

**BRIEF OF
MAKIVIK CORPORATION
TO ENVIRONMENTAL COMMITTEES
REGARDING SCOPING OF GUIDELINES
FOR THE GREAT WHALE PROJECT**

19 March 1992

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PART I

OPENING STATEMENT

BY MAKIVIK CORPORATION

TO ENVIRONMENTAL COMMITTEES AT

PUBLIC MEETING FOR SCOPING OF GUIDELINES

FOR GREAT WHALE PROJECT,

MONTREAL, 19 MARCH 1992

**OPENING STATEMENT BY MAKIVIK CORPORATION
TO ENVIRONMENTAL COMMITTEES AT
PUBLIC MEETING FOR SCOPING OF GUIDELINES
FOR GREAT WHALE PROJECT,
MONTREAL, 19 MARCH 1992**

1. INTRODUCTION

Mr. Chairmen, Commissioners, Ladies and Gentlemen:

Good afternoon.

My name is Mark T. Gordon. I am a Vice President of Makivik Corporation which represents the Inuit of Nunavik in northern Quebec. Appearing with me today on behalf of Makivik Corporation and the Inuit of northern Quebec are:

1. Mr. Anthony Ittoshat, Mayor of the Municipality of Kuujjuaraapik;
2. Mr. Noah Inukpuk, appointed representative of the Inuit Community of Umiujaq, formerly Mayor of that community;
3. Mr. Alec Tuckatuck, appointed representative of the Inuit Community of Kuujjuaraapik;
4. Dr. Paul Wilkinson, Scientific Coordinator for Makivik Corporation in this environmental assessment and review process;
5. Mr. John Hurley, Legal Counsel to Makivik Corporation in this environmental assessment and review process.

Our presentation this afternoon will proceed in three parts. I shall begin with a short opening statement on behalf of Makivik Corporation. Second, Mr. Ittoshat and Mr. Inukpuk will review the concerns of the Inuit intervenors in relation to the Great Whale Project stated at the public meetings on the scoping of the guidelines held in Kuujjuaraapik, Umiujaq, Inukjuak and Chisasibi in August 1991 and January through March 1992. Finally, Mr. Tuckatuck, Dr. Wilkinson and Mr. Hurley will review certain methodological and technical considerations.

2. MAKIVIK CORPORATION

Makivik Corporation represents the 5,500 Inuit beneficiaries of the *James Bay and Northern Quebec Agreement*, all of whom are members of the Corporation. It is the official Inuit Native party for the purposes of the *James Bay and Northern Quebec Agreement*.

Constituted by special act of the National Assembly of Quebec, Makivik Corporation is mandated to represent and promote the interests of the Inuit of northern Quebec.

Makivik has an elected Board of Directors, with directors from each of the fifteen Inuit communities of northern Quebec. Its Executive officers are elected through universal elections for three-year terms; all Inuit of northern Quebec are entitled to vote in these elections.

3. MAKIVIK'S POSITION REGARDING THE GREAT WHALE PROJECT

My colleagues will address specific concerns in relation to the guidelines for the Great Whale Project. I should like, however, to clarify Makivik's position on the Project.

The press has reported that Makivik is in negotiations with Hydro-Québec concerning the Great Whale Project. Some have inferred from this that Makivik favours the Project or has reached an agreement or accommodation with Hydro-Québec. Thus the need for some clarification.

In simplest terms, Makivik and the northern Quebec Inuit have not endorsed or accepted the Great Whale Project and have stated this position consistently since 1981.

Makivik's objective is two-fold -- to determine, through negotiations and this process, the true scope of the impacts of the Project and whether they can be acceptably managed or minimized; at the same time, to determine through negotiations, whether Hydro-Québec and the Government of Quebec will share the benefits from the Project fairly and equitably with the Inuit of the communities most affected and with the Inuit of the Nunavik region as a whole.

Makivik's goal is to get at the truth about the Project, so as to present to the Inuit of the affected communities the most complete information possible as to its potential impacts and their options in relation to it. To this end, over the past year and a half Makivik has been working in close collaboration with a team of community representatives from the region of Nunavik and from Kuujjuaraapik, Umiujaq and Inukjuak, the Inuit communities most affected.

The Inuit are well aware that the Great Whale Project poses potentially serious negative impacts for them, their communities, and the land, waters and animals upon which they depend. They are also aware that the Project offers potential benefits for the Inuit in terms of local and regional economic development, vocational training, employment and business opportunities.

The final position of the Inuit in relation to the Project will be a function of the balance between the positive and negative impacts of the Project for them. Makivik's

responsibility at this stage is to assist northern Quebec Inuit in informing themselves as well as possible about the Project so that they may make reasoned decisions about it.

Final decisions will not be easy. Difficult choices and trade-offs will have to be made. The Inuit face a real challenge in attempting to secure a strong and lasting economic base while safeguarding their way of life and environment.

Given the scale of the Project, it is not surprising that it should be the object of lively debate in the affected Inuit communities. The stakes are high, and many Inuit feel that their future hangs in the balance. They wish to do what is right. And they must reconcile sometimes conflicting information and aspirations.

Makivik considers this debate natural and healthy. We have never tried to hide it, nor have we tried to muzzle adherents of any view, pro or con, about the Project. We are confident that this contest of ideas and values will, by subjecting all options to close scrutiny, help the Inuit to identify the best course for them.

4. NEGOTIATIONS

Consistent with this, and with the mandate given it by its membership in April 1990 and reconfirmed in March 1991, Makivik has pursued a single course, comprising two main elements, in relation to the Project. First, Makivik has undertaken direct negotiations with Hydro-Québec on the Project. Second, Makivik has taken, and intends to continue, an active role in the environmental assessment and review processes relating to the Great Whale Project.

Makivik sees these two elements as complementary. Direct negotiations provide a formal, non-adversarial context for the proponent and the Inuit to exchange information and views about Project design and scheduling, environmental and social impacts, and possible remedial and compensatory measures. They have enabled the Inuit to inform themselves as to Hydro-Québec's plans for the Great Whale Project and, we believe, to influence these plans. Hydro-Québec's deletion of the Nastapoka diversion may be based on environmental grounds, but it is in no small part a result of face-to-face discussion where the Inuit expressed, in detail, the ecological objections to that element of the Great Whale Project.

At the same time, certain topics, such as some remedial and compensatory measures, are best discussed bilaterally by the affected populations with the proponent, without the direct interposition of review panels. The Inuit themselves are best placed to identify and protect their interests in these regards. The environmental committees can certainly assist and safeguard this process, but ultimately it is only the Inuit themselves who are empowered to reach agreement on the Project with the proponent, within the framework

of the terms and conditions of any environmental authorizations that the proponent might obtain.

Makivik will not go into the details of its negotiations with Hydro-Québec. The Inuit communities of Kuujjuaraapik, Umiujaq, and Inukjuak are kept regularly and fully informed as to the progress of these negotiations, both through their representatives on the negotiating team and by means of formal and informal communications. But the negotiations are being conducted in confidence. Makivik considers that public disclosure of the negotiations would only hinder their progress by harming the atmosphere of good faith which the parties have worked to develop.

5. ENVIRONMENTAL ASSESSMENT AND REVIEW

At the same time as it pursues talks with Hydro-Québec, Makivik has publicly committed itself to full and active participation in the environmental assessment and review processes applicable to the Great Whale Project. The environmental regime established under Section 23 of the *James Bay and Northern Quebec Agreement* provides for a special status and involvement for the Inuit in the assessment and review of projects like the Great Whale Project. As the representative of the Inuit of Nunavik, Makivik has a responsibility to play an active role, in close coordination with the affected Inuit communities, in the assessment and review of this Project.

Makivik has, without fanfare, fulfilled this responsibility on several occasions over the past twelve months. It intervened in two court proceedings when questions of principle involving the environmental regimes under Sections 22 and 23 of the *James Bay and Northern Quebec Agreement* were at stake.

First, Makivik intervened in the proceedings brought by the Crees in the Federal Court of Canada in the case *Cree Regional Authority v. Raymond Robinson*. These proceedings sought to force the Federal Administrator to apply the federal environmental processes provided for in Sections 22 and 23 to the Great Whale Project. These proceedings were successful in obtaining a judgement from Mr. Justice Rouleau of the Federal Court, Trial Division, ordering the Federal Administrator to apply the federal processes under Sections 22 and 23 of the *James Bay and Northern Quebec Agreement* to the Project. This judgement is now under appeal before the Federal Court of Appeal, but the Federal Administrator has not sought to stay its execution.

Second, Makivik intervened in the proceedings brought by the Crees in the Superior Court of Quebec in the case *Chief Robbie Dick v. Pierre Paradis*. The purpose of these proceedings was to obtain a declaration that the division by Hydro-Québec and the Provincial Administrator of the Great Whale Project into access infrastructure and hydroelectric works, as separate "projects", for purposes of environmental assessment and review under the *James Bay and Northern Quebec Agreement* was invalid. After a number

of days of argument, the case was settled out of court when Hydro-Québec announced that it would submit the access infrastructure and hydroelectric works related to the Great Whale Project as a single project for purposes of environmental assessment and review. This undertaking was formalized by a declaration of settlement out of court signed by Hydro-Québec, the Crees and the Inuit on 25 October 1991.

Subsequent to this settlement, Makivik took an active role in the negotiation of the Memorandum of Understanding providing for the coordination of the five environmental assessment and review processes applicable to the Great Whale Project under the *James Bay and Northern Quebec Agreement* and the *Federal Environmental Assessment and Review Process Guidelines Order*. Makivik's position is that all of these processes apply to the Project. Makivik recognizes, however, that their uncoordinated application would be inefficient, wasteful and possibly unworkable. That is why, as early last November, Makivik advocated to the other parties concerned a mechanism for the coordination of the these processes. After intense negotiations, the parties, including the Government of Canada, the Government of Quebec, the Crees and the Inuit, concluded the Memorandum of Understanding on 23 January 1992. This agreement has established the framework for the coordination of the environmental assessment and review processes now underway in relation to the Great Whale Project. Makivik is confident that this framework will promote a full and fair review of the Project.

6. MAKIVIK'S OBJECTIVES IN THE ENVIRONMENTAL ASSESSMENT OF THE GREAT WHALE PROJECT

Makivik seeks full and rigorous assessment and review of the environmental and social impacts of the Great Whale Project. The assessment and review should proceed in an open and non-adversarial way as much as possible. It should serve as a forum for the exchange between the proponent and intervenors of information and preoccupations in relation to the Great Whale Project.

Above all, Makivik looks to the environmental assessment and review processes as one means of identifying the full range of impacts, environmental and social, negative and positive, associated with the Great Whale Project. This is information which will permit the Inuit communities, on the one hand, and the environmental committees, on the other, to take a reasoned position in relation to the Great Whale Project.

As already noted, Makivik will play an active role in these proceedings. It has already formed a team comprising representatives from all sectors of the affected Inuit communities, some of whom you have already heard from and others of whom you will be hearing from shortly. Makivik has also prepared a detailed work programme for its intervention in these proceedings; this plan will be revised upon receipt of the final guidelines for the preparation of the impact statement. In its preparations for these scoping

meetings, Makivik has commissioned a team of some twenty-two technical experts, largely from Quebec, to submit comments on key issues to be addressed in the guidelines.

In short, Makivik is here, front and centre before the environmental committees, to represent the interests of the Inuit of northern Quebec in relation to the Great Whale Project. Makivik will continue to do so.

Thank you.

PART II

SUMMARY OF

CONCERNS OF INUIT INTERVENORS

STATED AT PUBLIC MEETINGS ON SCOPING OF

GUIDELINES FOR THE GREAT WHALE PROJECT

HELD IN KUUJJUARAAPIK, UMIUJAQ, INUKJUAK AND CHISASIBI

IN AUGUST 1991 AND JANUARY-MARCH 1992

INTRODUCTION

This part of the brief summarizes the concerns stated by the Inuit of Kuujjuaraapik, Umiujaq, Inukjuak and Chisasibi to the environmental committees at public meetings on the scoping of the guidelines for the Great Whale Project.

This summary is based on the transcript of the scoping meetings held in Umiujaq and Inukjuak in August 1991 on the access infrastructure of the Great Whale Project, and on notes taken at the scoping meetings held in Kuujjuaraapik, Umiujaq, Inukjuak and Chisasibi from January to March 1992 on the entire Great Whale Project. The Inuit having spoken at these meetings are identified in Annex I.

Concerns are grouped in eleven categories. Some overlap exists between categories. Under subheadings, general concerns are stated first, followed by more specific concerns.

The comments of the Inuit have been summarized for concision and edited for coherence. This document attempts to reflect the substance of their concerns as accurately as possible.

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**SUMMARY OF
CONCERNS OF INUIT INTERVENORS
STATED AT PUBLIC MEETINGS ON SCOPING OF
GUIDELINES FOR THE GREAT WHALE PROJECT
HELD IN KUUJJUARAAPIK, UMIUJAQ, INUKJUAK AND CHISASIBI
IN AUGUST 1991 AND JANUARY-MARCH 1992**

A - ENVIRONMENTAL IMPACTS

A.1 ENVIRONMENT AND LAND (General)

A general concern was often repeated as to the negative impacts of construction and operation of the Great Whale Project on the land, the sea and the animals upon which the Inuit depend for their survival.

A.2 WATER - RIVERS - LAKES (General)

A general concern was expressed as to the impacts of the construction and operation of the Project on waterbodies, *i.e.* rivers and lakes. Specific concerns were expressed in

Kuujuaraapik, as to

- A.2.1 the effects of fallen trees in the water and along shorelines;
- A.2.2 the creation of new rivers (diversions);

Umiujaq, as to

- A.2.3 Project impacts on smaller rivers which are linked farther inland; and

Inukjuak, as to

- A.2.4 Project impacts in the marine environment.

A.3 LAND FLOODING

Concern was expressed as to the extent of the Project's flooding of the land, and hence upon the animals and the Inuit's subsistence.

A.4 WATER - LEVEL IN THE SEA

Concern was expressed as to the effect of the construction and operation of the Project upon the sea level: will it be lowered excessively?

A.5 WATER - FLOW REDUCTION

Concern was expressed about the reduction of flow ("drying up") in the lower Great Whale River and Little Whale River. This reduction in flow will make travel by boat difficult in the affected reaches.

A.6 WATER/SEA - CURRENTS

Concern was expressed as to the impact of changed flows, volumes, timing and temperature of fresh water discharges from the Project on currents in Hudson Bay and, more specifically,

- A.6.1 in Manitounuk Sound;
- A.6.2 between Umiujaq and the Belcher Islands; and
- A.6.3 in the vicinity of Inukjuak.

Concern was also expressed as to the possible effects of changed currents in these areas on

- A.6.4 species at the bottom (*i.e.* benthos) and top (*i.e.* seals, beluga whale) of the marine food chain; and
- A.6.5 travel from Kuujjuaraapik to the Manitounuk Islands in all seasons.

A.7 WATER - CHANGES IN SALINITY

Concern was expressed as to the impact of Project-induced changes in flows and volumes of discharges of freshwater upon the salinity of water in Hudson Bay, Manitounuk Sound, Richmond Gulf and the estuaries of the Great Whale River and Little Whale River, as well as upon the food chain in these areas.

A.8 TIDES

Concern was expressed as to the results of interaction between the tides and Project-induced changes in flows and volumes at the estuaries of the Great Whale and Little Whale Rivers, with special reference to

- A.8.1 salt water intrusion into the lower reaches of the Great Whale River and Little Whale River.

A.9 ICE FORMATION

Concern was expressed as to changes in ice formation caused by Project-induced changes in the flows, volumes, timing and temperature of freshwater discharges. Specific mention was made in this regard to

- A.9.1 estuaries of Great Whale and Little Whale Rivers;
- A.9.2 GB-1 tailrace at Manitounuk Sound;
- A.9.3 Richmond Gulf;
- A.9.4 the increased danger of winter travel over ice for hunting purposes, especially between Kuujjuaraapik and the islands in Manitounuk Sound.

A.10 ANIMALS (General)

A general concern was expressed about the negative impacts of the Project on animals. A decline in wildlife populations is feared. Nongame species (*e.g.* worms) were mentioned to emphasize the fact that all species of animals are important and merit protection.

A.11 FOOD CHAIN

Concern was repeatedly expressed as to Project impacts upon the entire food chain, both on land and in the water, including plants, "microscopic animals" (benthos), bottom-feeders, fish and smaller mammals.

A.12 MIGRATORY ANIMALS

Concern was expressed as to the disruption of migration routes and activities of caribou and migratory waterfowl caused by Project works. More specifically, concern was stated that

- A.12.1 construction of Project works (roads, airports, dams, etc.) should be suspended during the migration periods of caribou and geese;
- A.12.2 migration routes of these species might be changed or abandoned, causing losses of animals less able to cope in new surroundings.

A.13 BIRDS (General)

A general concern was expressed as to the negative impacts of the Project on bird species.

A.14 NESTING

Concern was expressed about the disturbance of waterfowl nesting areas caused by air and land surveys for the Project.

A.15 WATERFOWL

Concern was expressed about negative Project impacts upon migratory waterfowl, with specific reference to

- A.15.1 geese;
- A.15.2 eider duck; and
- A.15.3 migration routes.

A.16 PTARMIGAN

A number of speakers commented upon a decline in the population of ptarmigan, which they associated with the construction of the La Grande Project.

A.17 CARIBOU

The Inuit noted their heavy reliance upon caribou as a food source. Concern was expressed as to negative Project impacts:

- A.17.1 decline in the population of caribou;
- A.17.2 disturbance of migration routes;
- A.17.3 disturbance of calving grounds;
- A.17.4 damage or loss of grazing areas.

A.18 FISH (General)

Concern was repeatedly expressed as to the negative impacts of the Project upon various species of fish, which form one of the main food sources for the Inuit. Specific concerns related to:

- A.18.1 disturbance of spring and autumn runs of fish in the rivers;
- A.18.2 blocked access caused by frozen culverts;
- A.18.3 the need for further studies of the biology of all fish species;
- A.18.4 fish in small rivers between Umiujaq and Kuujjuaraapik;
- A.18.5 cod;
- A.18.6 sculpin.

A.19 SPAWNING/BREEDING

Concern was expressed as to the impacts of the Project on the spawning sites of fish and the breeding sites of whales.

A.20 MARINE MAMMALS

Project impacts upon marine mammals generally were identified as a concern.

A.21 SEALS

More specific concerns were expressed as to Project impacts upon seals, in particular,

- A.21.1 freshwater seals;
- A.21.2 ringed seals;
- A.21.3 bearded seals;
- A.21.4 seals in Little Whale River.

A.22 WHALES

Concern was expressed as to negative Project impacts on beluga whales, specifically their

- A.22.1 calving grounds;
- A.22.2 moulting or rubbing areas in the estuaries of the Little Whale River and Great Whale River.

A.23 OTHER AQUATIC SPECIES

Concern was expressed as to negative Project impacts upon other aquatic species, including

- A.23.1 mussels, sea urchins, sea cucumbers;
- A.23.2 species that feed from river banks;
- A.23.3 microscopic species (benthos);
- A.23.4 seaweed.

A.24 ENDANGERED SPECIES

Among the endangered species identified as of special concern in relation to Project impacts were

- A.24.1 beluga whale;
- A.24.2 freshwater seals.

A.25 DEFORESTATION

Deforestation is feared in association with Project works. Specific concerns identified include

- A.25.1 forest fires;
- A.25.2 clear cutting to be minimized;
- A.25.3 cutting of trees for workers' camps.

A.26 OZONE LAYER

On several occasions, concern was expressed as to the possible negative impacts of the Project on ozone depletion in the atmosphere.

