); • 1 potential stockpiling site; • Large amount of excess material from construction work on the Sarcelle powerhouse.

Impacts on the biophysical environment	• 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 powerhouse) including breeding areas of walleye, longnose suckers, and lake whitefish.
Impacts on the human environment	• The territory is opened up; • Relocation of fishing site used by members of several communities located below the Sarcelle powerhouse due to the increase in debris; • Boating conditions on Boyd Lake continue to be difficult; • New boating conditions on the Boyd River due to the increased speed of currents; • In some winters, snowmobiling dangerous between KP 133 and 128; • Boyd River (between KP 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.
Mitigation measures	• Development of multi-species spawning grounds in the section of the river 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; • 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; • 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; • Construction of a boat-launching ramp on the shore of Boyd Lake just east of the Sarcelle powerhouse; • Installation of a gatehouse controlling access to the site so as to limit entry by recreational hunters and fishermen; • Follow-up on boating conditions on Boyd Lake and take whatever measures are needed, such as cleaning up debris on certain banks.

Trapline VC23 (West of Opinaca Reservoir)

Existing infrastructure	• 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.
Infrastructure and sandpits	• Sarcelle work camp (bordering trapline VC34 of the Eastmain community); • ~20 km of permanent road in need of improvement; • ~20 km of the 735-kV Sarcelle-Eastmain-1 line; • 1 potential stockpiling site.
Impacts on the biophysical environment	• Opinaca River has reduced flow.

Impacts on the human environment	• The territory is opened up.
Mitigation measures	• 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.

Trapline VC28 (Extreme North of the Opinaca Reservoir) (Not Included Among the 36 Traplines Affected by the Project According to HQ)

Existing infrastructure	• About 6 km of road linking the Sarcelle regulatory facility to the OA-01 dike and the OA-02 dike
Infrastructure and sandpits	• 1 potential stockpiling site; • Large amount of excess material from construction work on the Sarcelle powerhouse.
Impacts on the biophysical environment	• 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) – predicted reduction of 0.51 m on average versus the mean reference level; • 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.
Impacts on the human environment	• Boating remains difficult on the Opinaca River.
Mitigation measures	• 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.

Impacts by Trapline – CHISASIBI
Trapline CH1 (FG1) (North of La Grande Rivière)

Existing infrastructure	• About 26 km of the Long Point road.
Infrastructure and sandpits	
Impacts on the biophysical environment	
Impacts on the human environment	• No change to boating conditions on La Grande Rivière; • No change to ice conditions on La Grande Rivière.
Mitigation measures	

Trapline CH2 (FG2)
(North of the La Grande-1 Reservoir)

Existing infrastructure	• La Grande-1 powerhouse and ~5 km of the Long Point road.
Infrastructure and sandpits	• Rock blankets or riprap armouring at KP 34 on the north shore of La Grande Rivière.
Impacts on the biophysical environment	• Water levels rising an average of 0.30 m upstream from KP 89 of the La Grande-1 reservoir.
Impacts on the human environment	• No change to boating conditions on La Grande Rivière or the La Grande-1 reservoir. No change to ice conditions on La Grande Rivière or the La Grande-1 Reservoir.
Mitigation measures	

Trapline CH9 (FG9)
(North of the Robert-Bourassa Reservoir and the La Grande-1 Reservoir)

Existing infrastructure	• Spillway from the Robert-Bourassa reservoir, the Robert-Bourassa dam, ~20 km of secondary roads and 1 non-Cree camp.
Infrastructure and sandpits	
Impacts on the biophysical environment Mesures d'atténuation	• About 15% of the land flooded by the Robert-Bourassa reservoir; • 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; • Water levels rising an average of 0.30 m upstream from KP 89 of the La Grande-1 reservoir.

