Environment Canada Environnement Canada

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February 21, 2011 File No: 4194-22-2

Ms. Lesley Griffiths
Co-Chair, Joint Review Panel
Lower Churchill Joint Review Panel Secretariat
33 Pippy Place, P.O. Box 8700
St. John's, NL A1B 5J6

Mr. Herbert Clarke
Co-Chair, Joint Review Panel
Lower Churchill Joint Review Panel Secretariat
33 Pippy Place, P.O. Box 8700
St. John's, NL A1B 5J6

Dear Ms. Griffiths and Mr. Clarke:

RE: Lower Churchill Hydroelectric Generation Project - Departmental Submission and Presentation

This is in response to your letter of January 25, 2011 asking that Environment Canada (EC) participate in the public hearing and in particular the topic specific sessions that pertain to our mandate. The attachment to your letter identifies a list of preliminary issues for the department to consider and discuss in the public hearing. The purpose of this letter is to provide a copy of our general submission and, based on it, the presentation we would like to make during the General Sessions scheduled March 3rd to 5th. These two documents are attached. A 15 minute time slot will be sufficient for our presentation. The presenter will be Jeffrey Corkum, Manager, Environmental Assessment and Marine Programs. He will be presenting as Acting Regional Director, Environmental Protection Operations Directorate Atlantic of EC.

EC has responded your January 25 letter, but has not yet received a response. To reiterate, the list of required expertise includes elements for which EC does not have expertise to offer. Firstly, EC is unable to address the impacts of the project on drinking water supply and quality. We understand this issue is related to the potential incursion of salt water into the estuary during impoundment of the reservoir(s). Our expertise in water quality does not include this type of modelling and we therefore have no advice to offer on this issue. We understand that our colleagues at Natural Resources Canada, Fisheries and Oceans Canada and the provincial Water Resources Division intend to address this issue at the hearing.

Secondly, EC cannot provide expertise or advice with regard to impact determination and methodology on rare plants. Any populations of plants that could be impacted by this project do not reside on federal lands. The Minister of the Environment is the Competent Minister under the *Species at Risk Act* for such cases and has confirmed the necessary scientific expertise and legislative authority lies with the provincial Department of Environment and Conservation. We understand that our provincial colleagues are prepared to address this issue at the hearing.

EC was also asked to present at a number of topic specific sessions for which we are seeking clarification and for which we also have suggestions on how we can most effectively help meet the panel's request. As such, EC asks that you consider the following:

Atmospheric Environment

EC has been asked to provide expertise with respect to greenhouse gases (GHG) and present to a Topic-specific session on Atmospheric Environment. However, your document "Information for Public Hearing Participants" public notice registry number 561 dated January 24, 2011 does not identify a topic specific session dedicated to atmospheric environment. EC reviewed and commented upon atmospheric environment issues regarding the reconciliation of GHGs produced and potentially offset by the project and as previously indicated we are satisfied with the adequacy of the Proponent's analysis. Therefore, it is proposed that we discuss these findings during the General Session. Alternatively, since the GHG issue is in part related to reservoir preparation EC can present the requested expertise to the topic-specific session on Reservoir Preparation. Please advise as to the Panel's preference on this topic.

Reservoir Preparation

With regard to reservoir preparation, EC has little to offer that has not already been provided in our written submissions. Our engagement on this topic was limited to methods for estimating GHG emissions from the various reservoir clearing scenarios (addressed above) and to a limited extent the analysis of how mercury accumulation may be mitigated by reservoir preparation options. With regard to mercury accumulation, EC expertise is focused on the movement and accumulation of methylmercury in fish eating wildlife after the methylation process has occurred. Although we are aware of the issues surrounding methylation of mercury on inundated lands we recognize that our colleagues at NRCan represent the best expertise available on this topic. Therefore, EC does not likely have information of value or substance beyond what we have offered to date.

Environmental Management, Monitoring and Follow-up

EC is making recommendations to the panel regarding follow up programs for mercury accumulation in fish eating wildlife, effects on specific waterfowl species and compensation for wetlands lost to flooding. EC intends to address each of these recommendations within the context of the key indicator affected during the relevant topic-specific sessions. Similarly, with regard to environmental management, EC has mandated interest and expertise with respect to the management, storage, handling and transportation of hazardous materials and waste. Nevertheless, with respect to all these issues EC does not expect to see detailed programs or contingency plans at this stage

of project planning. Rather our expectation and recommendation is that these programs be developed in future and approved by the appropriate agencies prior to construction. EC is prepared to review these documents and advise the responsible authority whether they are acceptable or not. EC does not have anything further to offer on the Proponent's treatment of these topics to date. Therefore we are proposing to address follow-up and monitoring under the aquatic and terrestrial topic specific sessions and to address environment management in the general session. Please advise whether this approach is acceptable to the panel.