A.27 CLIMATIC CHANGES

The greenhouse effect of gases emitted from Project reservoirs was mentioned as a concern.

A.28 NOISE

Noise associated with Project construction was identified as a concern, with special reference to the effects of

- A.28.1 blasting on seals, cod and small fish;
- A.28.2 vibration from construction activities;
- A.28.3 noise of vehicles on animals.

A.29 EROSION

Concerns expressed as to erosion in relation to the Project addressed

- A.29.1 rockslides near the GB-1 main dam and their effects on the latter;
- A.29.2 landslides on Manitounuk Islands;
- A.29.3 erosion of river banks.

A.30 WATER - SEDIMENTS

Concern was expressed as to increased sediment loads in the rivers caused by the Project. One intervenor referred to the milky white colour of river water caused by the La Grande Project.

A.31 HABITAT

Concern was expressed as to the Project - related destruction of habitat generally, and specifically for

- A.31.1 ptarmigan;
- A.31.2 Great Whale River belugas.

Spawning habitat (redds) for various salmonids

A.32 SEISMIC ACTIVITY

One intervenor expressed concern as to the possible effects of seismic activity on the integrity of the GB-1 dam and reservoir.

A.33 LIFE (General)

The possible negative impacts of the Projects on various forms of life was stated as a general concern.

B - CONTAMINATION

B.1 MERCURY

Mercury contamination associated with the Project was a focus of concern in the Inuit communities. Specific concerns related to

- B.1.1 contamination of water and rivers;
- B.1.2 mercury production in reservoirs, caused by submerged trees and vegetation;
- B.1.3 contamination of fish, mussels, sea urchins and marine species;
- B.1.4 contamination of marine mammals and fish caused by scavenging on dead fish and benthos discharged from the GB-1 tailrace into Manitounuk Sound;
- B.1.5 contamination of waterfowl;
- B.1.6 contamination of endangered species like freshwater seal;
- B.1.7 reduced productivity of animals caused by mercury contamination.

B.2 FOOD CONTAMINATION

Food contamination caused by Project works is a major preoccupation for the Inuit. Several intervenors stated that, given the high cost of store-bought food, the Inuit would continue to rely upon country food, even if it were contaminated. Other concerns expressed in this regard were

- B.2.1 the absence of inspection of country food for contamination;
- B.2.2 the need for a public information campaign concerning contamination standards for various types of country food;
- B.2.3 changes in the taste of country food and in the amount of blood in it.

B.3 WATER CONTAMINATION

Concern was expressed as to Project - related water contamination, with special reference to

- B.3.1 contamination of rivers;
- B.3.2 contaminated water getting into the sea;
- B.3.3 oil spills in the sea.

B.4 DRINKING WATER QUALITY

The potential negative impact of the Project upon the quality of drinking water was a major preoccupation. Reference was made to the negative experience at Eastmain. Concern was stated that the supply of drinking water at Kuujjuaraapik would dry up and people would have to travel far to get replacement supplies. The need for a guarantee of replacement drinking water was stressed.

B.5 HUMAN HEALTH

Among the concerns mentioned as to the negative impacts of the Project on human health were

- B.5.1 diseases caused by pollution;
- B.5.2 AIDS and other sexually transmitted diseases;
- B.5.3 drug and alcohol abuse;
- B.5.4 mental health;
- B.5.5 appearance of red spots on peoples' bodies;
- B.5.6 appearance of new or incurable diseases.

B.6 ANIMAL HEALTH

Concern was expressed as to the impact of the Project on animals' health. Specific concerns related to

- B.6.1 animals eating contaminated food (i.e. mercury contaminated fish) and garbage;
- B.6.2 the thin appearance of animals now;
- B.6.3 caribou;
- B.6.4 appearance of red spots on fish.

B.7 WHALES

Concern was expressed as to Project impacts on the health of beluga whales. It was noted that beluga whales from Churchill had "thin skins, bad shape, no white skin; they fed on contaminated water."

B.8 FISH

Among the concerns expressed about fish contamination were:

- B.8.1 dead fish on the beach in Chisasibi;
- B.8.2 Chisasibi fish unfit for consumption;
- B.8.3 fish abnormally large at LG-4;
- B.8.4 mercury contamination;
- B.8.5 contamination of fish in Great Whale, Little Whale, Nastapoka Rivers and up to Richmond Gulf.

B.9 WASTE

Specific concerns mentioned were:

- B.9.1 toxic waste;
- B.9.2 equipment, tents, barrels left behind after construction;
- B.9.3 floating garbage in reservoirs;
- B.9.4 garbage left by roads, at camps, in bush;
- B.9.5 in land markers;
- B.9.6 waste water sites;
- B.9.7 tank farms.

B.10 OIL AND GAS SPILLS

Fuel leaking from barrels left by airstrips was mentioned as a source of damage to land and animals.

B.11 CONTAMINANTS (General)

In addition to the general concern of Project - related pollution, specific reference was made to

- B.11.1 movement of contaminants northward and in Hudson Bay;
- B.11.2 air pollution.

B.12 OTHER

Concern was expressed as to the proliferation of mosquitoes as a result of the creation of reservoirs.

C - INUIT WAY OF LIFE

C.1 CHILDREN AND FUTURE GENERATIONS

An overriding concern was the possible destruction of the Inuit way of life as a result of the Project. Inuit intervenors stated their concern that they would be unable to pass on the Inuit way of life to future generations. Among specific statements made were the following:

- C.1.1 "our children will blame us (for not protecting the Inuit way of life)";
- C.1.2 "will our children eat country food?";
- C.1.3 the land must be preserved for future generations.

C.2 CULTURE AND TRADITIONAL LIFE

Inuit intervenors repeatedly expressed the concern that the Project would have a negative effect upon their culture and traditional way of life. In particular,

- C.2.1 "when the food source and the land are affected then the Inuit way of life is affected";
- C.2.2 "the pace of life is too fast."

C.3 INUIT HERITAGE

Specific concerns as to the negative impacts of the Project on Inuit heritage were:

- C.3.1 the destruction or disturbance of Inuit graves and burial grounds;
- C.3.2 the disturbance of the Inuit's special relationship to the land and waters. Physical features have special significance for the Inuit. One intervenor mentioned, for example, that the Great Whale River has special importance for him since his brother had drowned there. Others have stayed in Kuujjuaraapik because the graves of their relatives are there;
- C.3.3 the Inuit noted that their territory is their homeland, that they have no other territory to which to go.

C.4 INUIT VALUES

A number of Inuit intervenors stated that the Project would interfere with the Inuit system of values. Concerns stated addressed the following:

- C.4.1 Inuit's love for the earth;
- C.4.2 emotional pain of Inuit elders at the drowning of rivers;
- C.4.3 the feeling that the proponent has no respect for Inuit values;
- C.4.4 Inuit struggling and suffering in the past and in the future;
- C.4.5 Inuit not feeling comfortable on the land as result of Project - related changes;
- C.4.6 destruction of Inuit self-respect;
- C.4.7 loss of Inuit's former pride in maintaining their territory.

C.5 INUIT CONTROL OVER THE LAND

Several intervenors mentioned a sense of loss of control by the Inuit over their land, or a sense that the land and rivers were being taken from the Inuit. A desire to be involved in land management was mentioned.

C.6 INUIT PEOPLE - EXTINCTION

Several persons noted that the Inuit are a small population and so somewhat analogous to an endangered species. They therefore merit special protection.

D - SOCIAL IMPACTS

D.1 SOCIAL PROBLEMS (General)

A general concern was expressed that the Project would entail new social problems and aggravate existing ones within the affected Inuit communities. More specifically, the following concerns were mentioned:

- D.1.1 the presence of non-Natives in the Inuit communities, particularly overnight;
- D.1.2 the presence of non-Native tourists in too large numbers.

D.2 SOCIAL TENSION

The project was anticipated to increase social tensions both within the Inuit communities, between Inuit communities and between the Inuit and non-Inuit. Specific reference was made to:

- D.2.1 disruption of the social peace;
- D.2.2 the problem of living between two cultures (Inuit and non-Native);
- D.2.3 the potential for future conflicts and violence.

D.3 RELOCATION

Concern was expressed that the Project might require the relocation of the community of Kuujjuaraapik, or that the Inuit of this community might be forced themselves to relocate to the north, because of Project-induced declines in the availability of country food and other negative impacts in the affected area. Experience of past relocation is that it generates social tensions.

D.4 INUIT - CREE RELATIONSHIP

A number of Inuit intervenors, particularly in Kuujjuaraapik and Chisasibi, feared that the Project would lead to a deterioration of relations between the Inuit and the Cree. It was noted that, while the Inuit and the Cree traditionally shared and helped one another, the Project might cause conflict between them, in particular, because of competition in hunting, fishing and trapping. Specific concerns focused on

- D.4.1 conflict for resources as new roads provide easy access throughout the region;

- D.4.2 displacement of Cree hunting and fishing to Inuit areas in the north, caused by competition by non-Natives and ecological deterioration in the more southern parts of the region.

D.5 YOUTH CONCERNS

A number of Inuit youth expressed concerns as to the negative impacts of the Project on them as a group, including

- D.5.1 loss of Inuit language and culture;
D.5.2 loss of the Inuit's special relationship with the land and the animals;
D.5.3 remote prospect of the Inuit deriving lasting economic benefit, in the form of training, employment and contracting opportunities, from the Project, should it proceed.

D.6 DRUG AND ALCOHOL ABUSE

The Inuit are concerned that the Project will lead to an increase of drug and alcohol abuse in their communities. In particular, concerns relate to the following:

- D.6.1 easier access by new roads will make the import of drugs and alcohol into the communities easier;
D.6.2 the presence of relatively large numbers of non-Native transient workers will likely increase the availability of drugs and alcohol in the communities;
D.6.3 the need for mechanisms to prevent or control access to drugs and alcohol and for curative mechanisms to deal with abuse as it arises;
D.6.4 road accidents caused by drunk driving.

D.7 SUICIDE

Concern was expressed that social stresses related to the Project might lead to an increase in suicide.

D.8 POVERTY

Concern was expressed that the Project would impoverish the Inuit by destroying the land, the water and the animals upon which they depend for their livelihood. The destruction of the hunting economy would lead, it was feared, to an increased dependence on welfare.

D.9 YOUNG PEOPLE TRAVELLING SOUTH

Concern was expressed that easier access to the south by means of the new roads related to the Project would lead young people increasingly to travel to the south and, possibly, to abandon their home communities. The pull of outside attraction is strong.

D.10 EMPLOYMENT

A number of Inuit intervenors expressed concern as to the difficulty of securing permanent jobs in relation to the Project, should it proceed. Some feared that, on the basis of experience at LG1, Project jobs would go primarily to non-Natives, not to Inuit. Another concern was that the lack of French would render the Inuit ineligible for employment. The need for real training programmes was noted.

D.11 ECONOMIC DEVELOPMENT

Concern was expressed that the Project would change, and possibly compromise, the economic development of the affected region. Specific concerns mentioned were

- D.11.1 the prospect that the roads would lead to more large-scale resource developments like mining;
- D.11.2 the need for local economic development projects, such as fish farms, caribou grazing and the like;
- D.11.3 the threat posed by the Project to the Inuit's economic and political autonomy.

D.12 SECURITY/CONTROL

The need for mechanisms of security and control was noted, especially in relation to

- D.12.1 control of drugs and alcohol;
- D.12.2 control of access by non-Native workers both to the communities and to the country for purposes of hunting and fishing.

D.13 PROSTITUTION

Concern was expressed that the Project would be associated with an increase in prostitution and in sexual abuse of teenagers.

D.14 SINGLE MOTHERS

Concern was expressed that the influx of non-Native workers would lead to an increase in cases of single motherhood and child abandonment.

D.15 VIOLENCE

The potential for violence as a result of construction of the Project was noted. Two types of violence were identified as possibilities: between the Inuit and the Cree, and between Natives and non-Natives.

D.16 MENTAL HEALTH

Concern was expressed that the Project would cause the deterioration of mental health among the Inuit.

D.17 OTHER

"Baby bottle syndrome" was mentioned as another concern.

E - ACCESS INFRASTRUCTURE

E.1 ROADS (General)

Concern was expressed as to the potential social, economic and ecological impacts of the proposed roads. Specific concerns included:

- E.1.1 the adverse affects of dust storms caused by unpaved roads on migratory animals;
- E.1.2 the possibility that the new roads might affect the traditional migration routes of the caribou;
- E.1.3 road kills of wildlife;
- E.1.4 increased traffic;
- E.1.5 the need to reduce the width of the 8-mile road corridor from LG-2 to GB-1;
- E.1.6 borrow pits (sand and gravel); location and restoration.

E.2 ROAD ACCIDENTS

The risk of increased deaths in road accidents related to drug or alcohol abuse was noted.

E.3 CONTROL OF ACCESS ROADS

The need was noted for control over non-Native access by road to the region, both during construction and after commissioning of the Project. Control over access both to the communities and to hunting and fishing sites is required.

E.4 AIR TRAFFIC

Air traffic was considered to have a negative impact on hunting, primarily by disturbing migratory waterfowl in their nesting and feeding areas. The need to control or suspend local aircraft movements during the spring and autumn hunts was noted. The need for a proper regime of maintenance for airports was also noted.

F - TRANSMISSION LINES

F.1 WIDTH OF CORRIDORS

It was stated that the width of corridors should be reduced in order to minimize the impacts.

F.2 ANIMALS

Concern was expressed as to the potential impacts of the transmission lines upon animals such as caribou, rabbits, ptarmigan and other birds.

F.3 USE OF PLANTS AND BERRIES AS FOOD

Concern was expressed as to the potential negative impacts of the transmission lines upon the use by the Inuit of plants and berries as food. [The concern apparently relates to the use of pesticides to control the growth of vegetation in the transmission line corridors.]

G - TECHNICAL ASPECTS OF THE PROJECT

G.1 FREQUENCY OF USE OF GB-1 SPILLWAY

Concern was expressed as to the frequency of use of the spillway proposed for the GB-1 reservoir.

G.2 LOCATION OF SPILLWAY

The desirability of moving the spillway for the GB-1 reservoir to the proximity of the powerhouse was raised.

G.3 OPERATION OF GB-1 SPILLWAY

Concern was expressed as to the effects of operation of the GB-1 spillway in relation to:

- G.3.1 damage to Inuit equipment downstream;
- G.3.2 safety of Inuit at Kuujjuaraapik;
- G.3.3 danger to caribou.

G.4 EFFECTS OF USE OF GB-1 TAILRACE

Concern was expressed as to the effects of the GB-1 tailrace, with special reference to:

- G.4.1 ice formation;
- G.4.2 sea bed;
- G.4.3 marine mammals;
- G.4.4 water current in Manitounuk Sound.

G.5 OVERSEA ACCESS AT GB-1 TAILRACE

Concern was expressed as to the loss of access over the sea ice in the vicinity of the GB-1 tailrace along the coast and to the Manitounuk Islands, caused by the permanent open water brought about by the discharge of large volumes of relatively warm water from the tailrace.

G.6 CONTROL OF WATER LEVEL AT LAC BIENVILLE

Concern was expressed as to the effects of operation of the control structure at the outlet of Lac Bienville upon water levels downstream. A specific concern was whether the operation of this control structure would necessarily entail operating the spillway for the GB-1 reservoir.

H - PROJECT JUSTIFICATION

H.1 ELECTRICITY CONSERVATION

Several Inuit intervenors questioned the need for the Project, noting the wastefulness of energy consumption in southern Quebec and the scope for further conservation of electricity.

H.2 SUPPLY ALTERNATIVES

Several intervenors questioned whether, assuming the need for additional electricity supply, other sources of supply could not be identified. Among the supply alternatives mentioned were fossil-fuel fired generators and wind energy.

H.3 ELECTRICITY EXPORTS TO UNITED STATES

The need for additional electricity supply was questioned in view of Hydro-Québec's export of electricity to the United States.

H.4 ALTERNATIVE SITES FOR PRODUCING ELECTRICITY

Assuming the need for additional supply, several intervenors questioned whether other sites than the Great Whale and Little Whale basins could not be developed for this purpose. Among the alternative sites mentioned were:

- H.4.1 St. Lawrence River;
- H.4.2 areas already disturbed;
- H.4.3 the South.

H.5 CRITERIA FOR ESTIMATING COST OF PROJECT

Concern was expressed as to the criteria used in estimating the cost of the Project. One specific concern was whether environmental costs (i.e. "external costs") as well as financial costs were taken into account.

H.6 ELECTRICITY RATES

Concern was expressed as to the relation between electricity demand and Hydro-Québec's rate policy.

H.7 COST-BENEFIT ANALYSIS

The cost-benefit ratio of the Project was questioned, in that Natives would bear the environmental and social costs of the Project, while non-Natives would reap the benefits generated by the Project, in particular, additional electricity supply.

I - IMPACT STUDY METHODOLOGY

I.1 INUIT PARTICIPATION L.D

were: Among the concerns noted as to Inuit participation in the assessment process

- I.1.1 the entitlement of Inuit elders and hunters to recognition as experts in the fields of their experience;
- I.1.2 concern as to whether account would be taken of the Inuit's concerns ("Will our voices be heard?");
- I.1.3 the feeling that insufficient time had been allocated for the participation of the Inuit in the scoping process;
- I.1.4 the feeling that the Inuit carry little weight in the general political process;
- I.1.5 the need for the Inuit to be involved in the technical and analytical aspects of research and not just as field guides.

I.2 M STUDY AREA

The need to broaden the study area beyond the immediate Project area was noted. Among the areas to be included were:

- I.2.1 the territories used by the Inuit communities along the coast of Hudson Bay, *i.e.* Kuujjuaraapik, Inukjuak, Umiujaq, Chisasibi and Sanikiluaq;
- I.2.2 the offshore of Hudson Bay, Hudson Bay in general and the Hudson Strait;
- I.2.3 areas impacted by similar projects in similar latitudes, *i.e.*, the Churchill Project in Manitoba;
- I.2.4 Cape Dorset;
- I.2.5 Penderton.

M I.3 **INSUFFICIENT TIME ALLOCATED TO RESEARCH**

Concern was expressed that Hydro-Quebec had allocated insufficient time to study the ecology of the affected region. The need for continuing research and monitoring for years after commissioning of the Project was noted.

M I.4 **USE OF PLANES AND HELICOPTERS**

Concern was expressed that movements of planes and helicopters for air surveys disturbed birds and animals and so disrupted Inuit hunting. The need to control or suspend such flights during the hunting season was noted.

I.5 **RELIABILITY OF DATA**

Concern was expressed as to the reliability of data acquired by Hydro-Québec.

M I.6 **IMPACT OF STUDIES ON ANIMALS**

Concerns were expressed as to specific aspects of research conducted on animals, such as

- I.6.1 tranquillizing of polar bears;
- I.6.2 tagging of geese;
- I.6.3 shooting at geese from helicopters.

I.7 **CUMULATIVE IMPACT ASSESSMENT**

The need for cumulative impact assessment was noted, since "the second project will add to the impacts of the first." Special reference was made to:

- I.7.1 social impacts;
- I.7.2 health impacts.

M I.8 **COMPREHENSIVE STUDIES**

The need for comprehensive, exhaustive studies, on all species of animals in the food chain, was noted.

I.9 **MONITORING**

The need for long-term monitoring of the impacts of the Project was noted. Special reference was made to the need for

- I.9.1 proper baseline studies for the comparison of "before" and "after" states;
- I.9.2 long-term studies of people's health;
- I.9.3 long-term studies of contaminants in food;
- I.9.4 monitoring on land and animals.