Impacts on the human environment	• No change to boating conditions on La Grande Rivière or the La Grande-1 reservoir. No change to ice conditions on La Grande Rivière or the La Grande-1 Reservoir.
Mitigation measures	

Trapline CH33 (VC1) (South of La Grande Rivière)

Existing infrastructure	• The village of Chisasibi, Chisasibi airport, the La Grande-1 powerhouse, ~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 powerhouse, ~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 KP 9.7 and 22.7 of La Grande Rivière); • 17 potential sand pits.
Impacts on the biophysical environment	
Impacts on the human environment	• Presence of a sector improved for use by the community for goose-hunting along the bank of La Grande Rivière between Chisasibi and the LG-1 powerhouse; • Presence of a site for use by the community on Lake Wastawawmakw; • The territory is opened up; • No change to boating conditions on La Grande Rivière; • No change to ice conditions on La Grande Rivière.
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.

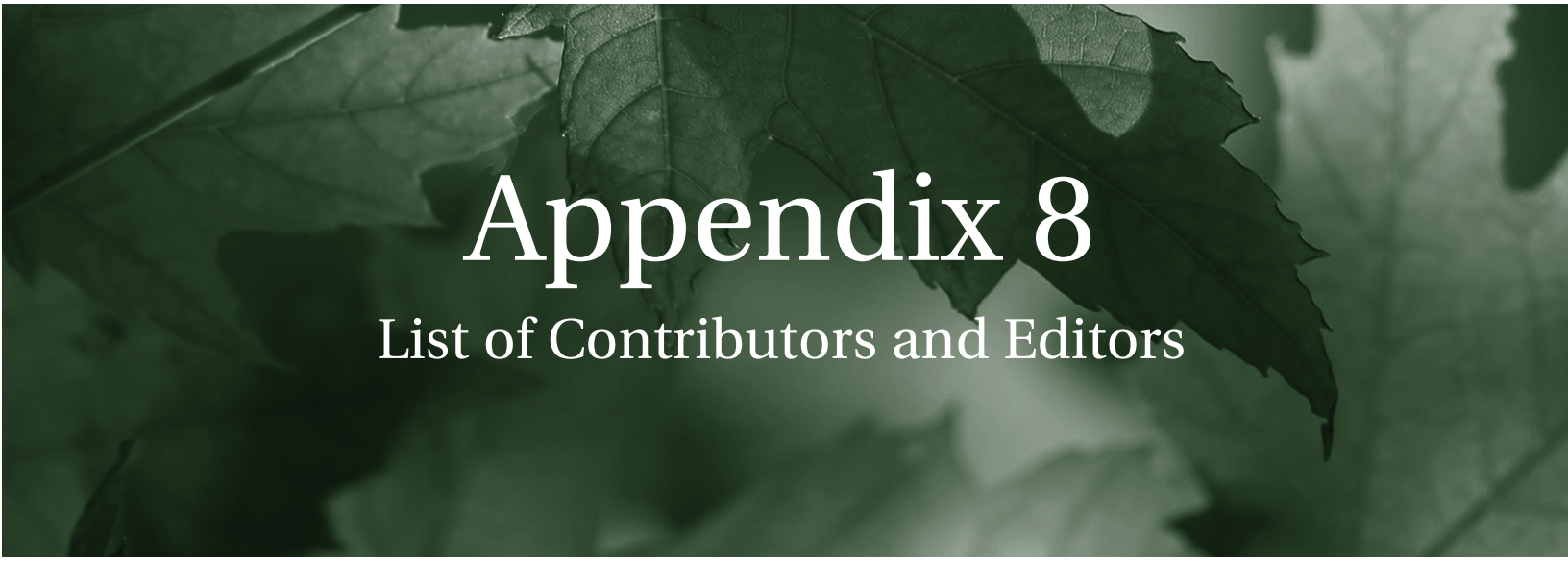
Trapline CH35 (VC3) (South of the La Grande-1 Reservoir)

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 biophysical environment	• Water levels rising an average of 0.30 m upstream from KP 89 of 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 La Grande Rivière 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.

Trapline 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 Rivière 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 powerhouse, the La Grande-2A powerhouse, 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 environment	• About 60% of this trapline 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 KP 89 on the La Grande-1 reservoir; • Increased flow in the Sakami River.
Impacts on the human environment	• No change to boating conditions on La Grande Rivière or the La Grande-1 reservoir; • No change to ice conditions on La Grande Rivière or the La Grande-1 reservoir.
Mitigation measures	



Appendix 8

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