The department looks forward to participating in the public hearing and we would be pleased to offer any further information that will assist you in determining the sessions in which EC is best positioned to present its expertise to the panel.

Yours truly,

<original signed by>

I.R. Geoffrey Mercer
Regional Director
Environmental Protection Operations Directorate
Atlantic

cc: Glenn Troke
Stephen Zwicker

Att.: EC Submission, Lower Churchill Hydroelectric Generation Project JRP Hearings
EC Presentation, Lower Churchill Hydroelectric Generation Project JRP Hearings

CANADA – NEWFOUNDLAND AND LABRADOR JOINT REVIEW PANEL HEARINGS

NALCOR ENERGY

LOWER CHURCHILL HYDROELECTRIC GENERATION PROJECT

SUBMISSION OF THE DEPARTMENT OF THE ENVIRONMENT (ENVIRONMENT CANADA)

February 21, 2011

Environment Canada | Environnement Canada

Address for Communications:

Communications can be sent to Environment Canada at the address below

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Signed on behalf of Environment Canada

<original signature removed>

21 Feb 11

Sue Milburn-Hopwood **Date**
Director General
Environmental Protection Operations Directorate
Environment Canada

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EXECUTIVE SUMMARY

On January 25, 2011, the Joint Review Panel (JRP) wrote to Environment Canada (EC) requesting the Department's participation in the Panel Hearing. The JRP asked that EC provide a written submission on the potential effects of the Lower Churchill Hydroelectric Generation Project (the Project) based on the department's areas of responsibility and expertise.

To this end, EC has evaluated the Project to develop, construct, and operate two hydroelectric generation facilities; one at Gull Island (2,250 megawatt (MW)) and the second at Muskrat Falls (824 MW), interconnecting transmission lines and the construction of associated dams and reservoirs. The reservoir flooding required for the Project is 126 km^2. The Project is located on the lower Churchill River in Labrador, Newfoundland and Labrador.

For projects that require a federal environmental assessment, EC, as a Federal Authority, provides specialist or expert information or knowledge on environmental matters, in accordance with the expertise that the Department has available as it relates to EC's mandate, and in accordance with subsection 12(3) of the *Canadian Environmental Assessment Act* (CEAA), and in accordance with our regulatory responsibilities.

This submission summarizes EC's outstanding concerns and issues, and includes advice, observations and recommendations based on a review of the information provided by Nalcor Energy. This includes the Proponent's Environmental Impact Statement and supporting documents,

their responses to the Information Requests issued by the Joint Review Panel, other information available to the Department, and information posted on the Canadian Environmental Assessment Registry.

EC's submission focuses on its concerns related to air quality (e.g. greenhouse gases), migratory birds, species at risk, accidents and malfunctions, water quality and the accumulation of mercury in fish eating wildlife. A summary of EC's recommendations can found in Chapter 9.

Overall, if the project and associated mitigation activities are well executed, Environment Canada expects there will not be any significant adverse effects on environmental matters within the Department's mandate. Furthermore, execution of this project could have a beneficial environmental impact through its potential to offset greenhouse gas emissions elsewhere.

CHAPTER 1 – INTRODUCTION

Environment Canada (EC) is responsible for the implementation of the Government of Canada's environmental agenda. EC's mandate covers the preservation and enhancement of the quality of the natural environment, including water, air and soil, flora and fauna, including species at risk and migratory birds. Science plays a fundamental role in enabling EC to deliver on the Department's mandate by informing environmental decision-making and regulations and by supporting the delivery of services to Canadians. EC, as a Federal Authority (FA), provides specialist or expert information or knowledge to Responsible Authorities (RAs), mediators and panels on environmental matters, in accordance with the expertise that the department has available as required under subsection 12(3) of the *Canadian Environmental Assessment Act* (CEAA).

In addition to EC's mandate to conserve and enhance the quality of the natural environment, the Department administers Section 36(3) of the *Fisheries Act* which prohibits the deposit of a deleterious substance into fish-bearing waters. EC also participates in the regulation of chemicals and the development and implementation of environmental quality guidelines pursuant to the *Canadian Environmental Protection Act, 1999* (CEPA). EC is responsible for protecting and conserving migratory birds, as populations and individual birds, under the *Migratory Birds Convention Act, 1994* (MBCA), and administers the *Species at Risk Act* (SARA), which has objectives to prevent wildlife species from becoming extirpated or extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and

to manage species of special concern to prevent them from becoming threatened or endangered.