I.10 COMMUNICATION OF INFORMATION

Concern was expressed that the Inuit were not regularly informed of the results of studies carried on by Hydro-Québec in their territory.

I.11 RESTORATION OF STUDY SITES

The need to restore camps and camping spots used by Hydro-Québec's research teams was noted.

I.12 OTHER

Other concerns related to the conduct of the environmental assessment studies and process included:

- I.12.1 the need for ground-based, as well as air-borne, surveys and research;
- I.12.2 the need for studies to be conducted in winter as well as in summer;
- I.12.3 the need to relate Project impacts to those experienced by Natives from similar developments in *e.g.* Alberta, Manitoba, Ontario, Chisasibi;
- I.12.4 the need for counter-expertise given the commissioning of studies by Hydro-Québec for the impact statement.

J - MITIGATIVE MEASURES

including The need for proper remediation of negative Project impacts was noted,

J.1 CLEAR CUTTING

Clear cutting of reservoirs before flooding.

J.2

M

CLEAN UP

Clean-up of all areas affected by Project works after their completion.

K - OTHER

K.1

N

LAND REGIME

Concern was expressed as to the possible impacts of the Project upon the rights of the Inuit under the land regime provided for in the James Bay and Northern Quebec Agreement.

* * *

ANNEX I

INUIT INTERVENORS AT SCOPING MEETINGS HELD ON THE GREAT WHALE PROJECT

KUUJJUARAAPIK - Access Infrastructure (meeting held in Inukjuak)

Date of public meeting: 22 August 1991

Number of participants: 25

Mayor Sappa Fleming	- 4x
Mrs. Winnie Cookie	
Mrs. Mina Weetaluktuk	- 2x
Mrs. Annie Amittuk	- 2x
Mr. Willie Tooktoo	- 2x
Mr. Billy Weetaltuk	
Mr. Peter Tooktoo	
Mr. Robert Fleming	
Mr. George Kudlu	- 2x
Mrs. Caroline Angutiguluk	
Mr. Moses Weetaltuk	
Mr. Joe Angutiguluk	
Mr. Silas Cookie	
Mrs. Carolyn Niviaxie	- 2x
Mr. George Ittoshat	
Mr. Abellie Nowra	
Mr. Alec Tuckatuck	- 2x
Mr. Sam Mickeyook	
Mr. Peter Papiarluk	
Mr. Luke Inukpuk	- 2x
Mrs. Louisa Fleming	- 2x
Mrs. Lizzie Weetaltuk	
Mr. Johnny Weetaltuk	
Mrs. Mina Tooktoo	
Mrs. Martha Sala	

KUUJJUARAAPIK - Great Whale Project (Part 1)

Date of public meeting: 29 January 1992

Number of participants: 17

Mayor Anthony Ittoshat
Mrs. Mina Weetaluktuk
Mr. Willie Tooktoo
Mr. Pauloosie Napartuk
Mrs. Louisa Fleming
Mr. Jimmy Stone - 2x
Mr. Charlie Tooktoo
Mr. Johnny Weetaltuk
Mr. Jacob Tookalook
Mrs. Lizzie Weetaltuk
Mr. Pauloosie Mickpegak
Mr. Mark T. Gordon
Mr. Abellie Nowra
Mr. Moses Weetaltuk
Mr. Samwillie Mickpegak
Mrs. Winnie Cookie
Mr. Alec Tuckatuck - 2x

KUUJJUARAAPIK - Great Whale Project (Part 2)

Date of public meeting: 9 to 11 March 1992

Number of participants: 19

Mayor Anthony Ittoshat
Mr. George Ittoshat
Mr. Alec Tuckatuck
Mr. Pauloosie Napartuk
Mrs. Caroline Weetaltuk
Mrs. Mina Weetaluktuk
Mr. Paul Fleming
Mr. Robert Fleming
Mr. George Kudlu
Mrs. Annie Ittoshat - 2x
Mrs. Sarah Bennet
Mrs. Annie Amitook - 2x
Mr. Noah Miko
Mr. Sappa Fleming

Mr. Miva Niviaxie
Mr. Pauloosie Mickpegak
Mr. Simionie Takatak
Mr. Samwillie Mickpegak
Mr. Willie Tooktoo

Note: In Kuujjuaraapik - 30 different persons spoke (parts 1 & 2).

UMIUJAQ - Access Infrastructure

Date of public meeting: 20 and 21 August 1992
Number of participants: 15

Mayor Robbie Tookalook	- 5x
Mrs. Martha Kauki	
Mr. Pauloosie Nuktai	
Mr. David Niviaxie	- 2x
Mr. Willy Kumarluk	
Mr. Noah Inukpuk	- 4x
Mr. Isaak Anowak	- 3x
Mrs. Nellie Nuktai	
Mr. Charlie Tooktoo	- 2x
Mrs. Eva Sappa	- 2x
Mr. Charlie Sappa	
Mrs. Josie Tookalook	
Mrs. Viola Napaartuk	
Mr. Willie Kumaruk	
Mrs. Sarah Niviaxie	

UMIUJAQ - Great Whale Project

Date of public meeting: 5 and 6 February 1992
Number of participants: 17

Mayor Moses Inukpuk	
Mr. Josie Tookalook	- 2x
Ms. Eva Niviaxie	
Mr. Pauloosie Nuktie	
Mr. Willie Kumarluk	
Mr. Charlie Sappa	
Mr. Daniel Nuktie	

Ms. Eva Sappa - 2x
Mrs. Jeannie Nuktie
Mr. Charlie Tooktoo - 2x
Mr. Davidee Niviaxie - 2x
Mrs. Eva Niviaxie
Mr. Peter Stone
Mrs. Lucy Crow
Mr. Noah Inukpuk
Mr. Willie Kumarluk
Mrs. Viola Napartuk

INUKJUAK - Access Infrastructure

Date of public meeting: 22 August 1991
Number of participants: 13

Mayor Daniel Nulukie
Mr. Shaumik Inukpuk - 2x
Mr. Johnny Inukpuk - 2x
Mr. Joanassie Ningiuk - 2x
Mr. Lucassie Iqualuk
Mr. Eli Elyasiapik
Mr. Pauloosie Qantsiaq Weetaluktuk
Mrs. Louisa Ningiuk
Mrs. Lizzie Palliser - 2x
Mr. Peter Inukpuk
Mrs. Alacie Pov
Mr. Autsiak Weetaluktuk
Mr. Daniel Inukpuk

INUKJUAK - Great Whale Project

Date of public meeting: 3 and 4 February 1992
Number of participants: 17

Mr. Joanassie Ningiuk (vice-mayor)
Mr. Johnny Inukpuk - 2x
Mr. Shaumik Inukpuk - 3x
Mr. Johnny Williams
Mr. Adamie Inukpuk
Mr. Pauloosie Weetaluktuk

PART III

METHODOLOGICAL ISSUES

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APPENDIX I

BIBLIOGRAPHY AND REFERENCES

SECTION ONE - INTRODUCTION

A. STATEMENT OF PURPOSE

The purpose of the third part of this brief is to state Makivik's recommendations concerning the guidelines for the environmental impact statement ("EIS") on the Great Whale Project (the "Project"). These comments address principally the methodological and substantive aspects of the EIS. They do not purport to be exhaustive, but are limited to matters of particular concern to the Inuit.

B. BASIS FOR COMMENTS

These comments are based on the following:

1. concerns raised by Inuit interveners at public scoping meetings held in
 - Kuujuaaraapik on 29 January, and 9-10 March, 1992;
 - Umiujaq on 20-21 August, 1991, and 5-6 February, 1992;
 - Inukjuak on 22 August, 1991, and 3-4 February 1992;
 - Chisasibi on 5 March, 1992;
2. the *James Bay Northern Quebec Agreement*, especially Section 23, with particular reference to Schedule 3;
3. other guidelines;
4. the scientific literature, including the so-called "grey" literature;
5. internal discussions;
6. written or verbal comments from 20 technical experts listed in Annex I to Part IV.

C. COMPLICATING FACTORS

The details of the assessment and review procedures have not yet been announced. We recommend that the form and procedures of the assessment be clarified by the Committees after appropriate consultation.

It is most important to know whether there will be a staged approach to the assessment. Such a staged approach might involve the following major steps:

1. a preliminary assessment focusing on the justification of the Project, alternatives to the Project, and alternative ways of carrying out the Project - as contemplated in Subsection 1 of Schedule 3 to Section 23 of the *James Bay and Northern Quebec Agreement* ("JBNQA");
2. if appropriate, a more detailed review of the alternative retained, leading to a decision in principle either to authorize the Project, to reject it, or to subject it to further study;

3. if appropriate, a more complete assessment of the Project, leading to a final decision either to reject the Project or to authorize it, with or without conditions.

The answers to these and other questions will enable us to formulate a final position on the content of the guidelines. We understand that a draft of those guidelines will be circulated in due course. Given that we shall have to review that draft internally and hold meetings in the communities, we respectfully recommend a delay of at least four weeks in which to prepare and submit our comments on the draft guidelines.

D. NOTION OF ENVIRONMENT

Section 23 of the JBNQA contemplates the environment as including all the components of the natural and human environments, as well as the relationships between them (paragraphs 23.2.2 and 23.2.4).

The *Environment Quality Act* defines "environment" as: "the water, atmosphere and soil or a combination of any of them or, generally, the ambient milieu with which living species have dynamic relations." This is a good definition, in that it includes notions of dynamism and of the relationships between the components of the environment. The Bureau d'audiences publiques sur l'environnement (Rapport d'enquête n° 9, 1982, p. 15) has argued persuasively the importance, even primary, of mankind as a central element of the environment, and Hydro-Québec (1984) takes a similar view.

The *Guidelines for the Preparation of An Environmental Impact Statement on Military Flying Activities in Labrador and Quebec* (Environmental Assessment Panel, 1987, p. 8) also stress the human theme in its definition of "ecosystem":

"The term 'ecosystem' must be interpreted broadly, to include human populations with their social, spiritual, cultural, economic, and other structures, systems, practices, institutions and values, as part of a life-support system composed of the air, water, minerals, soil, plants, animals and micro-organisms, all of which function together to maintain the whole."

Annex I and Section 5 of the Memorandum of Understanding of 23 January 1992 ("MOU"), and Hydro-Québec's letter of the same date, confirm that Hydro-Québec will "address sociological factors or impacts" if the guidelines direct it to do so. Makivik considers the social impacts of the Project to be among the most significant of its potential impacts. We recommend, therefore, that they form an integral part of the guidelines.

E. TIMELINESS

We view environmental assessment as a tool to assist rational planning and decision-making. Thus we concur with the view expressed at section 3 of the *Environmental Assessment and Review Process ("EARP") Guidelines Order* and in Recommendation 2 of the "Lacoste Report" (Québec, December 1988, pp. 111-112).

Environmental assessment often involves research, but, unlike scientific research, it must operate within realistic, often pre-established, timetables that are conceived on the basis of other priorities. It must, therefore, rely largely on data that are already available or that can be collected over a relatively limited period.

Undeniably, the foregoing creates difficulties. For example, many biological systems, are subject to cycles or manifest long-term trends. Similarly, understanding, even superficially, the structure and functioning of the societies that might be affected by a given project may require years of study, especially where aboriginal societies or communities are involved.

It is regrettable that Hydro-Québec did not use the ten-year postponement of the Project in the 1980's to conduct baseline research and otherwise prepare and expedite the current assessment of the Project. Nevertheless, we believe that it is important that the decision whether or not the Project should proceed should be taken in a timely fashion. We fear that one effect of undue delay in completing the assessment and review of the Project might be to discredit the applicable processes and even the concept of environmental assessment in the eyes of the public. We suggest that an acceptable compromise must be found between the stated desire of Hydro-Québec to proceed rapidly with the Project and the necessity of carrying out an environmental assessment that satisfies contemporary standards of environmental assessment in North America.

We recommend, therefore, that, while the guidelines not establish a timetable for the assessment and review of the Project, they state where field work or analysis are required and that the Committees bear in mind the need to complete the assessment and review in a timely fashion. Barring unforeseen circumstances, it may be possible to complete the assessment and review within 18 months, given that considerable preparatory work has already been carried out.

F. BINDING NATURE

The JBNQA envisages guidelines as binding proponents in the preparation of this EIS. The earlier guidelines for the access infrastructure for the Project were drafted so as to bind the proponent. We recommend that the guidelines state that they bind the proponent and that they require the proponent to obtain the prior approval of the Committees for any departure from them.

G. COMPREHENSIVENESS

The issue here is whether the guidelines are comprehensive. It is not difficult to imagine a situation in which a significant impact that is not covered in guidelines might emerge during the preparation of an EIS. The methylation of mercury in man-made water bodies and the production of methane and other so-called "greenhouse gases" from reservoirs are two recent examples of long-unrecognized impacts. Social impacts and cumulative impacts are particularly difficult to anticipate and to deal with comprehensively in guidelines.

Practice in federal assessments is instructive. For example, the guidelines for the assessment of potential oil production on the Northeast Grand Banks (Environmental Assessment Panel, 1980, p. 1) state that

"The Initiator and Proponent are expected to...make every effort to identify and describe all environmental impacts likely to arise from the Project, *even for those situations not explicitly identified in these guidelines.*" (emphasis added).

The same wording is found at page 1 of the guidelines for improvements to the Trans-Canada Highway in Banff National Park (Environmental Assessment Panel, September, 1978). Finally, the guidelines for the assessment of military flying activities in Labrador and Quebec (Environmental Assessment Panel, January 1987, pp. 13-14) identify ten issues that merit special attention. They then point out, however, that:

"The EIS must pay special attention to the preceding, but that list of issues should not be considered as exhaustive. Should the Proponent, through its own studies and consultation, estimate that there are other matters that should be studied, it must do so."

We recommend, therefore, that the Committees state clearly in the guidelines that they are not necessarily comprehensive, and that it is the duty of Hydro-Québec to ensure that its EIS adequately covers all relevant issues.

The reason for placing the onus on proponents is, of course, that they necessarily have a better knowledge of their projects, some aspects of the affected environment, and some of the probable impacts of their projects than do environmental review agencies or most intervenors. This is especially on the present assessment, because the proponent has spent considerable time designing the Project and studying the potentially affected environment.

H. DURATION OF RECOMMENDATIONS/DECISIONS

Given the tendency for the scheduling of hydroelectric projects to be revised, sometimes significantly, and given that ecosystems change, sometimes quickly, we recommend that the Committees specify in the guidelines their opinion on the duration of any authorizations that might be issued pursuant to the recommendations or decisions that they will make. It might be, for example, that authorizations should be subject to review if construction of the Project did not begin or had not advanced substantially within specified delays.

I. DECOMMISSIONING

It is increasingly standard practise for EIS's to deal with the decommissioning of the projects under review. We acknowledge elsewhere in this brief our belief that the dams, dykes, and other major engineering works associated with hydroelectric projects are to all intents and purposes permanent modifications to the natural and social landscapes. Nevertheless, one cannot take for granted that they will always be used for hydroelectric purposes. Given that many of the impacts of reservoirs in particular are related to their operational characteristics, it is important to know whether there is a foreseeable possibility that the facilities of the Project will not be needed for energy generation at some future time. If there is such a possibility, a number of questions need to be addressed, at least in a preliminary manner: who will have ongoing legal responsibility for their maintenance and the associated cost? who will determine what form their decommissioning will take? who will decide the purposes for which they will be used?

We recommend that the guidelines require the EIS to address the preceding and related issues as thoroughly as is possible at the present time.

It is equally true, however, that other components of the Project, such as airports, borrow pits, and some roads will not be permanent. Experience with the La Grande Complex was that at least one landing strip, that at Duplanter, was simply abandoned. Abandoned airstrips facilitate such activities as illegal outfitting and poaching, and they are less than satisfactory from an environmental perspective. It is also true, however, that Hydro-Québec did a creditable job in cleaning and restoring many other types of site. We recommend that the guidelines require that the EIS contain an appropriately detailed programme for decommissioning and restoring such impermanent sites and facilities.

J. KUUJJUARAAPIK AIRPORT

The redevelopment of the Kuujjuaraapik Airport is proposed by Hydro-Québec for the purposes of the Project. Hydro-Québec will pay for the greater part of the cost of this redevelopment. While the airport is situated on land owned by the ministère des Transports du Québec, and while the latter might have certain technical responsibilities for

the implementation of the redevelopment, the fact remains that the sole raison-d'être of the redevelopment is the Project.

The Declaration of Settlement Out of Court dated 25 October 1991 in the case of *Dick vs. Paradis* requires the global assessment of the Project as a single project, including the access and housing infrastructure. The redevelopment of the Kuujuaaraapik Airport forms part of the access infrastructure for the Project.

Makivik recommends, therefore, that the guidelines require the proposed redevelopment of the Kuujuaaraapik Airport to be assessed as part of the Project.

K. PROJECT JUSTIFICATION

We believe that the Committees need to know in detail why the proponent considers the Project to be needed before they can weigh adequately the benefits and disadvantages of its proceeding or not proceeding.

Annex I of the MOU contains a list of the major matters that should be discussed under Project Justification. By letter of 23 January, 1992 to Makivik Corporation and others, Hydro-Québec agreed to participate in a Technical Information Exchange Group on project justification. By another letter of 23 January, 1992, Hydro-Québec also agreed to address the topics mentioned in Annex I, if required to do so by the guidelines.

We recommend that, at a minimum, the guidelines require that all the items listed in Annex I be addressed in the EIS.

L. INDIVIDUAL VERSUS COLLECTIVE IMPACTS

EIS's tend to focus on collective impacts, such as those on villages, ethnic groups, or particular segments of society, often to the exclusion of impacts on the individuals who compose those larger units. It is true, nevertheless, that even those impacts that can perhaps best be studied collectively first affect individuals. There is no reason to assume that different individuals will experience or be affected by the same impact in the same way or to the same degree merely by virtue of belonging in the eyes of a third party to a social or ethnic group or other entity.

The sense of loss of control over one's life that is often associated with external, development-related intrusions into aboriginal communities is a good example of an impact that can be experienced individually and collectively. Suicide and untroubled acceptance represent the extremes of the individual reactions to such an impact.

We recommend that the guidelines require the EIS to distinguish between impacts that are likely to be experienced differently by individuals, those likely to impact

groups, and those that should be studied from both perspectives and to prepare appropriate forms of study and analysis for each.

M. "NO-GO" SCENARIO

It is becoming increasingly standard practice for environmental assessments to consider the "no-go scenario", or the impacts of not proceeding with the project under review. We recommend that the guidelines require the EIS to consider the impacts of not proceeding with the Project.

N. REVIEW OF ALTERNATIVES

We recommend that the guidelines require the EIS to address the distinct questions of alternatives to the Project and alternative ways of constructing and operating the Project, consistent with the MOU and Section 23 of the JBNQA, including Schedule 3.

O. USE OF SCIENTIFIC LITERATURE

A common failing of environmental impact statements is that they fail to take adequate account of the relevant scientific literature. We recommend that the guidelines require the proponent to justify its choice of methodologies and to explain and interpret its results in the light of current standards, theories, and knowledge in each of the relevant disciplines. This element of the guidelines should, of course, apply to every component of the EIS.

P. MISSING DATA

We recommend that the guidelines provide that, where data are missing and cannot reasonably be collected, the EIS must evaluate the significance of their absence and must, if appropriate, provide for their collection during the monitoring programme.

Q. HISTORICAL CONTEXT

The Project has been under active study and consideration at least since the late 1970's, and an environmental assessment was, in fact, initiated by Hydro-Québec. We recommend that the guidelines require the proponent to describe that history in some detail in an introductory chapter to the EIS and to explain in particular detail the relationship between the prior assessment and the present one, with particular reference to the evolution of Project design variants and alternatives to the Project.

SECTION TWO - METHODOLOGICAL ISSUES

A. INTRODUCTION

Our view is that guidelines should be relatively short. They should focus on establishing the minimum standards that an EIS must satisfy and should, if possible, identify some of the critical issues that it must address.

There are, of course, many ways of carrying out an environmental assessment and preparing an EIS. We are of the view, however, that the main components of any satisfactory contemporary assessment are the following:

1. a process of periodic consultation of knowledgeable and concerned persons by review bodies or proponents at critical stages of the preparation of the EIS, and during construction and operation of the Project, to ascertain issues to be addressed in the EIS or later, such as the significance of the predicted impacts, mitigating measures, and the evaluation of residual impacts;
2. description of the environment prior to the project;
3. prediction of impacts, comparing the environment as it is expected to be affected by a project with the way that it would have been without the project;
4. assessment of the significance of the predicted impacts;
5. the identification of mitigating measures;
6. the identification and the assessment of the significance of the anticipated residual impacts;
7. the identification of compensatory measures for impacts that cannot be fully mitigated and, if appropriate, for other losses;
8. the formulation of a programme of monitoring during and after construction;
9. a process of evaluating the residual impacts of a project with a view to determining whether, and under what conditions, the project should proceed;
10. and, finally, a programme of periodic post-project audits.

It is our view that the structure of an EIS should generally follow the structure of the assessment process, as defined above. The following pages present some general observations and then propose a few constructive suggestions.

B. ETHICAL PRINCIPLES REGULATING FIELDWORK

Proponents must usually conduct field studies as they plan and design projects and as they prepare their EIS. Occasionally, those studies can be a cause of complaint, whether public or private, and even of friction. Hydro-Québec has its own *Environment Code* (1991), but it contains no provisions governing the carrying out of field work or relations with local populations and individuals.

In 1981, the Association of Canadian Universities for Northern Studies adopted a series of *Ethical Principles for the Conduct of Research in the North*, a copy of which constitutes Appendix I hereto. The *Ethical Principles* are intended to apply to "research in its broadest sense, including fundamental or applied research in the physical, biological or social sciences [including] surveys or monitoring studies." Research is defined to cover "all technological activities in the North." Transports Québec (1992) has also produced guidelines for its employees and consultants carrying out research in the North.

The *Guidelines for the Preparation of An Environmental Impact Statement on Military Flying Activities in Labrador and Québec* (Environmental Assessment Panel, 1987, p. 8) required the Department of National Defence, as proponent, to respect the *Ethical Principles* "in planning and implementing consultation and research in any community."

We recommend that the guidelines for the Project follow that lead. We recommend, however, the following clarifications: that the *Ethical Principles* be applied to all research related to the Project in the Territory, as defined at Subsection 1.16 of the JBNQA, and that it be clear that it is the responsibility of Hydro-Québec to ensure that all its employees, contractors, sub-contractors and consultants engaged in research are informed of and bound by the principles.

C. ANALYSIS BY AGE AND GENDER

There is reason to assume that the probable impacts of the Project will affect persons of different age-groups and genders differently. For example, many job opportunities are likely to be more available to younger, southern-educated men than to older men or, perhaps, to women of any age. Similarly, impacts on subsistence activities might affect a higher percentage of older persons of both sexes than of younger persons.

The guidelines should require the proponent to take the preceding into account at every relevant stage of the assessment. That means not only analyzing data by gender and age, but also using appropriate sampling techniques to ensure that each age-

group and persons of both genders are consulted, interviewed, or otherwise involved in preparing the EIS in proportion to their numerical importance in the population. In particular, the guidelines should emphasise the possibility that some remedial or compensatory measures, monitoring activities, and post-project audits should be age- or gender-specific.

D. INCORPORATION OF NATIVE KNOWLEDGE

There is a growing appreciation of the breadth, depth, and relevance to environmental assessment of Native knowledge (Deleary, 1991; Freeman, 1978; Nakashima, 1990; Waldram, 1986; Werner & Begishe; 1980, Vincelli, 1991). Indeed, as long ago as 1983, the KEQC itself sponsored a study entitled *Inuit Knowledge and Perceptions of the Proposed Great Whale Hydro-Electric Project* (Kemp, 1983). By "knowledge" we do not mean merely facts or information about the environment, but rather complex explanatory systems that rival western science or philosophy in their power, coherence, and elegance (see, for example, Boldt & Long, 1985; Deleary, 1991; Lyons, 1985; Stoffle & Evans, 1990).

The Guidelines for the Preparation of An Environmental Impact Statement on Military Flying Activities in Labrador and Québec provide:

"Many of the effects of the Project will probably occur in areas that have been studied relatively little by practitioners of the western scientific tradition. There is increasing recognition, however, that aboriginal persons possess knowledge and understandings that complement and sometimes improve those available from other approaches. The Proponent must make full use of the knowledge, understandings and interpretations of aboriginal persons, not only in areas where other types of data, knowledge and interpretations are not available, but also to complement and improve them where they exist."

We recommend that a substantially similar provision be inserted in the guidelines for the Project. In addition, we recommend that the guidelines direct the proponent to enter into agreements with the groups concerned, setting out to the mutual satisfaction of all concerned the roles and responsibilities of each partner at every stage of data-collection, -analysis, -interpretation, and -synthesis.

E. NON-COOPERATION IN RESEARCH

We have recommended above that the guidelines require the proponent to incorporate Inuit knowledge, interpretations, and understanding, in its EIS. Clearly, that cannot be done without the cooperation of the Inuit individuals and organizations possessing that knowledge, including, for example, the Avataq Cultural Institute. Similarly, many field

studies in both the natural and social sciences cannot be carried out effectively unless knowledgeable local persons are involved at every stage, from the collection of data through to its analysis and interpretation.

It is not uncommon, however, for Native individuals or organizations to withhold their cooperation. Such appears to have been the case with the Naskapi-Montagnais-Innu Association and the Conseil Atikamekw-Montagnais when National Defence prepared its impact statement on certain military flying activities in parts of Québec and Labrador.

The reasons for such non-cooperation vary. For example, they may constitute an overt attempt to delay or block a project. Alternatively, they may reflect a genuine distrust born of prior experience, or a feeling that Native "informants" are generally used as a source of otherwise unobtainable knowledge, but are then ignored when the time comes to synthesise or interpret that knowledge. In any case, it is important to remember that no citizen, whether Native or non-Native, is obliged to provide data or otherwise cooperate in the preparation of an EIS.

It would be foolish, however, for the guidelines to contain requirements that presuppose the cooperation of Native individuals or organizations without also indicating to the proponent how to proceed if such cooperation is not forthcoming in a timely fashion. The only relevant precedent of which we are aware comes from the federal panel reviewing certain military flying activities in parts of Québec and Labrador. As noted above, at least two important Native groups withheld their cooperation from the proponent.

In that case, the panel decided that the proponent had made reasonable efforts and had given fair delays to the groups in question. It absolved the proponent from any further obligation to consult the groups in question, directing it to do the best job that it could on the basis of the available data on the areas and peoples in question and on other, comparable areas and peoples.

If Hydro-Québec does not receive the level and quality of cooperation from Inuit groups or individuals that it judges necessary to satisfy the requirements of the guidelines, we recommend that the guidelines direct it to so inform the Committees in writing at the earliest possible moment, documenting in detail the efforts that it has made and the results obtained. We recommend that the guidelines provide that the Committees evaluate the information from Hydro-Québec; that they give the groups or individuals concerned an opportunity to reply, verbally and in writing, to Hydro-Québec's affirmations; and that they provide rapid direction to Hydro-Québec as to how to proceed.

F. TREATMENT OF ETHICAL ISSUES

Environmental decision-making is inevitably inspired by the ethical premises of the decision-makers. Equally, the positions of intervenors with respect to a given development - whether for or against - are often an expression of underlying value-systems. Unfortunately, however, the ethical aspects of environmental assessment and decision-making are rarely acknowledged explicitly.

Aboriginal and environmental issues have begun, however, to appear in publications on contemporary moral issues (e.g., Stevenson, 1987), while a recent survey of applied ethics in Canada (Canadian Federation for the Humanities, 1989, pp. 89-90) concluded as follows with respect to what it called "ethical impact assessment":

"A second subject area in which research is needed is the development of criteria for what might be labelled an 'ethical impact assessment' that can be proposed for use by government and private sector planners in making major decisions in such areas as the development of technologies that greatly affect the environment or the distribution of opportunities. The EIA would move beyond a pure bottom line concern with dollars to a more encompassing ethical assessment of the wider values at issue. Moreover, there is a need for research that would develop guidelines that could be used to morally assess proposals for research in the natural sciences, engineering, and medicine."

We have already expressed the view that Hydro-Québec's EIS should at least meet contemporary standards, but that the guidelines should not pose unreasonable or impracticable demands. The above quotation illustrates that "ethical impact assessment" is at best at an early developmental stage. It is not Hydro-Québec's responsibility, in the assessment of the Project, to act unduly as a pioneer in this important field. Hydro-Québec is not, however, unaware of the relevance and importance of ethical issues in environmental assessments. Indeed, we understand that it has funded a programme in environmental ethics at the McGill Centre for Medicine, Ethics, and Law, for which we commend it.

We recommend that the guidelines require the proponent to include in its EIS a description and evaluation of ethical arguments in favour of the Project. We recommend also that, on the basis of research and consultation, the EIS should also describe to the best of its ability the relevant aboriginal ethic. Thereafter, we recommend that the EIS address some of the specific ethical issues raised by the Project, such as the likely unequal geographic distribution of its costs and benefits and the ethical justification for one society's using, principally for its own benefit, lands, waters, and resources that are fundamental to the identity and survival of another society.

G. CONSULTATION AND PUBLIC PARTICIPATION

There is a growing literature on public involvement in environmental assessment and decision-making (Bush, 1990; Federal Environmental Assessment and Review Office, 1988; Grima, 1985; Grima *et al.*, 1986; Henshaw, 1987; Parenteau, 1988; Roberts, 1987; Rounthwaite, 1984; Thompson, 1984). There is a consensus that the public, and particularly those individuals and groups most directly affected by a given development should be fully involved.

Public involvement should, of course, occur at several of the stages of an environmental assessment listed above. We recommend, therefore, that the guidelines require the proponent to submit to the Committees for their approval, after consultation with Makivik, a programme of public consultation and involvement. We recommend that the guidelines establish a delay for the submission of that programme, and we submit that four to six weeks would be adequate. It goes without saying that the programme should be submitted before the start of substantive work on the EIS.

It is our view that, for practical reasons, all public participants in an environmental assessment cannot be accorded identical status. As a general rule, we believe that the individuals and groups potentially most affected should have a privileged status. Subparagraph 23.2.2c) of the JBNQA explicitly provides for the special status and involvement for the Native people of the Territory, including the Inuit, in the assessment and review of developments such as the Project.

We recommend that the guidelines require the proponent to indicate in its programme of consultation how it intends to recognize the special status of the Inuit in its programme of consultation and public participation. We wish to make it clear that, when we speak of public consultation, we envisage modest and manageable programmes, in which representative organizations and individuals are consulted. We are not implying that every individual should be consulted. We recommend, however, that the guidelines require the proponent to use recognized sampling techniques, to describe those techniques in the EIS, and to evaluate the results obtained in the light of sampling difficulties.

We recommend that the guidelines contain guidance to the proponent on the scope of consultation that would be deemed acceptable. We believe that consultation is required at the following stages of the guidelines:

1. identification of issues and valued ecosystem components;
2. assessment of the significance of the predicted impacts;
3. identification of mitigating measures;
4. identification of compensatory measures;
5. formulation and implementation of monitoring, including post-project audits.

H. FOCUS

The Lacoste Report (Québec, 1988, p. 116) recommended that EIS's be made shorter and more relevant, and it proposed public consultation and thoughtful, well-crafted guidelines as primary tools for achieving that goal. In the United States, the Council on Environmental Quality has ruled that an EIS on a large project may not exceed 300 pages. We support those objectives.

We recommend that the guidelines require that the EIS be focused. There are two principal aspects to the preceding: the EIS must concentrate on issues that are important; and, from our perspective, it must concentrate on those geographic areas and those components of the ecosystems that are actually likely to be impacted in ways that affect the Inuit and their interests (which is not to say that it should ignore other legitimate concerns).

1. Issues

Preister (1987, pp. 42-43) described the successful application of issue-centred social impact assessment to certain proposed recreational developments in Colorado. He summarized the benefits of issue-centred assessment as follows:

- "1. Provide direction for the collection of specific social and economic data, rather than assessing all possible effects;
2. Ensure that the analysis is responsive to affected people;
3. Form the basis for determining whether identified effects are favourable or unfavourable from the perspective of the people affected;
4. Provide the context for the development of mitigation measures that are practical and responsive to the people affected."

The identification of issues is one of the prerequisites for identifying the areas and ecosystem components that should be studied. Somewhat paradoxically, however, the issues that merit study cannot all be identified with finality until the impacts of the Project on the environment are known, at least in a preliminary way. That is particularly true for social issues or social impacts, whether or not they are mediated through biophysical impacts.

Makivik's concern is to ensure that all of the issues relevant to the Inuit, individually and collectively, and to their territory and its resources, are dealt with fully and fairly in the EIS. The present scoping exercise is a first step in that direction, and the

present brief contains a preliminary listing of the popular and scientific issues that have been identified to date. We recommend that the guidelines provide an opportunity for intervenors to amend their lists of issues at least at the following stages: when the preliminary project description has been finalized; when questions of alternatives, design variants and operating characteristics have been defined more precisely; and when biophysical and social impacts have been identified in a preliminary way.

2. Ecosystem Components

It is self-evident that a territory as large as the 70,000 square kilometres of the drainage basins of the Great Whale, Little Whale, and the Nastapoka Rivers cannot be described in detail in an EIS. Nor, of course, can the countless components of the relevant ecosystems or the myriad relationships between them be comprehended, let alone described.

Whitney and Maclaren (1985, p. 6) rejected Leopold's (1949) argument that there are meta-anthropocentric natural criteria dictating the selection of phenomena for study on the self-evident grounds that there is no consensus as to what they might be. Beanlands and Duinker (1983), among others, have developed the more practical approach of "valued ecosystem components" rooted in the biophysical and socio-economic world for resolving the preceding dilemma.

The principal point that we must make is that, paraphrasing what Makivik stated in the context of the Northern Airport Infrastructure Program (Makivik, 1986), it cannot be the proponent alone who decides which ecosystem components should be considered "valued" for purposes of assessing the Project, since the proponent has a very specific viewpoint and interest in its realisation. Makivik, and the Inuit in general, must be allowed to express their viewpoints as to the value of the various components of the human and natural environments, and that viewpoint must be given equal or greater importance than that of Hydro-Québec.

We must also stress that valued ecosystem components can be of a social or abstract nature, and we recommend that the guidelines specifically acknowledge that. Examples would include: a sense of individual and collective control by the Inuit; the sight of land- and sea-scapes unaffected by man; relative silence in the communities and in the bush; freedom to travel at will; the knowledge that an ancestor's burial site creates a personal link with a particular area of land; the sharing of food along lines of kinship or friendship; the application of traditional systems of land-tenure; and the certainty that food and water are uncontaminated.

We also recommend that the guidelines specify that the aspirations of the Inuit, both individually and collectively, also be considered as valued ecosystem components. A viable regional economy is one example of a collective aspiration that Makivik and other Inuit entities are actively pursuing.

Insights into those aspirations can be obtained in many ways: by interviewing individual Inuit; by interviewing the elected leaders of Makivik, the Kativik Regional Government, and other Inuit organizations; through study of municipal zoning plans, economic development plans, and the like; and through analyzing harvesting data. Aspirations are, of course, intangible and to some degree ephemeral, but adequate understandings of them can be formed for purposes of environmental assessment.

We recommend that the guidelines direct Hydro-Québec to use a methodology based on valued ecosystem components for both biophysical and social impacts. They should require Hydro-Québec to consult Inuit individuals and organizations, especially those in or concerned about the communities and the areas most likely to be affected, about the ecosystem components that they value. If Hydro-Québec finds - as seems probable - that different intervenors value different ecosystem components, or that they have different valuations of the same ecosystem components, then it should explain and justify the ecosystem components and the values that it retains. Alternatively, we recommend that the guidelines require Hydro-Québec to submit a series of analyses based on the different groupings of ecosystem components and values identified by the various intervenors.

We recommend that the guidelines require the EIS to contain a checklist showing the following:

- (a) ecosystem components that are not expected to be impacted and that were not, therefore, studied;
- (b) ecosystem components that are expected to be impacted, but that are not sufficiently valued to have been studied in detail; and
- (c) ecosystem components that are expected to be impacted and that are sufficiently valued to have been studied in detail.

3. Baseline Description

The detail and extent of baseline descriptions derive initially from the description of the project and from general knowledge of ecological principles and the social sciences. The description of the location and nature of the facilities and activities associated with the construction and the operation of the project provides a first indication of the probable location and nature of its major impacts.

One means of focusing the EIS would be to concentrate descriptions of the environment on the areas likely to be affected by the actions associated with the Project and, within those areas, on valued ecosystem components likely to be affected by the kinds of actions that building and operating the Project will entail.

A further possibility for focusing the EIS would be to synthesise impacts by action and/or ecosystem. Under such an approach, every instance of the impacts of flooding

on the nesting habitat of waterfowl, for example, would not be treated separately; rather, the common features of the various likely occurrences would be identified, and variations related to species, ecosystems, or other factors would be highlighted.

The acceptability and feasibility of the approach suggested in the preceding paragraph is influenced very considerably by the approach that the Committees will take to the assessment of the Project. If a staged approach of the type outlined in the Introduction is adopted, the type of approach suggested is relatively well-adapted to the initial, more sweeping stages of the assessment. As the assessment becomes progressively more detailed, however, generalizations and syntheses must give way to extremely site-specific considerations. Although the appropriate level of detail or degree of resolution may vary at different stages of an assessment, the requirement to focus on the most relevant areas and ecosystem components continues to apply.

The identification of valued ecosystem components and of geographic areas must, like the identification of issues, be approached iteratively. We recommend that the guidelines provide for periodic consultation, as indicated above. Such an approach is consistent with the *Economic and Environmental Guidelines for Water and Related Land Resources Implementation Studies* in the United States, which provide at subparagraph 1.4.8 that:

"Scoping should be used as appropriate *throughout planning* to ensure that all significant decision-making factors are addressed and that unneeded and extraneous studies are not undertaken."
(emphasis added)

4. Bounding

Bounding is the process of establishing the spatial and temporal boundaries of an environmental assessment.

(a) Spatial Bounding

Various kinds of spatial boundaries may be used to define the "study area" of an environmental assessment. It is not uncommon, for example, for the study area to be defined as the area where a project, including all its ancillary activities, is located, plus a surrounding area delimited more or less arbitrarily on the basis of preliminary study, experience or expectation (e.g., Ontario Hydro, 1991).

Administrative boundaries, especially provincial and national ones, are also often used in environmental assessments, because they may limit the areas where studies can be carried out or to which decisions or recommendations of the responsible committees or administrations can apply. That is clearly inadequate from an environmental perspective,

since impacts rarely, if ever, correspond to administrative boundaries. Interestingly, Bill C-13, *An Act to establish a federal environmental assessment process*, attempts to overcome this difficulty. Section 43 provides, under certain circumstances, for the creation of review panels to assess the interprovincial or international environmental effects of projects located within Canada or one of its provinces. In the case of the Project, the problem is mitigated somewhat by the fact that the mandate of the EARP Panel covers those parts of the Northwest Territories that are likely to be most directly affected.

We recommend that the guidelines direct the proponent to use both environmental and administrative boundaries. If, for example, the Project is expected to affect Canada geese, the study area for Canada geese would be the entire geographic area used by the population(s) in question during a full annual cycle. Similarly, if the Project is anticipated to affect the caribou of the George River Herd, the study area for caribou would be all those portions of Québec and Labrador used by that herd.

Social-environmental boundaries should also be established in a similar way. If, for example, the Project may affect the harvesting of certain species of wildlife, and if that wildlife is shared, through barter, gift or trade, between several Inuit villages, then the study area for that impact would include all of the villages in question. In the same way, the study area for the impacts of any income that Inuit might earn from employment on the Project should be the communities throughout which that revenue might be distributed through such ties as kinship, friendship, and trade.

Once the individual study areas have been identified, a "Project Impact Area", being the area defined by all of the environmental boundaries, should be prepared in the form of a map of suitable scale in the EIS. The foregoing does not mean, however, that Hydro-Québec is expected to undertake field work, monitoring or remedial measures outside Québec, nor that the Administrators or the governments can take decisions outside their respective jurisdictions. The proponent's responsibilities in that regard are defined by the applicable administrative boundaries. The recommendations of the Committees and the Administrators would be restricted to the administrative areas where they have jurisdiction.

Knowing the environmental boundaries is, nevertheless, important so that decisions about the Project may be taken in the light of full knowledge of the likely geographical extent of its possible impacts. Secondly, this knowledge is one prerequisite for a proper assessment of the Project's likely cumulative impacts.

(b) Temporal Bounding

As defined by Whitney and Maclaren (1985, p.7), temporal bounding has two aspects: it refers to the time-horizon that will be used in the prediction of changes; and it takes into account the temporal variability and periodicity expected to characterize the predicted impacts.

The severity of impacts may in some cases be in part a function of their frequency or duration, as well as of their magnitude or intensity. For example, a given level of noise may cause birds to abandon nesting habitat, if it is repeated too frequently over a given period or if each occurrence lasts too long. The same aggregate level of noise may, however, have lesser effects if it is distributed over a longer period, or if each individual occurrence is shorter. Similarly, Inuit communities may be able to absorb or adapt to certain changes, such as influxes of outside workers, increased noise levels from aircraft, or new employment opportunities, if those changes are gradual rather than sudden, or if they do not last for too long.

The time horizon used to predict changes must be a function of, among other things, the anticipated longevity of the project under study and its anticipated impacts, as modified by the predictive abilities of the various disciplines concerned. Although hydroelectric projects may be treated for accounting purposes as having a life of 60 to 100 years, they must be considered for practical purposes as being permanent modifications to the natural and human environments. Decommissioning large dams is virtually unknown, while small dams are only rarely decommissioned, although they are sometimes modified for non-power purposes, particularly in the United States (Echeverria *et al.*, 1989).

Given the foregoing, we recommend that the Committees reproduce in the guidelines at least the substance of subparagraph 1.4.12 of the United States' *Economic and Environmental Guidelines for Water and Related Land Resources Implementation Studies*, as follows:

"(a) The period of analysis is to be the same for each alternative plan. The period of analysis is to be the time required for implementation plus the lesser of-

- (1) The period of time over which any alternative plan would have significant beneficial or adverse effects; or
- (2) A period not to exceed 100 years.

(b) Appropriate consideration should be given to environmental factors that may extend beyond the period of analysis."

Admittedly, the preceding extract does not require the prediction of impacts over a specific period, but it serves to underline that, in the case of hydroelectric facilities, the period of prediction must be significantly long. We accept that it is extremely difficult to make reliable predictions over long periods, and that the degree of uncertainty surrounding some long-term predictions may be high. Nevertheless, emerging concerns about long-term, humanly-induced climatic change, for example, more than justify serious consideration of the possible long-term consequences of the Project.

Concerns relating to temporal variability and periodicity probably arise principally with respect to the impacts to be expected during the construction phase, although certain operational considerations, such as fluctuations in reservoir levels and releases of water downstream of dams, may also be relevant here. We recommend that the guidelines require the proponent to evaluate the sensitivity of the valued ecosystem components, both biophysical and social, to the variability and periodicity of impacts; to identify the likely variability and periodicity of the predicted impacts; and to highlight potentially important interactions.

(c) Dynamic Change

Considerations relating to dynamic change are related to, but distinct from, temporal bounding. By their very nature, ecosystems and their components, including human individuals and societies, are dynamic, in the sense that they change constantly. The changes in question may be cyclical or gradual, reactions to catastrophes, local, regional, global, planned, or unplanned.

The significance of a given impact on a valued ecosystem component may vary according to its state or "health" at the time when that impact occurs. For example, a relatively minor reduction in spawning habitat for a given species of fish might be relatively unimportant on a "wild" river, but quite disastrous on a river in which prior development or natural change had affected spawning habitat and seriously reduced populations.

Indeed, the same impact may change in importance or significance over time, as the valued ecosystem component in question itself changes, whether in response to or independently from the impact in question. Increased rates of mortality among a population of caribou as a direct or indirect result of a development may be unimportant or even beneficial when the population in question is abundant. If the size of the population declines, however, that same level of mortality may become very serious.

Environmental impact studies commonly "freeze" ecosystems and human societies at a given point in time, usually immediately prior to the development in question, when the baseline data are usually collected. They then evaluate the significance of the predictable impacts in relation to those "frozen" ecosystems and societies.

We recommend that the guidelines require the proponent to assess the severity or significance of the predicted impacts in the light of knowledge of the present state or health of each valued ecosystem component and of its probable future evolution with and without the Project. The EIS must, therefore, deal with the likely evolution of valued ecosystem components with and without the Project.

The "freezing" of human societies at a given point in time for purposes of study, although perhaps unavoidable to some extent, also results in a situation in which the

social and cultural dynamics of that society are commonly overlooked in environmental assessments. Coupled with an understandable tendency on the part of proponents to favour quantitative over qualitative data, the result is that most EIS's adopt a reductionist approach to the description and analysis of vibrant, living societies.

What one tends to find in many EIS's are statistical descriptions of employment/unemployment, rates of alcohol- and drug-abuse and criminality, tables showing the numbers of animals hunted, and maps showing the lands and waters used. What is lacking is, of course, any serious understanding or explanation of the causes behind the situation described, any description of the intangible, cultural attributes of the societies in question, and any explanation of the manner in which the various elements isolated for purposes of study interact, combine, and recombine to form a functioning society. Bouchard, Vincent & Arcand (1985) have addressed the preceding and related questions from a theoretical perspective, while Vincent (1989) evaluated the *Main Report. Goose Bay EIS. An EIS on Military Flying Activities in Labrador and Québec* (National Defence, 1989) from a broadly comparable perspective.

We do not underestimate the difficulties of incorporating a dynamic portrait and understanding of Inuit society into an EIS. If that is not achieved, however, the value of the current exercise might be severely compromised.

We recommend, therefore, that the guidelines require the proponent to describe and explain the human and biological systems studied in functional rather than reductionist terms.

I. PREDICTION OF IMPACTS

Predicting impacts involves describing the future state of valued ecosystem components. We recommend that the guidelines explicitly require the proponent to predict those future states both with and without the Project. The preceding inevitably requires the collection of baseline data that can be demonstrated to be representative of certain aspects of the state of the relevant ecosystems or their components.

We recommend also that the guidelines require the proponent to evaluate to what degree the baseline data reveal relatively unimpacted ecosystems and, if appropriate, to identify the sources of any prior impacts identified.

That is important, because the true magnitude of certain predicted future impacts of the Project might be underestimated if they are affecting ecosystem components that have already been impacted or stressed by other developments. As noted above, such impacts, although quantitatively not necessarily great, might be of extreme significance, since they might cause social or ecological thresholds of tolerance to be exceeded. Moreover, it is important to know whether remedial measures could restore the ecosystem components

in question in some degree to their former state. If necessary, such impacts might have to be mitigated prior to or during the Project, although not necessarily by the proponent.

The now-abandoned proposal to construct a Forward Operating Location (hereinafter the "FOL") at Kuujuaq by the Department of National Defence provides a good example of the foregoing. In that case, the community insisted that large numbers of barrels abandoned near the airport by former military and other users be removed as one means of mitigating the anticipated impacts of the FOL itself.

Ideally, the prediction of impacts should involve the formulation and replicable testing of hypotheses and comparing the observed results against the null hypothesis with tests of statistical significance. In practice, however, the formal testing of ecological hypotheses is difficult under any circumstances, although the importance and feasibility of ecological experiments are now receiving considerable discussion (see, for example, Hairston, 1989). For obvious reasons, the direct testing of social hypotheses through formal, replicable experiments is virtually impossible under the best of circumstances.

We have already indicated that we do not expect the guidelines to impose on the proponent requirements that are unrealistic or impossible to fulfil. To do so would not only be unfair to the proponent, but it might threaten the credibility of the very review processes themselves, since it could cause significant delays and could result in unfulfilled expectations on the part of some intervenors.

Nevertheless, we expect the assessment of the Project at least to meet contemporary North American standards of environmental assessment for projects of the scale and importance of the Project. Consequently, we recommend that the guidelines require that predictions of impacts be stated explicitly and be based on the formulation and testing of hypotheses, wherever it is realistic and feasible to do so. Further, we recommend that the guidelines provide that the proponent must justify any decisions that it takes to predict impacts other than on the basis of the testing of hypotheses by means of laboratory or field experiments. In particular, the proponent should be required to insert in its monitoring programme protocols and timetables for testing hypotheses that could not be tested during the preparation of the EIS.

We recommend that the guidelines specify that any decision by the proponent not to test hypotheses, whether during preparation of the EIS or in its monitoring programme, will be evaluated on the basis of the scientific and practical arguments advanced and of contemporary practice in other parts of North America and elsewhere.

If the guidelines acknowledge that not all impact predictions are likely to be based on the testing of hypotheses by experiment, we recommend that they provide direction to the proponent as to other acceptable forms of impact prediction.

One obvious method, commonly used, is to evaluate the degree to which the results of testing hypotheses in the context of scientific experimentation or environmental assessment and monitoring elsewhere provide findings that can be extrapolated to the Project. We recommend that the guidelines draw the proponent's attention to Hydro-Québec's own experience with the Ecological Monitoring Network established for the La Grande Complexe (Société d'énergie de la Baie James, 1987; Hydro-Québec, May 1990); to the Canadian Electrical Association's three-volume compilation on predicting the environmental impacts of hydroelectric developments in Canada (Marmorek *et al.*, 1986), and to the existence of a comprehensive body of relevant literature (e.g., Fish and Wildlife Service, 1984; Delisle and Bouchard, 1990).

Increasingly, environmental assessments rely on undocumented "expert judgments" as to the probable impacts of developments. The guidelines must make clear that such an approach is unacceptable: we recommend that the guidelines require the EIS to state clearly the basis for all impact predictions. Where predictions are based on the experience or opinions of experts, we recommend that the guidelines require that the experts must be identified, their qualifications described, and that the justification of their opinions, including references to the relevant scientific literature, must be presented. Moreover, we recommend that the guidelines require those experts to be available for questioning during the public hearings.

Whitney and Maclaren (1985) listed some of the other ways in which predictions can be made. They include: simulation modelling, both mathematical and mechanical; pre-project experiments; models using statistical techniques, such as analysis of variance and correlation techniques; time-series or trend forecasting. We recommend that the guidelines require that the most rigorous and reliable applicable techniques be used.

We recommend that the guidelines require that predicted impacts be expressed quantitatively, wherever it is possible to do so. Expressing impacts quantitatively and showing that the future state of an ecosystem component with the Project will probably be significantly different statistically from its future state without the Project should not be confused, however, with assessing the significance of the impact in question.

Most impact predictions are necessarily of a probabilistic nature. We recommend that the guidelines require the proponent to present the most likely values of occurrence and the associated frequency distribution.

The notion of uncertainty refers to the occurrence of known and unknown future events with unknown or unknowable probability (Whitney and Maclaren, 1985, p.9). We recommend that the guidelines provide that the monitoring programme be designed to identify and react to unknown future events with unknowable probabilities. Further, we recommend that the guidelines require that appropriate statistical techniques, such as sensitivity analysis, be applied to known events with an unknown probability of occurrence.

One of our particular concerns is that changes in the seasonality of the demand for electricity, possibly linked to global climatic change, might alter very fundamentally the operational characteristics of the Project and other hydroelectric projects. Stated simply, demand for electricity in Québec is highest in winter, while that of Hydro-Québec's United States customers is highest in summer. Hydro-Québec has therefore designed large reservoirs in the headwaters of river systems, such as the Caniapiscau and the Bienville reservoirs, to provide inter-seasonal or inter-annual storage. Spring and summer run-off is thus stored for release at times when the value of energy is high. One of the principal changes associated with the La Grande Complex and with the Project is increased winter flows and comparably reduced spring and summer flows.

It is not inconceivable, however, that the changing seasonality of energy demand could alter or even reverse that pattern, thereby further stressing ecosystems that have adapted or are still adapting in some degree to the initial perturbations associated with the Project.

Given that the changing patterns in demand are, in our opinion, more than a theoretical problem, we recommend that the guidelines require the proponent to address it comprehensively. We suggest that one solution might be for any authorization for the Project to approve certain operating parameters for the Project and to provide that departures from those parameters would require a new environmental assessment.

J. CUMULATIVE IMPACTS

The literature on cumulative impacts is rapidly growing (e.g., Cada and Hunsaker, 1990; Canadian Environmental Advisory Research Council, 1986; Canadian Environmental Advisory Research Council, 1988; Sonntag *et al.*, 1987).

It is important to study cumulative impacts, because global warming, acid precipitation, and changes in the ozone layer are driving home the lesson that the global ecosystem can be profoundly modified in ways formerly unappreciated by the effects of activities and developments far removed from one another in space and time.

In the case of mega-projects, such as the Project, the potential for such impacts is great enough to merit thorough consideration in the EIS, since hydroelectric projects in Manitoba and Ontario may already be affecting Hudson Bay and James Bay, and other developments are under review in both of those jurisdictions.

We have commented above that a common failing of EIS's is that they "freeze" human and other systems at a single moment in time. The study of cumulative impacts requires an understanding of the functioning of and interactions between complex systems, thereby counteracting the tendency to prefer static glimpses of dynamic systems merely to simplify study.

Baskerville (1986, pp.11-12) offered a useful tripartite classification of cumulative impacts. The categories derive from the manner in which natural terrestrial systems may respond to impacts. His first category is incremental impacts, which he illustrates by acid rain, where each increment is added to previously accumulated loads. In such a case, the impacts on the affected biological system will also be incremental, although it can be linear or non-linear.

His second category envisages a situation "where a single action or limited intervention results in alteration of the system structure, or system dynamics, such that the system itself accumulates the cause of an impact over time." He illustrates that category with budworm infestation in the Cape Breton forests and with the effects of exposure to carcinogens. An important feature of this type of cumulative impact is that the response of the system may manifest itself only a long time after the initial impact.

Finally, Baskerville identifies a class of impacts that accumulate by cycling over space and time. He illustrates that class by reference to clearcutting.

It follows from Baskerville's approach that the definition of cumulative impacts to be applied in the context of the Project must derive in part from knowledge of the structure and functioning of the biological systems, terrestrial and aquatic, potentially impacted. Baskerville's taxonomy was developed for terrestrial systems, with particular emphasis on certain types of forest ecosystems. The Project, however, has the potential to impact a variety of terrestrial and aquatic ecosystems, including marine and estuarine ones.

It is particularly important to know also whether cumulative impacts are considered to refer only to past projects and the project under review, or whether they should take into account, to the degree possible, known or reasonably probably future developments. Given that plans for the future development of the hydraulic resources in Québec, Ontario, and Manitoba are relatively well known, we recommend that the guidelines require Hydro-Québec to take account of past and future developments. To avoid any ambiguity, we recommend also that the guidelines state clearly that cumulative impacts, however defined, are not limited to the cumulative impacts of hydroelectric developments, but include the cumulative impacts of all forms of development affecting the Territory.

We do not underestimate the difficulty of actually carrying out an adequate cumulative impacts assessment within a reasonable period. Indeed, we anticipate that some of the work will have to be done through a programme of long-term monitoring. Nevertheless, fieldwork and monitoring during the preparation of the EIS should permit some preliminary insights into the major cumulative impacts, if any, of the Project. We draw the attention of the Committees to a useful and relevant publication by Contant & Wiggins (1991).

We recommend that the guidelines require Hydro-Québec to address cumulative impacts in its EIS. We suggest that the guidelines require Hydro-Québec to justify its definition of cumulative impacts and its approach to their assessment on the basis of a review of the scientific literature and relevant experience elsewhere. We recommend also that the guidelines require Hydro-Québec to integrate into its EIS available results from the study of cumulative impacts in the Hudson Bay/James Bay Bioregion recently initiated by the Canadian Arctic Resources Committee, The Rawson Academy, and others.

K. SIGNIFICANCE ASSESSMENT

The reason for establishing significance at the present stage of the assessment is that it permits judgments and decisions about how to orient the later stages. Particularly where time and money are limited, it is not always possible for an EIS to evaluate with equal thoroughness the full range of mitigating measures that might be available, or to describe a monitoring programme encompassing every conceivable variable or situation. For practical reasons, therefore, it is important to establish priorities among the myriad matters that an EIS might address.

The basic information from which significance is determined is the predicted state of the environment if a project proceeds, as compared to the future state of the environment if it does not proceed. Where quantitative present and future data are available, the comparisons should be based on techniques for establishing statistical significance. As we noted above, however, statistical significance should not be confused with the *importance* of the predicted changes.

Estimates of significance are ultimately judgments that reflect individual and collective values. At one extreme, the collective values involved are probably almost universal. Thus, it is difficult to imagine any individual or society that would authorize a project with a virtual certainty of seriously disrupting global ecological processes, leading to the mass extermination of humanity. At the other extreme, a collector of butterflies living in a particular area might consider the loss of a single species of butterfly in his area to be extremely important, even though that same species might be abundant in other areas. In practice, most of the judgments that have to be made in environmental assessments probably fall between those two extremes.

Environmental assessments of projects affecting Native peoples are particularly difficult in this respect, since, as we have noted above, Native individuals and societies by definition have values that are different from those of mainstream Canadian individuals and societies.

Common failings of EIS's are that they do not state clearly the basis on which they arrive at judgments of the significance of predicted impacts and that they form those judgments exclusively on the basis of the proponent's own values. Proponents might argue

that it is not their responsibility to make judgments on the basis of values other than their own, that assessment procedures provide an opportunity for others to express their values, and that decisions regarding developments are ultimately made by governments, which are supposed to reflect collective values. Those arguments are not entirely without merit.

In practice, however, intervenors who do not share a proponent's values do not have the time, ability, or resources to produce alternative EIS's that re-analyze the predicted impacts according to another system of values and then apply those same values to every other element of the assessment process. The result is, of course, that the proponent's values and the proponent's EIS by default assume a disproportionate importance and exert undue influence over the decision-making process.

The practical difficulties of considering more than one set of values in an EIS should not be overestimated. In the case of the Project, however, we feel confident in saying that there are two major categories of values involved: Native and non-Native. Within the Native values, one can expect to find the sub-categories "Inuit values" and "Cree values", probably with considerable overlap between the two and modest variability within each one. Within the "non-Native values", one can expect the extremes "development at any price" and "development at no price", with dominant values probably mid-way between those extremes. Requiring a proponent to take into consideration values other than its own should not be seen, therefore, as imposing an unreasonable burden.

Comparing the significance of biophysical and social impacts poses many problems, which derive in part from the fact that many social impacts cannot be expressed quantitatively and in part from the inherent difficulty of comparing dissimilar phenomena. Even where social impacts can be quantified, comparing them with biophysical impacts is not straightforward.

Perhaps the only way of comparing biophysical and social impacts is on the basis of their significance. We recommend that the guidelines require the proponent to address this question on the basis of a review of the literature, of prior experience elsewhere with environmental assessment, and on the basis of its own experience. We recommend also that the Committees instruct the Joint Support Team to commission the preparation of a background paper on this topic, which should be made public.

We recommend that the guidelines require the proponent to explain and justify how its own judgments of significance presented in the EIS were derived. We recommend also that the guidelines require the proponent to present to the best of its ability alternative analyses based on its understanding of other relevant values and value systems. Finally, we recommend that the guidelines require the proponent to explain and justify why it retained one value system over other value systems, if such proves to be the case.

Choosing between competing values or value systems is, of course, an ethical question. We recommend that the Committees retain the services of one or more recognized experts in ethics, including at least one expert in environmental ethics. We recommend that the Committees direct their ethicists to prepare a background paper and recommendations relevant to the ethical aspects of environmental assessments of mega-projects potentially affecting aboriginal groups and individuals and that that report be made public.

L. MITIGATING MEASURES

There is a very considerable literature about mitigating and compensatory measures (e.g. Canadian Environmental Advisory Council, 1988; Exner & Nelson, 1987; Jackson, 1980; Lindqvist *et al.*, 1990; Société d'énergie de la Baie James, 1985; Threader, 1991; Acres Consulting Services Ltd, 1984; Canadian Electrical Association, 1984; Coats & Williams, 1990; Stucky *et al.*, 1987). We repeat here our general recommendation that the guidelines require the proponent to demonstrate in the EIS through reference to the relevant literature that the measures that it proposes reflect contemporary standards.

We have recommended above that the guidelines require the proponent to ascertain whether certain ecosystems or components thereof have been adversely affected by previous developments. We recommend that, if such appears to be the case, the guidelines require the proponent to consider their restoration as one means of mitigating the anticipated impacts of the Project, even though the proponent may not itself have been responsible for the initial damage.

We recommend that the guidelines require this part of the EIS to evaluate the costs and feasibility of the mitigating measures proposed; to state who will be responsible for implementing them; and to provide a timetable for carrying them out. We recommend further that the guidelines require the proponent to state in the EIS how the proposed mitigating measures will be made legally binding and enforceable on its contractors and sub-contractors. Finally, we recommend that the guidelines require the proponent to include in the EIS a firm proposal, previously negotiated with and accepted by the representatives of the potentially affected communities, for involving the Inuit fully in the detailed planning, execution, and evaluation of the mitigating measures.

Mitigating measures for long-term developments, such as the Project, pose special problems. The model of the La Grande Complex suggests, for example, that the road network built by the proponent and operated initially as a series of private roads will eventually become public and may well be transferred to the authority of the ministère des Transports du Québec or some other body. The question then arises as to the respective future responsibilities for mitigating measures of the proponent and of the bodies that might replace it. We recommend that the guidelines specifically require the EIS to address that issue.

M. RESIDUAL IMPACTS

Residual impacts are those for which feasible mitigating measures cannot be devised and for which compensatory measures have not yet been determined, as well as those that remain after the successful application of mitigating measures.

We recommend that the guidelines require the EIS to express the residual impacts in a manner that permits their easy comparison with the original impacts and to express their significance in the same manner as for the original impacts.

The significance of the residual impacts must also be evaluated, and our earlier comments on this topic apply here also. We recommend, however, that the guidelines make it clear that the significance of the residual impacts must be determined using the same criteria as those for the original impacts.

N. MONITORING AND POST-PROJECT AUDITS

The literature on monitoring is abundant (e.g., Berger, 1990; Bush, 1990; Canadian Environmental Assessment Research Council, 1988; Environmental Protection Service, 1983; Krawetz *et al.*, 1987; Sadler, 1985; Saxe, 1991). Hydro-Québec itself has considerable experience with the Ecological Monitoring Network established for the La Grande Complexe. As usual, we recommend that the guidelines require the proponent to situate all its relevant proposals in the EIS in relation to the state-of-art reflected in the recent scientific literature and contemporary practices, and to the extent possible, to incorporate the experimental testing of hypotheses into its monitoring programme.

Although monitoring is a standard feature of major developments in North America today, it tends to be initiated only once the developments in question are operational. There is a tendency to overlook the need for monitoring during the construction of large projects (sometimes known as "compliance monitoring") and, for example, to include necessary remedial measures in a binding form in contracts and sub-contracts. It is equally important to provide for the necessary supervisory personnel and to ensure that they are sufficiently senior in the hierarchy to be able to enforce their decisions, if necessary in the face of powerful contractors and senior engineering and administrative personnel.

A second common weakness is in the area of monitoring social impacts. The monitoring programmes that we know of, including the Ecological Monitoring Network for the La Grande Complex, have focused on quantifiable biophysical parameters, to the virtual exclusion of social parameters, even those as basic as changes in patterns of morbidity and mortality.

Finally, it is our experience that even biophysical monitoring is often unfocused. It is sometimes as if monitoring programmes are designed to collect as much information as possible, with little or no prior consideration to its likely relevance and insufficient flexibility to adapt to unforeseen situations or changing priorities.

We recommend, therefore, that the guidelines require the proponent to use a broad definition of monitoring, which gives equal weight to ecological and social monitoring.

We recommend also that the guidelines require the proponent to distinguish between monitoring during the construction period (compliance monitoring) and monitoring after the construction period.

We recommend that the guidelines require the proponent to propose programmes of monitoring designed to achieve the following objectives at the construction and post-construction stages:

1. to collect relevant data that were not available when the EIS was prepared;
2. to test from time to time the validity and accuracy of the predicted hypotheses and to define and analyze any observed variance, which constitutes a post-project audit;
3. to ensure compliance with regulatory standards and with the terms and conditions of the Project, during and after construction;
4. to identify, evaluate, and mitigate impacts that were not or could not be predicted;
5. to identify, determine the significance of, and develop mitigating measures for unforeseeable cumulative impacts;
6. to test the effectiveness of the mitigating measures implemented and, where appropriate, to identify better measures.

We recommend that the guidelines require the proponent to employ methodologies for the various elements of the monitoring programmes that permit direct comparisons between their results, those of earlier monitoring programmes, and those in the EIS.

We recommend that the guidelines require the proponent to identify, as far as practicable, the proposed duration and location of each element of the monitoring programme and to offer satisfactory guarantees that the programme will be adequately funded, and its results appropriately disseminated in popular and scientific form.

We recommend that the guidelines require the proponent to insert in the EIS a thorough critical evaluation of the monitoring and remedial measures bodies created under the JBNQA (Caniapiscau-Koksoak Joint Study Committee, Environmental Expert Committee, SOTRAC, etc.). In the light of that evaluation, the EIS should then propose mechanisms for fully involving the Inuit in the monitoring programmes.

Finally, we recommend that the guidelines require the proponent to provide undertakings as to how it will react to the findings of the monitoring programmes. We appreciate, however, that some of those undertakings may have to be of a relatively general nature at the present time.

We have already raised with regard to remedial measures the question of ongoing responsibility if ownership of or responsibility for infrastructure or facilities is eventually transferred to someone other than the proponent. We believe that those comments are relevant also to monitoring and post-project audits. We recommend that the guidelines require the proponent to address in the EIS ongoing responsibility for monitoring in such situations.

O. EVALUATION

By evaluation, we refer to a separate, concluding chapter of the EIS. The objective of that chapter would be for the proponent to present succinctly all the arguments for and against the Project, taking into account mitigating measures, compensatory measures, and the various value systems identified. On the basis of the preceding, the proponent should explain and justify its position as to whether or not the Project should proceed and should specify, if appropriate, the conditions that it feels should accompany any authorization.

We recommend that the guidelines require the proponent to insert a chapter on evaluation in the EIS.

SECTION THREE - THE ENVIRONMENTAL IMPACT STATEMENT

The following section constitutes a brief series of recommendations concerning the structure and format of the EIS.

A. DEFINITIONS

We recommend that the guidelines themselves contain a section defining special terms used, especially those that relate to the JBNQA or its related legislation, and that they require the EIS to contain a similar Definitions section.

B. GLOSSARY

We recommend that the guidelines require the proponent to include in the EIS a glossary explaining the technical terms used.

C. RAW DATA AND COMPUTER PROGRAMMES

We recommend that the guidelines require the proponent to make available at a single, central location a copy of all the raw data summarized in the EIS. We consider that necessary to permit intervenors to check statements based on statistical analyses of, for example, biological or social data. The documentation centre at the office of the Joint Support Team in Montreal might be a good location for that data.

We recommend also that the guidelines require the proponent to provide intervenors with access to the computer programmes that the EIS used to analyze data, unless such programmes are commonly available commercial programmes. If copies of such programmes can be made available, the documentation centre of the Joint Support Team might be a suitable location, provided that it is equipped with the necessary computers. If not, the proponent might be asked to provide work space, computers, and assistance available at one of its own offices.

D. DOCUMENTATION

EIS's and the sectorial reports on which they are based often cite internal reports and the so-called "grey" literature, neither of which are readily available to intervenors, as well as the scientific literature. When delays for reviewing documents are short, it is often difficult or impossible, therefore, for intervenors to obtain copies of documents that they need to verify portions of the EIS.

We recommend that the guidelines require the proponent to provide Makivik with all sectorial reports and to deposit in the documentation centre of the Joint Support Team copies of every report or document cited in the EIS or any of its sectorial reports or other supporting documents. The preceding request assumes that intervenors will have

access to the documentation centre of the Joint Support Team. If that is not so, alternative arrangements for documents would have to be made.

E. MEDIA

We recommend that the EIS and all sectorial reports prepared by the proponent be made available to Makivik in hard copy and on diskettes useable by the major types of commercially available desk-top computers. We recommend that its diskette version lend itself to searches by one or more commercially available computer programmes.

F. CONCORDANCE

We recommend that the guidelines require the proponent to submit with the EIS a concordance showing where in the EIS each requirement of the guidelines has been satisfied. We suggest that the concordance be prepared by the Joint Support Team and submitted to the proponent, who would complete it and submit it as part of the EIS.

G. LIST OF ISSUES AND STUDIES

We recommend that the guidelines contain a list of the known issues that the EIS must address, as well as a list of the field and other studies that the proponent must undertake. As we have noted above, however, the guidelines should state that the lists may not be exhaustive, and that it is the responsibility of the proponent to identify all relevant issues and to undertake all necessary field studies.

H. SUMMARY

We recommend that the guidelines require the proponent to submit a detailed summary of the EIS. The summary should be included in the EIS and published separately. It should consolidate the important findings of the EIS and be written in such a manner as to allow readers to focus immediately on the nature of the authorizations requested, the major impacts, the major residual impacts, the principal areas of uncertainty, and other important matters. It should be written in terms understandable to the general public, especially the general public of the areas where the project will be situated and where many or most of its impacts will probably be felt. It should contain such maps, diagrams and plans as are necessary to permit the public to form an adequate understanding of the Project, its predicted impacts, and other relevant issues.

I. MAPS

We recommend that the guidelines require the EIS to contain all relevant maps at appropriate scales. We recommend that, where useful, maps or larger scales be made available for consultation in the Inuit communities and in the offices of the Joint

Support Team. We recommend that the guidelines require the proponent to use a Geographic Information System and, upon written request approved by the Scientific Coordinator of the Joint Support Team, to generate maps for intervenors. We recommend that the maps in the EIS use Inuit place-names, among others.

J. LANGUAGE

Section 4 of the MOU provides, in part, that:

"Key documents and information of the proponent and the Committees, as identified by the Committees, shall be made available in French and English. Such documents, or summaries thereof, shall, when appropriate and practicable, be made available in Cree and Inuktitut."

We recommend that the Committees require in the guidelines that Hydro-Québec make available in both French and English at least the EIS and any summary thereof in order to facilitate their comprehension by the affected Native populations.

* * *

APPENDIX I

**ETHICAL PRINCIPLES FOR THE CONDUCT
OF RESEARCH IN THE NORTH**

ETHICAL PRINCIPLES FOR THE CONDUCT OF RESEARCH IN THE NORTH

*Association of Canadian Universities for Northern Studies
Draft Document 1981 (based upon Canada Man and Biosphere
Discussion Document, 1977)*

INTRODUCTION

In too many cases, researchers have worked in isolated communities without regard for the people who live there. Communities have been disrupted, and essential local resources used without consultation. Privacy is difficult in small communities, creating additional problems for participants. Guidelines, or principles, are needed so that research may be carried on with a minimum of friction and social disruption.

The principles proposed here are intended to promote cooperation and mutual respect between researchers and the people of the North.

Northerners are involved with research in several different ways:

1. as research subjects;
2. providing information;
3. as part of a research team;
4. using the completed research; and
5. identifying research needs.

If research is to be explained clearly, conducted ethically, and used constructively, it must be guided by principles that consider all of the above-mentioned ways in which Northerners are likely to be involved in research activities.

PRINCIPLES

1. The research must respect the privacy and dignity of the people.
2. The research should take into account the knowledge and experience of the people.
3. The research should respect the language, traditions and standards of the community.
4. The person in charge of the research is accountable for all decisions on the project, including the decisions of subordinates.

5. No research should begin before being fully explained to those who might be affected.
6. No research should begin without the consent of those who might be affected.
7. In seeking informed consent, researchers should clearly identify sponsors, purposes of the research, sources of financial support, and investigators responsible for the research.
8. In seeking informed consent, researchers should explain the potential effects of the research on the community and the environment.
9. Informed consent should be obtained from each participant in research, as well as from the community at large.
10. Participants should be fully informed of any data gathering techniques to be used (tape and video recordings, photos, physiological measures, etc.), and the use to which they will be put.
11. No undue pressure should be applied to get consent for participation in a research project.
12. Research subjects should remain anonymous unless they have agreed to be identified; if anonymity cannot be guaranteed, the subject must be informed of the possible consequences of this before becoming involved in the research.
13. If, during the research, the community decides that the research may be unacceptable to the community, the researcher and the sponsor should suspend the study.
14. On-going explanations of research objectives, methods, findings and their interpretation should be made available to the community, with the opportunity for the people to comment before publication; summaries should also be made available in the local language.
15. Subject to requirements for anonymity, descriptions of the data should be left on file in the communities from which it was gathered, along with descriptions of the methods used and the place of data storage.
16. All research reports should be sent to the communities involved.

17. All research publications should refer to informed consent and community participation.
18. Subject to requirements for anonymity, publications should give appropriate credit to everyone who contributes to the research.

DEFINITIONS

The principles refer to research in its broadest sense, including fundamental or applied research in the physical, biological or social sciences. Surveys or monitoring studies would also be included. In general, "research" includes all technological activities in the North. Even mineral and petroleum exploration surveys would be expected to honour the general principles. However, the more detailed principles on informed consent and reporting of research results are meant specifically for researchers and might not apply to all technological activities.

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SUMMARY OF MAKIVIK'S RECOMMENDATIONS

RESPECTING METHODOLOGICAL ISSUES

GREAT WHALE PROJECT

GUIDELINES SCOPING HEARINGS

MONTREAL, 19 MARCH 1992

RECOMMENDATIONS

1. We recommend that the form and procedures of the assessment be clarified by the Committees after appropriate consultation.
2. We recommend a delay of at least four weeks in which to prepare our comments on the draft guidelines.
3. We recommend that social impacts form an integral part of the guidelines.
4. We recommend, that, while the guidelines not establish a timetable for the assessment and review of the Project, they state where field work or analysis are required and that the Committees bear in mind the need to complete the assessment and review in a timely fashion.
5. We recommend that the guidelines state that they bind the proponent and that they require the proponent to obtain the prior approval of the Committees for any departure from them.
6. We recommend that the Committees state clearly in the guidelines that they are not necessarily comprehensive, and that it is the duty of Hydro-Québec to ensure that its EIS adequately covers all relevant issues.

7. We recommend that the Committees specify in the guidelines their opinion on the duration of any authorizations that might be issued pursuant to the recommendations or decisions that they will make.

8. We recommend that the guidelines require the EIS to address the decommissioning of major facilities as thoroughly as is possible at the present time.

9. We recommend that the guidelines require that the EIS contain an appropriately detailed programme for decommissioning and restoring impermanent sites and facilities.

10. We recommend that the guidelines require the proposed redevelopment of the Kuujuaaraapik Airport to be assessed as part of the Project.

11. We recommend that, at a minimum, the guidelines require that all the items listed in Annex I of the MOU be addressed in the EIS.

12. We recommend that the guidelines require the EIS to distinguish between impacts that are likely to be experienced differently by individuals, those likely to impact groups, and those that should be studied from both perspectives, and to prepare appropriate forms of study and analysis for each.

13. We recommend that the guidelines require the EIS to consider the impacts of not proceeding with the Project.

14. We recommend that the guidelines require the EIS to address the distinct questions of alternatives to the Project and alternative ways of constructing and operating the Project consistent with the MOU and Section 23 of the JBNQA, including Schedule 3.

15. We recommend that the guidelines require the proponent to justify its choice of methodologies and to explain and interpret its results in the light of current standards, theories, and knowledge in each of the relevant disciplines.

16. We recommend that the guidelines provide that, where data are missing and cannot reasonably be collected, the EIS must evaluate the significance of their absence and must, if appropriate, provide for their collection during the monitoring programme.

17. We recommend that the guidelines require the proponent to describe the history of the Project in some detail in an introductory chapter to the EIS and to explain in particular detail the relationship between the prior assessment and the present one, with particular reference to the evolution of Project design variants and alternatives to the Project.

18. We recommend that the guidelines require the proponent to implement *Ethical Principles for the Conduct of Research in the North*.

19. We recommend that the guidelines require the proponent to analyze data by age and gender wherever it is appropriate and useful to do so.

20. We recommend that the guidelines require the proponent to integrate Inuit knowledge, understandings and interpretation into every stage of its environmental assessment.

21. We recommend that the guidelines direct the proponent to enter into agreements with the Native groups concerned, setting out to the mutual satisfaction of all concerned the roles and responsibilities of each partner at every stage of data-collection, -analysis, -interpretation, and -synthesis.

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involve

22. We recommend that the guidelines establish a mechanism for settling problems of non-cooperation in research.

23. We recommend that the guidelines require the proponent to include in its EIS a description and evaluation of ethical arguments in favour of the Project. We recommend also that, on the basis of research and consultation, the EIS should also describe to the best of its ability the relevant aboriginal ethic. Thereafter, we recommend that the EIS address some of the specific ethical issues raised by the Project, such as the likely unequal geographic distribution of its costs and benefits and the ethical justification for one society's using, principally for its own benefit, lands, waters, and resources that are fundamental to the identity and survival of another society.

24. We recommend, that the guidelines require the proponent to indicate in its programme of public consultation how it intends to recognize the special status of the Inuit in its assessment process.

25. We recommend that the guidelines require the proponent to indicate in its programme

of consultation how it intends to recognize the special status of the Inuit in its programme of consultation and public participation.

26. We recommend, that the guidelines require the proponent to use recognized sampling techniques (in relation to public consultation, for example), to describe those techniques in the EIS, and to evaluate the results obtained in the light of sampling difficulties.
27. We recommend that the guidelines contain guidance to the proponent on the scope of consultation that would be deemed acceptable.
28. We recommend that the guidelines require that the EIS be focused.
29. We recommend that the guidelines provide an opportunity for intervenors to amend their lists of issues at least at the following stages: when the preliminary project description has been finalized; when questions of alternatives, design variants and operating characteristics have been defined more precisely; and when biophysical and social impacts have been identified in a preliminary way.
30. We recommend that the guidelines specifically acknowledge that valued ecosystem components can be of a social or abstract nature.
31. We recommend that the guidelines specify that the aspirations of the Inuit, both individually and collectively, be considered as valued ecosystem components.
32. We recommend that the guidelines direct Hydro-Québec to use a methodology based on valued ecosystem components for both biophysical and social impacts.
33. We recommend that the guidelines require Hydro-Québec to submit a series of analyses based on the different groupings of ecosystem components and values identified by the

various intervenors.

34. We recommend that the guidelines require the EIS to contain a checklist showing the following: ecosystem components that are not expected to be impacted and that were not, therefore, studied; ecosystem components that are expected to be impacted, but that are not sufficiently valued to have been studied in detail; and ecosystem components that are expected to be impacted and that are sufficiently valued to have been studied in detail.

35. We recommend that the guidelines provide for periodic consultation about valued ecosystem components.

36. We recommend that the guidelines direct the proponent to use both environmental and administrative boundaries to define study areas.

37. We recommend that the Committees reproduce in the Guidelines at least the substance of Sub-paragraph 1.4.12 of the United States' *Economic and Environmental Guidelines for Water and Related Land Resources Implementation Studies*, which deals with the reviewing of alternatives.

38. We recommend that the guidelines require the proponent to evaluate the sensitivity of the valued ecosystem components, both biophysical and social, to the variability and periodicity of impacts, to identify the likely variability and periodicity of the predicted impacts, and to highlight potentially important interactions.

39. We recommend that the guidelines require the proponent to assess the severity or significance of the predicted impacts in the light of knowledge of the present state or health of each valued ecosystem component and of its probable future evolution with and without the Project.

40. We recommend, that the guidelines require the proponent to describe and explain the human and biological systems studied in functional rather than reductionist terms.
41. We recommend that the guidelines explicitly require the proponent to predict the future states of valued ecosystem components both with and without the Project.
42. We recommend that the guidelines require the proponent to evaluate to what degree the baseline data reveal relatively unimpacted ecosystems and, if appropriate, to identify the sources of any prior impacts identified.
43. We recommend that the guidelines require that predictions of impacts be stated explicitly and be based on the formulation and testing of hypotheses, wherever it is realistic and feasible to do so. Further, we recommend that the guidelines provide that the proponent must justify any decisions that it takes to predict impacts other than on the basis of the testing of hypotheses by means of laboratory or field experiments.
44. We recommend that the guidelines specify that any decision by the proponent not to test hypotheses, whether during preparation of the EIS or in its monitoring programme, will be evaluated on the basis of the scientific and practical arguments advanced and of contemporary practice in other parts of North America and elsewhere.
45. We recommend that the guidelines provide direction to the proponent as to other acceptable forms of impact prediction.
46. We recommend that the guidelines draw the proponent's attention to Hydro-Québec's own experience with the Ecological Monitoring Network established for the La Grande Complexe
47. We recommend that the guidelines require the EIS to state clearly the basis for all

impact predictions. Where predictions are based on the experience or opinions of experts, we recommend that the guidelines require that the experts must be identified, their qualifications described, and that the justification of their opinions, including references to the relevant scientific literature, must be presented. Moreover, we recommend that the guidelines require those experts to be available for questioning during the public hearings.

48. We recommend that the guidelines require that the most rigorous and reliable applicable analytical techniques be used.

49. We recommend that the guidelines require that predicted impacts be expressed quantitatively, wherever it is possible to do so.

50. We recommend that the guidelines require the proponent to present the most likely values of the occurrence of impacts and the associated frequency distribution.

51. We recommend that the guidelines provide that the monitoring programme be designed to identify and react to unknown future events with unknowable probabilities.

52. We recommend that the guidelines require that appropriate statistical techniques, such as sensitivity analysis, be applied to known events with an unknown probability of occurrence.

53. Given that the changing patterns in demand are, in our opinion, more than a theoretical problem, we recommend that the guidelines require the proponent to address it comprehensively.

54. Given that plans for the future development of hydraulic resources in Québec, Ontario, and Manitoba are relatively well known, we recommend that the guidelines require Hydro-Québec to take account of past and future developments.

55. We recommend also that the guidelines state clearly that cumulative impacts, however defined, are not limited to the cumulative impacts of hydroelectric developments, but include the cumulative impacts of all forms of development affecting the Territory.
56. We recommend that the guidelines require Hydro-Québec to address cumulative impacts in its EIS.
57. We recommend also that the guidelines require Hydro-Québec to integrate into its EIS available results from the study of cumulative impacts in the Hudson Bay/James Bay Bioregion recently initiated by the Canadian Arctic Resources Committee, The Rawson Academy, and others.
58. We recommend that the guidelines require the proponent to address comparisons of biophysical and social impacts on the basis of a review of the literature, of prior experience elsewhere with environmental assessment, and on the basis of its own experience. We recommend also that the Committees instruct the Joint Support Team to commission the preparation of a background paper on this topic, which should be made public.
59. We recommend that the guidelines require the proponent to explain and justify how its own judgments of significance presented in the EIS were derived. We recommend also that the guidelines require the proponent to present to the best of its ability alternative analyses based on its understanding of other relevant values and value systems. Finally, we recommend that the guidelines require the proponent to explain and justify why it retained one value system over other value systems, if such proves to be the case.
60. We recommend that the Committees retain the services of one or more recognized experts in ethics, including at least one expert in environmental ethics. We recommend that the Committees direct their ethicists to prepare a background paper and recommendations relevant to the ethical aspects of environmental assessments of mega-projects potentially

affecting aboriginal groups and individuals and that that report be made public.

61. We recommend that the guidelines require the proponent to demonstrate in the EIS, through reference to the relevant literature, that the measures that it proposes reflect contemporary standards.

62. We recommend that the guidelines require the proponent to ascertain whether certain ecosystems or components thereof have been adversely affected by previous developments. We recommend that, if such appears to be the case, the guidelines require the proponent to consider their restoration as one means of mitigating the anticipated impacts of the Project, even though the proponent may not itself have been responsible for the initial damage.

63. We recommend that the guidelines require this part of the EIS [mitigating measures] to evaluate the costs and feasibility of the mitigating measures proposed, to state who will be responsible for implementing them, and to provide a timetable for carrying them out.

64. We recommend further that the guidelines require the proponent to state in the EIS how the proposed mitigating measures will be made legally binding and enforceable on its contractors and sub-contractors.

65. Finally, we recommend that the Guidelines require the proponent to include in the EIS a firm proposal, previously negotiated with and accepted by the representatives of the potentially affected communities, for involving the Inuit fully in the detailed planning, execution, and evaluation of the mitigating measures.

66. We recommend that the guidelines specifically require the EIS to address the issue of long-term responsibility for mitigating measures if infrastructure or other facilities leave the control of Hydro-Québec.

67. We recommend that the guidelines require the EIS to express the residual impacts in a manner that permits their comparison with the original impacts and to express their significance in the same manner as for the original impacts.
68. We recommend that the guidelines require the proponent to use a broad definition of monitoring, which gives equal weight to ecological and social monitoring and, to the extent possible, to incorporate the experimental testing of hypotheses into its monitoring programmes.
69. We recommend also that the guidelines require the proponent to distinguish between monitoring during the construction period (compliance monitoring) and monitoring after the construction period.
70. We recommend that the guidelines require the proponent to propose programmes of monitoring designed to achieve the following objectives at the construction and post-construction stages:
- (1) to collect relevant data that were not available when the EIS was prepared;
 - (2) to test from time to time the validity and accuracy of the predicted hypotheses and to define and analyze any observed variance, which constitutes a post-project audit;
 - (3) to ensure compliance with regulatory standards and with the terms and conditions of the Project, during and after construction;
 - (4) to identify, evaluate, and mitigate impacts that were not or could not be predicted;
 - (5) to identify, determine the significance of, and develop mitigating measures for unforeseeable cumulative impacts;
 - (6) to test the effectiveness of the mitigating measures implemented and, where appropriate, to identify better measures.

71. We recommend that the guidelines require the proponent to employ methodologies for the various elements of the monitoring programmes that permit direct comparisons between their results, those of earlier monitoring programmes, and those in the EIS.
72. We recommend that the guidelines require the proponent to identify, as far as practicable, the proposed duration and location of each element of the monitoring programme and to offer satisfactory guarantees that the programme will be adequately funded, and its results appropriately disseminated in popular and scientific form.
73. We recommend that the guidelines require the proponent to insert in the EIS a thorough critical evaluation of the monitoring and remedial measures bodies created under the JBNQA (Caniapiscau-Koksoak Joint Study Committee, Environmental Expert Committee, SOTRAC, etc.). In the light of that evaluation, the EIS should then propose mechanisms for fully involving the Inuit in the monitoring programmes.
74. Finally, we recommend that the guidelines require the proponent to provide undertakings as to how it will react to the findings of the monitoring programmes.
75. We recommend that the guidelines require the proponent to address ongoing responsibility for monitoring in situations where Hydro-Québec ceases to own or to be responsible for certain infrastructure.
76. We recommend that the guidelines require the proponent to insert a chapter on evaluation in the EIS.
77. We recommend that the guidelines themselves contain a section defining the terms used, especially those that relate to the JBNQA or its related legislation, and that they require the EIS to contain a similar Definitions section.

78. We recommend that the guidelines require the proponent to include in the EIS a glossary explaining the technical terms used.
79. We recommend that the guidelines require the proponent to make available at a single, central location a copy of all the raw data summarized in the EIS.
80. We recommend that the guidelines require the proponent to provide intervenors with access to the computer programmes that the EIS used to analyze data, unless such programmes are commonly available commercial programmes.
81. We recommend that the guidelines require the proponent to provide Makivik with all sectorial reports and to deposit in the documentation centre of the Joint Support Team copies of every report or document cited in the EIS or any of its sectorial reports or other supporting documents.
82. We recommend that the EIS and all sectorial reports prepared by the proponent be made available to Makivik in hard copy and on diskettes useable by the major types of commercially available desk-top computers. We recommend that its diskette version lend itself to searches by one or more commercially available computer programmes.
83. We recommend that the guidelines require the proponent to submit with the EIS a concordance showing where in the EIS each requirement of the guidelines has been satisfied.
84. We recommend that the guidelines contain a list of the known issues that the EIS must address, as well as a list of the field and other studies that the proponent must undertake.
85. We recommend that the guidelines require the proponent to submit a detailed summary of the EIS.

86. We recommend that the guidelines require the EIS to contain all relevant maps at appropriate scales. We recommend that, where useful, maps at larger scales be made available for consultation in the Inuit communities and in the offices of the Joint Support Team. We recommend that the guidelines require the proponent to use a Geographic Information System and, upon written request approved by the Scientific Coordinator of the Joint Support Team, to generate maps for intervenors. We recommend that the maps in the EIS use Inuit place-names, among others.

87. We recommend that the Committees require in their guidelines that Hydro-Québec make available in both French and English at least the EIS and any summary thereof in order to facilitate their comprehension by the affected Native populations.

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PART IV

TECHNICAL ISSUES

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INTRODUCTION

This part of our brief presents preliminary suggestions for some of the technical and other issues that the guidelines should address. This represents our summary, not a verbatim transcript of verbal or written comments submitted by some 22 technical experts. Annex I presents their names, affiliations, and disciplines.

Wherever possible, our suggestions refer to the baseline description of the environment that should form part of the EIS. It must be understood, however, that an element suggested for the baseline must subsequently be treated at all later stages of the environmental assessment process.

1. RELIEF, BEDROCK GEOLOGY AND SURFICIAL DEPOSITS

1.1 Generally, the EIS should treat the region's physical systems as being dynamic and interrelated with one another and with the biological and human systems. It follows, therefore, that they can be expected to change in response to the Project, and cannot be seen as passive and static systems that need only to be inventoried.

1.2 The guidelines should require the following in the description of the environment:

- 1.2.1 surveys of the bathymetry and submarine physiography of the coastal zone, especially Manitounuk Sound;
- 1.2.2 surveys of the distribution, thickness (established by seismic profiling) and granulometric composition of recent marine sediments;
- 1.2.3 a physiographic analysis, including granulometry and profiles of the beaches showing their seasonal evolution, of the intertidal zone along the coast of Manitounuk Sound and especially along the "arrow" of sand opposite Kuujjuaraapik;
- 1.2.4 surveys of the possible existence of commercial mineral deposits in areas to be flooded or otherwise rendered inaccessible, using such techniques as field surveys, remote sensing (e.g., analysis of satellite images, aeromagnetic analyses, gravimetric studies) coupled with ground-truthing, drilling, and assaying;

- 1.2.5 mapping of bedrock features that might merit preservation, such as meteorite impact sites, special rock-types, and the large cuesta that rims the semicircular coast of eastern Hudson Bay;
 - 1.2.6 mapping of rock types rich in potentially toxic elements and a description of the conditions under which such toxic elements might be released;
 - 1.2.7 mapping of fault and fracture zones, together with an evaluation of the likelihood that they are associated with mercury anomalies;
 - 1.2.8 mapping of glacial landforms, such as the Sakami Moraine, that might warrant preservation or provide construction materials;
 - 1.2.9 mapping of the distribution and granulometric analyses of sandy sediments, especially in coastal areas, that are readily eroded once freed from vegetation or permafrost;
 - 1.2.10 mapping of geomorphic agents.
- 1.3 Subsequent sections of the EIS should evaluate, among other things:
- 1.3.1 the cumulative effects of existing and proposed dams on seismicity. Data should be presented to show whether the weight of water stored would in the long term cause subsidence, reduce isostatic uplift, or have other comparable effects. Any increased ability of water to penetrate bedrock as a result of the melting of permafrost or the increase in water pressure should be taken into account. Particular attention should be given to the possibility that seismic activity might facilitate the release of significant quantities of vapour from depth along fault zones;
 - 1.3.2 the long-term impacts of isostatic rebound rates, possibly exceeding 1 cm/yr, on the hydraulic potential of the region and the economic viability of the Project;

- 1.3.3 the likelihood that higher water levels in reservoirs, especially where they are combined with the degradation of permafrost, will raise the level of the water table locally, thereby leading to increased slope instability.

2. SOILS AND PERMAFROST

2.1 The guidelines should require the following in the description of the environment:

2.1.1 mapping of soils, with particular reference to peat deposits, including: differentiation of the various types of peat and peatlands; their distribution and thickness; quantitative estimates of the amount of peat in various areas; and a description of the process by which potentially toxic elements fixed on organic materials in bogs might be released;

2.1.2 mapping and areal quantification of the distribution of permafrost in relation to projected Project activities, and data on the following: its depth; the depth and distribution of the active layer; data on the freeze-thaw cycle of surficial and deep layers; data on overland and stream hydrology in permafrost areas; information on the relationship between climatic trends (including variations in snow depth and distribution); and ground-temperature profiles;

2.1.3 mapping of areas with ice-rich permafrost.

2.2 The EIS should, if appropriate, evaluate the potential impacts of construction, flooding, and other actions on permafrost, with particular reference to the period likely to be required for bank-stabilization in flooded areas. In this respect, the EIS should pay particular attention to experience in Northern Manitoba and should evaluate critically the view that such stabilisation may require up to 300 years.

2.3 The EIS should also evaluate the likelihood, extent, and consequences of surface icing where stream and shallow ground water circulation is interrupted, as, for example, by the channelling of small streams through culverts.

2.4 The likelihood that melting permafrost might contribute high levels of toxic elements to aquatic systems in dissolved and suspended form should also be addressed.

3. GEOCHEMISTRY

3.1 The following should be presented in the section of the guidelines describing the environment:

- 3.1.1 the distribution of trace elements in stream sediments;
- 3.1.2 quantitative analyses of trace elements, including mercury, in representative samples of water, soils, organic materials, and rocks;
- 3.1.3 data on the sensitivity of soils and unconsolidated deposits to acid precipitation;

4. FRESHWATER ECOSYSTEMS

4.1 The Proponent must take care to distinguish the different types of freshwater ecosystems (e.g., rivers, lakes, reservoirs) present in the area and to describe fully the respective characteristics of each.

4.2 The Proponent must use one of the Instream Flow Methods to quantify fish habitat in areas where it is likely to be affected. The EIS must specify which of the Instream Flow Methods is used, justify the method chosen, and discuss its strengths and weaknesses in the light of the following quotation:

"Many existing methods appear to be essentially arbitrary, although not necessarily incorrect in making specific flow recommendations. Others develop a functional relationship between an index of habitat quality and of instream flow. Although some of these habitat quality indexes have been correlated with biologic responses, only one has been shown to predict a measurable biologic response - and that one in a situation where flows were not altered. These methods, however, are undergoing rapid development that should lead to improved methods within a few years."

(Electrical Power Research Institute. 1986. Instream Flow Methodologies, Report EA4819)

4.3 The guidelines should specify that ground water should be considered as part of the freshwater ecosystems.

4.4 The guidelines should require the following in the description of the environment:

- 4.4.1 a description of ice regimes, including the following: dates of freeze-up and thaw; types and thicknesses of ice; types of ice breakup and drives; localities of ice jams and floods; amounts of ice-rafted sediments and localities of deposition; relationships between coastal ice and river ice;
- 4.4.2 an analysis of the transport of sediments, in suspension and by displacement, in the Great Whale River and the Little Whale River, identifying the sources of the sediments, the quantities of solids at the mouths of the estuaries, and the mapping of the moveable deposits in these estuaries;
- 4.4.3 a description of the extent of the freshwater plume offshore from the major rivers in winter and summer;
- 4.4.4 rates of sedimentation in relation to circulation in the reservoirs;
- 4.4.5 the number, location, and physical characteristics of each set of rapids that will be lost should be specified;
- 4.4.6 the descriptions of phyto- and zoo-plankton, benthos, and fish should include within- and between-year variations, and should include consideration of biomass, species-composition, life-cycles, and interrelationships;
- 4.4.7 the nature, source, magnitude, and importance of terrestrial inputs to aquatic ecosystems;
- 4.4.8 parasites of fish, especially those that can be transmitted to man, should be described;
- 4.4.9 Long Range Transportation of Atmospheric Pollutants (LRTAP), including heavy metals, radionuclides, organochlorine compounds, and polycyclic aromatic hydrocarbons, should be considered. Particular attention should be given here to the hardness of the water, since additions to soft water make up a larger proportion of the dissolved substances than do similar additions to hard water;

- 4.4.10 quantitative descriptions of the physical and chemical properties of the water, including analyses of potentially toxic trace elements (such as lead, zinc, molybdenum), together with a description and analysis of their cycles and bioaccumulation;
- 4.4.11 a description of the data-base, including period of record, on which the analysis of low- and high-water return periods and other hydrological phenomena is based, and an analysis of the significance of any observed inadequacies;
- 4.4.12 present flushing times in existing lakes of various sizes, as well as the estimated flushing times in the proposed reservoirs;
- 4.4.13 aquatic vegetation.

4.5 In dealing with impacts, the EIS might consider synthesising some of the findings about riverine ecosystems on the basis of rivers with increased flows and those with reduced flows.

5. ESTUARINE AND MARINE ECOSYSTEMS

5.1 The guidelines should require the following in the description of the environment:

- 5.1.1 the zones of mixing of fresh and salt water under natural conditions should be described in relation to flows in the rivers and also in relation to the state of the tides;
- 5.1.2 the flux of nutrients and nutrient cycling in existing estuaries, as well as downstream effects in Hudson Bay;
- 5.1.3 a study of the wave regime off the mouths of the major rivers, including data on directions, periods and height, with refraction diagrams and projections of sediment transportation along the arrow of sand opposite Kuujjuaraapik;
- 5.1.4 the characteristics of the tides, including their propagation in the estuaries and Manitousuk Sound;

- 5.1.5 quantitative descriptions of such relevant parameters as water chemistry, salinity, benthos, sediment loads, trace elements (including mercury), the relative contributions of marine and terrestrial sources of organic matter;
- 5.1.6 the relationship between annual cycles of salinity and migrations by certain coastal species, including shrimps;
- 5.1.7 the biomass, life-cycles, and other aspects of zooplankton and benthic invertebrates, including their reproductive characteristics in relation to habitats, the ecological determinants of their growth and survival, and their diversity and interspecific relationships;
- 5.1.8 the density, structure, and composition of shellfish beds.

5.2 The guidelines should include the following in the prediction of impacts with respect to Manitousuk Sound:

- 5.2.1 the likelihood that global warming will cause a rise in sea-level, and an evaluation of the probable consequences thereof for the design and operation of the Project, the economic viability of the Project, predictions of its biophysical and social impacts, and the adequacy of the mitigating measures proposed;
- 5.2.2 an examination of the consequences of the new flow regimes on the dispersion of the freshwater plume in winter and in summer, inside and outside the Sound, and on circulation in Hudson Bay in general;
- 5.2.3 the impacts of construction activities on levels of turbidity and sedimentation inside and outside the Sound;
- 5.2.4 the impacts of the exit from the tailrace on bottom erosion in the affected part of Manitousuk Sound.

6. MERCURY

6.1 The present state of knowledge of the biogeochemical cycle of mercury in natural fresh, estuarine, and salt waters should be reviewed, with emphasis on northern biomes. The review should describe the role of microbial transformations of mercury

compounds in regulating methyl mercury levels in the aquatic environment and should consider the physical, chemical, and biological factors known to regulate microbial methylation and demethylation rates and, consequently, mercury levels in fish. This information should be used to develop a conceptual model or general explanation of the factors that currently (i.e., pre-Project) regulate methyl mercury concentrations in biota in the study area. The review should also describe current knowledge of the way in which flooding of terrestrial soils and vegetation affects these natural biogeochemical transformations of mercury. The factors known or suspected to regulate microbial methylation and demethylation rates in reservoirs should be described.

6.2 The methods of quantifying the form and quantity of mercury occurring in water, sediments, and tissues have changed dramatically in the last few years. The EIS should review the literature on methods for the determination of organic and inorganic mercury compounds in the environment, focusing on:

- 6.2.1 identifying those compounds that are or may be useful for understanding or predicting the impacts of impoundment on mercury levels in biota;
- 6.2.2 evaluating the validity of previous mercury studies, particularly those used to establish baseline mercury levels in the study area, and those on which any predictive models employed in the EIS are based; and
- 6.2.3 the development of a sampling and analytical protocol for future studies.

6.3 The toxicity of methyl mercury to biota has not, as far as we are aware, been examined in detail for any reservoir. Ramsey (1992 (in press) *Federal Ecological Monitoring Program. Final Mercury Report*. Winnipeg: Environment Canada. 141 + xxi pages) conducted a preliminary literature review. That review concluded that the highest fish mercury levels which occurred in the Notigi Reservoir following the diversion of the Churchill River were at the upper limits of the no-effects range identified in laboratory studies. Much higher levels developed in the La Grande Complex than in Notigi Reservoir. Levels above the no-effects range should, therefore, be expected in the Project area. The EIS should undertake a comprehensive review of the physiological effects of methyl mercury on biota, with emphasis on those species in which elevated levels are expected to develop.

6.4 With respect to baseline data, the EIS must present data on the current total and methyl mercury levels in tissues of biota from the study area, using the best available analytical methods. The organisms sampled should include:

- 6.4.1 all fish species that are important domestic food items or that are important food items for fish-eating birds and mammals;
- 6.4.2 all birds and mammals for which fish is a dietary staple.

All tissues (e.g., muscle, organs) and life-stages (e.g., juveniles, adults, eggs) that are normally consumed should be sampled. An analysis of the relationship between organism age, size, and mercury level should be undertaken.

6.5 The EIS should also determine the baseline methyl mercury concentrations in soils, vegetation, water, and sediments from the study area. Total mercury concentrations are not useful, however. Microbial methylation rates and mercury levels in fish in natural waters and reservoirs are not related to total mercury levels in any environmental components (Ramsey, 1992). Similarly, mercury bioaccumulation in fish is independent of the quantity of inorganic mercury made available to the methylating bacteria (Hecky, R.E., R.A. Bodaly, D.J. Ramsey, & N.E. Strange. 1987. "Enhancement of mercury bioaccumulation in fish by flooded terrestrial material in experimental ecosystems". *Summary Report of the Canada-Manitoba Agreement on the Study and Monitoring of Mercury in the Churchill River Diversion. Technical Appendix 6.*). That indicates that methylation in natural waters is not limited by inorganic mercury availability (Ramsey, 1992).

6.6 All other sources of baseline mercury data for water, sediments, and biota in the study area should be identified. Those data should be reviewed with respect to the adequacy of sampling and analytical methods and comparability with data gathered by the Proponent. If comparable data are found, an analysis of temporal trends in mercury levels should be undertaken.

6.7 The organic content of soils has been shown to be an important factor regulating net microbial methylation rates and mercury accumulation in fish (Ramsey, 1992). The primary surface soil types in the areas to be flooded should therefore be described, the organic content determined, and their distributions mapped. Measures of organic content that have been employed in other studies include organic carbon concentration and loss on ignition.

6.8 Different types of vegetation stimulate net mercury methylation and mercury bioaccumulation in fish to varying degrees (Hecky et al. 1987). Decomposition rates following flooding also vary considerably with plant species and the type of plant tissue (e.g., leaf, tree bole). Consequently, the types of vegetation flooded could have a significant influence on the severity and duration of any elevated mercury levels that may develop. Knowledge of the vegetation communities occurring in the study area will also be necessary in order to apply or modify models developed in other systems.

6.9 In addition to identifying and mapping the various vegetation communities in the study area, the Proponent should undertake a review of existing information on rates of decomposition of these materials in northern waters.

6.10 Given the demonstrated significance of mercury as an issue to be addressed in major hydroelectric developments, the Proponent should present the most complete description possible of Project impacts on mercury levels in biota. The following predictions should be made:

- 6.10.1 the expected maximum elevation of methyl mercury levels in biota following creation of the reservoirs;
- 6.10.2 the length of time that will be required to reach these maximum levels;
- 6.10.3 the period of time over which the maximum levels will be maintained;
- 6.10.4 the rate of decline from the maximum levels; and
- 6.10.5 the length of time required for return to pre-development values.

6.11 Those predictions should be developed separately for:

- 6.11.1 each of the reservoirs to be created;
- 6.11.2 any waterbody or watercourse that is accessible to fish from flooded areas and which is currently used or may be used in the future for resource-harvesting activities;
- 6.11.3 the downstream watercourses between reservoirs;
- 6.11.4 the downstream watercourse between GB 1 and Hudson Bay;
- 6.11.5 Manitounuk Sound; and
- 6.11.6 Hudson and James Bays.

6.12 The preceding modelling exercise should take into account the following factors:

- 6.12.1 reservoir morphology, including: the extent of flooding of the reservoirs (i.e., the percentage increase in water area due to impoundment), volume, mean depth, residence time;
 - 6.12.2 the variants in Project configuration;
 - 6.12.3 the composition and structure of the fish community and the composition and structure of the community of fish-eaters and their predators;
 - 6.12.4 the potential for cumulative impacts of reservoirs in series related to downstream transport of methyl mercury, upstream and downstream movements of mercury-contaminated fish, or downstream fish feeding on remains of other fish that have passed through turbines;
 - 6.12.5 the types of terrestrial organic matter (both soils and vegetation) that will be flooded, the areas of various soil types that are flooded, the biomass of vegetation flooded, the resistance of these organic materials to decomposition, the abilities of the various soils and vegetation to stimulate net methyl mercury production, and the differences or similarities in these biophysical conditions compared to any other northern hydroelectric developments where any models employed were first developed.
- 6.13 Model predictions should be developed for the following organisms:
- 6.13.1 all fish species which are important domestic food items, which are harvested commercially, or which are important food items for fish-eating birds and mammals; and
 - 6.13.2 any fish-eating species which are important domestic food items or which are harvested commercially for consumption.

6.14 The Proponent should undertake a comprehensive review of all models for prediction of mercury levels in biota following impoundment and should provide detailed justification for the model or models selected. The parameters included in the model(s)

should be completely described, along with the justification for their inclusion. The sources of data employed in the model predictions should be completely documented, along with the field sampling, laboratory, and statistical methods that were used in the gathering, analysis, and interpretation of the data.

6.15 We recognize that the Proponent will not be able to develop accurate or precise predictions of the impact of the Project on mercury levels for all organisms of interest or all parts of the system. The Proponent should, however, be able to make reasonable estimates for the principal fish species in the major reservoirs and other critical areas.

6.16 The Proponent must evaluate the significance of the predicted changes in mercury levels in biota with respect to the following:

- 6.16.1 physiological effects on biota;
- 6.16.2 risk to, and effects on, human health;
- 6.16.3 social, cultural, economic, and other impacts caused by disruption of traditional resource-harvesting activities;
- 6.16.4 the psychological impact of the introduction of an environmental contaminant, regardless of the demonstrable risk to individuals or groups;
- 6.16.5 the cumulative impacts of additional mercury-contaminated sites on Inuit communities and on biota.

6.17 The proponent should develop a plan to mitigate any of the significant adverse impacts of the project with respect to mercury. The consideration of mitigating measures should include:

- 6.17.1 methods of minimising or preventing the development of elevated mercury levels in biota (e.g., clearing or burning of organic matter);
- 6.17.2 methods of reducing the consumption of mercury-contaminated animals tissues, for example through the identification of acceptable alternate foods (different species, or smaller or younger individuals of the usual food species);

- 6.17.3 the development of acceptable off-system harvesting areas.

The rationale for selecting or rejecting any particular mitigating measure should be detailed.

6.18 The Proponent should describe in detail the monitoring programme that will be carried out. In particular, the control or reference sites to be used should be identified, and their selection justified. Similarly, the sampling and analytical methods which will be used must be documented, along with the measures which will be taken to ensure comparability of all data gathered over the course of the monitoring programme.

7. UPLAND AND WETLAND ECOSYSTEMS

7.1 The guidelines should include the following requirement in the description of the environment:

- 7.1.1 special habitats should be distinguished, such as stands of dwarf willow (*Salix* spp.), which are used by ptarmigan in winter for feeding and shelter.

8. AVIAN ECOLOGY

The more important species of waterfowl for study include Common and Red-throated Loons, Canada Geese, Black Ducks, Mergansers, Scoters, Ospreys, Arctic Terns, Eiders, and Harlequin Ducks. Particular attention should be given to describing the numbers, areas, and locations of shallow wetlands suitable for breeding Scoters and to evaluating quantitatively the probable losses thereof through flooding and other causes.

9. FISHERIES ECOLOGY

9.1 Consideration of mercury should focus on species of fish consumed by the Inuit, such as Brook char, Lake trout, Longnosed sucker, and Lake whitefish.

9.2 On the basis of experience with the La Grande Complex in particular, the EIS should present quantitative estimates by species and by types of water body (rivers, lakes, etc) of the numbers of fish likely to be taken by workers during the construction and operation phases of the Project. The EIS should evaluate the vulnerability of each species at relatively high latitudes to the anticipated fishing pressure.

9.3 The role of the freshwater plume offshore from each river in providing habitat for larval fishes and for sustaining anadromous species should be evaluated.

10. THREATENED SPECIES

Where appropriate, reference should be made to the classification system employed by the *Convention on International Trade in Endangered Species (CITES)*. The EIS should record the status of each relevant species and should identify habitats and locations where they have been recorded.

11. MARINE VEGETATION

The guidelines should require the Proponent to determine the potential effects of altered flows, salinities, temperatures, and other factors on the distribution, survival, and growth of coastal Eelgrass (*Zostera* spp.) beds and upon the Brant that use those beds.

12. PORT FACILITIES

If port facilities (quays, jetties, etc), whether new or expanded versions of existing facilities, are built, they may involve dragging, either in the estuaries or in Manitounuk Sound. They should be described, and then considered as appropriate in all the subsequent stages of the EIS in the same manner as other associated works.

13. CLIMATOLOGY

The following should be addressed:

13.1 increases or decreases and changes in the seasonality of precipitation due to the creation of large reservoirs;

13.2 changes in evaporation/evapotranspiration due to the replacement of barren lichen or taiga surfaces by water and wetlands;

13.3 microclimatic changes in humidity and the associated impacts on plants and animals;

13.4 the effects of changes in soil moisture on the spatial distribution, composition, and abundance of plant and animal communities;

13.5 the impacts of changes in humidity on the incidence, extent, and severity of forest fires;

13.6 methane releases from newly created wetlands, including their contribution to air quality and to global warming;

13.7 an evaluation of the relative efficiency of water in flooded areas as a

sink for carbon, as compared to the efficiency of the displaced terrestrial vegetation;

13.8 the possible effects of global warming on the volume and seasonality of run-off and the related flows in the rivers, and the possible consequences for engineering designs (including the maximum and minimum levels of forebays and reservoirs), for the predicted biophysical and social impacts of the Project, for demand projections (including the seasonality of demand), and for the long-term economic viability of the Project.

14. ARCHAEOLOGY AND HERITAGE RESOURCES

14.1 The EIS should employ clearly defined levels of significance for predicted impacts on archaeological and heritage resources. Examples might be:

- 14.1.1 significance to archaeology in general, both as a scientific discipline and as a technique;
- 14.1.2 significance to a better scientific understanding of the culture-history of the study area or of the Territory;
- 14.1.3 significance to the Inuit.

14.2 The guidelines should require a comprehensive overview of the current state of archaeological knowledge of the study area(s) (which should itself be defined in the manner suggested in Part III hereof). That overview should itself employ the levels of significance proposed above.

14.3 The EIS should contain a detailed description of the archaeological programme already implemented in relation to the Project, including a statement of the rationale underlying its development and a description of its general and specific objectives. In particular, the EIS must describe which of the areas that will be affected by the Project were studied and must explain and justify any choices made.

14.4 The EIS must also map and describe any traditional sites and other intangible cultural heritage resources that were identified in interviews with Inuit or in reviews of published or unpublished documents.

14.5 The EIS must take into account the unique knowledge that the Inuit have of their past cultural traditions, practices, and values and of the locations and features of the landscape associated with them. That knowledge is directly related to their perception of the landscape as simultaneously functional and spiritual. Mythical, cosmological, spiritual and sacred places, sites related to particular events or activities, and locations of aesthetic or other value are cases in point. The elucidation and preservation of such cultural heritage resources is of the utmost importance to the preservation and

enhancement of the identity and cultural pride of the Inuit. Although such sites often lack archaeological remains, measures for mitigating impacts on archaeological sites may be applied to their protection.

15. ECONOMY

15.1 The EIS must consider hunting, fishing, trapping, and gathering as economic activities, as well as describing the other roles that they play in Inuit society.

15.2 The description of the economy of the villages, including hunting, fishing, trapping and collecting, must be based on the most recent indicators, which must themselves permit comparisons with other villages and areas. The most relevant indicators are probably: income, expenditures, benefits, salaries, and jobs. The data should be grouped by category of economic activity and by type of establishment, and current systems of classification should be used.

15.3 The EIS must not only identify job opportunities for Inuit that the Project might create, but must also estimate realistically the number, type and duration of jobs that are actually likely to go to Inuit. That estimate should be based on experience with the La Grande Complex and other large projects and should explicitly take into account such factors as the education, training, and work experience of the Inuit manpower pools, Inuit attitudes towards wage employment, and other factors.

16. HEALTH

16.1 The EIS should deal explicitly with current types and frequencies of psychosocial pathologies (conjugal violence, child-abuse, child-neglect, depression, drug- and alcohol-abuse) and should evaluate how the Project might affect them, as well as suggesting mitigating measures and monitoring programmes. In this context, the EIS should evaluate the need for a comprehensive baseline epidemiological study of the populations most likely to be affected and of "control" populations in areas that will not be affected by the Project.

16.2 The EIS should contain a comprehensive socio-sanitary profile, based on standard indicators of mortality and morbidity, as well as on information about the culture and way of life in each of the concerned villages. In this regard, the EIS must document quantitatively the relative importance of country food in the diet and the possible effects thereon of the Project. The EIS must evaluate the impacts of any changes in the availability of country food on physical and psychological health. The Proponent should take full advantage of the Enquête Santé Québec, which is scheduled to start in the Fall of 1992 in the Inuit communities.

16.3 The World Health Organization ("WHO") advocates a concept of health that contains physical, psychological, and social dimensions, all of which are thought to be

interconnected. Any disequilibrium in the two latter is perceived as being reflected in the first, in such forms as physical suffering, violence, accidents, suicide, etc. The EIS should adopt the definition and working hypotheses of the WHO and should systematically evaluate the implications of the Project's proceeding without the active participation, support, and endorsement of the Inuit, particularly those of the communities likely to be most directly affected. The probability of unequal relations and poor communications between several thousand transient workers and the small, permanent Inuit population merits special consideration in this regard.

16.4 Finally the present system for delivering health and social services, particularly in Kuujjuaraapik, should be described, and any impacts related to the Project should be carefully assessed.

17. MONITORING

The Proponent should be directed to arrange its proposals for biophysical monitoring hierarchically by ease and accuracy of prediction. Physical and chemical conditions would probably be the basic habitat parameters. Changes in these would be linked to expected biotic responses through a chain of functional responses, leading ultimately to species that are important to local communities or to society as a whole.

18. EMPLOYMENT

In reviewing Project-related employment opportunities for the Inuit, the EIS should consider the possible negative consequences of employment and training. For instance, an increase in cash can upset the principle of reciprocity, while training can change the values of young persons by drawing them away from traditional activities, thereby stimulating or increasing inter-generational tensions. The EIS should also examine the need to provide continuing employment for those who are trained and should evaluate the costs and feasibility of so going.

19. BOOM AND BUST CYCLES

The EIS should examine the probability that the Project might cause or aggravate boom and bust cycles locally, regionally, or otherwise. It should review relevant experience elsewhere and should consider the full range of social, cultural, and economic impacts associated with such cycles. In particular, the sections of the EIS dealing with mitigating measures should examine the feasibility of avoiding or attenuating such cycles.

20. AESTHETIC AND WILDERNESS VALUES

We recommend that the guidelines direct the Proponent to address the full range of intangible values commonly subsumed under the rubric "aesthetic and wilderness values." It goes without saying that Inuit and other perspectives should be considered.

21. SUSTAINABLE DEVELOPMENT

We recommend that the guidelines compare and evaluate the notion of "sustainable development", as defined by the Brundtland Commission with that of "sustainability" as defined by the World Conservation Union (IUCN et al. 1990. *Caring for the World: A Strategy for Sustainability*. Gland: IUCN.). The latter, with its three dimensions of ecological sustainability, social and cultural sustainability, and economic sustainability, possibly offers more analytical power and lends itself better to the objectives of a focused EIS.

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ANNEX I

LIST OF TECHNICAL ADVISORS

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