On January 25, 2011, the Joint Review Panel (the JRP) wrote to EC requesting EC's participation in the public hearing. The JRP asked that EC present evidence at the hearing on the potential effects of the Lower Churchill Hydroelectric Generation Project based on the Department's areas of responsibility and expertise.

To this end, EC has evaluated the Nalcor Energy proposal known as the Lower Churchill Hydroelectric Generation Project (the Project). The Lower Churchill Project includes the site preparation, construction, and operation of two hydroelectric generation facilities; one at Gull Island (2,250 megawatt (MW)) and the second at Muskrat Falls (824 MW), interconnecting transmission lines and the construction of associated dams and reservoirs.

This submission summarizes EC's review of the Environmental Impact Statement (EIS) and supporting technical documents, additional information provided by Nalcor Energy and the supplemental information provided in response to Information Requests issued by the JRP, and other information submitted by Nalcor Energy throughout the EIS review process. This submission identifies any outstanding concerns related to issues we have identified, and makes recommendations for consideration by the JRP and other interested parties. If new information is brought forward, the conclusions and recommendations provided in this submission may be reconsidered and amended as necessary.

EC's submission focuses on issues related to air quality, water quality, accidents and malfunctions, migratory birds,

species at risk and cumulative effects. In particular, our comments are focused on those issues of "required expertise" identified by the JRP in the attachment to its letter of invitation dated January 25, 2011, except where EC does not posses the requested expertise. These areas include impacts on drinking water supply, and impact determination on rare plants. Further, our expertise in methylmercury accumulation is focused on mercury accumulation in fish eating wildlife. Our colleagues at Natural Resources Canada are better suited, and are commenting upon, other aspects of mercury contamination, the methylation process, and mitigation options.

Our comments related to air quality, water quality, accidents and malfunctions, migratory birds, species at risk, monitoring and follow-up, and cumulative effects are found in Chapters 3 to 8 of this submission. Chapter 9 summarizes EC's list of recommendations by topic or subject area. Information on the legislation from which EC's mandates arise is provided in Chapter 2.

EC based its analyses on the principle that the Project, if approved, should be planned, built, operated, and decommissioned in a manner that ensures the highest level of environmental protection so that the well-being of Canadians is enhanced and the natural environment is conserved.

EC has undertaken a science-based review of the various issues of interest to our Department. Throughout our review and in our previous submissions to the JRP, we have asked questions that were necessary to ensure that scientific rigour was applied to any modelling and other analyses provided by Nalcor Energy. EC did this to ensure that the data used to

support the analyses and the predictions and conclusions were credible.

In the conduct of our review, we were guided by a number of over-riding principles or concepts, including the following:

- The precautionary principle, which recognizes that the absence of full scientific certainty shall not be used as a reason to postpone decisions in the face of the threat of serious or irreversible harm.
- An ecosystem approach to environmental management, which is a method of environmental stewardship that focuses understanding, decision making, and program action on maintaining the capacity of a whole system to produce ecological goods and services by concentrating on the long-term health of ecosystem structure, processes and interactions. The intent is to proactively integrate environmental, economic, and social objectives within ecological scales and timeframes in order to achieve environmental sustainability.
- The use of Best Available Technology Economically Achievable (BATEA) and best management practices to prevent, reduce or eliminate the direct or indirect release of effluents and substances into aquatic, atmospheric and terrestrial ecosystems.

The recommendations within this submission are provided for consideration by the JRP. However, this does not preclude Nalcor Energy from adopting them in advance of any final recommendations by the JRP.

Nalcor Energy has made a variety of commitments throughout their environmental assessment, and it will be necessary for government regulators to ensure these

commitments are followed through during the detailed design phase and subsequent phases.

CHAPTER 2 – EC: MANDATE, ROLES & RESPONSIBILITIES

2.1 Introduction

The mandate of Environment Canada (EC) is determined by the statutes assigned to it by Parliament through the Minister of the Environment. In delivering this mandate, the Department is responsible for the development and implementation of regulations, policies, guidelines, codes of practice, inter-jurisdictional and international agreements, and related programs.

Subsection 12(3) of the *Canadian Environmental Assessment Act* (CEAA) sets out EC's responsibility as a Federal Authority (FA) as follows:

> *"Every federal authority that is in possession of specialist or expert information or knowledge with respect to a project shall, on request, make available that information or knowledge to the responsible authority or to a mediator or a review panel."*

The scope of specialist or expert information or knowledge provided by EC in this submission to the Joint Review Panel (JRP) is within the Department's mandate as defined by the *Department of Environment Act* and through other legislation assigned to the Minister of the Environment.

Should the Lower Churchill Hydroelectric Generation Project proceed, the *Fisheries Act*, the *Canadian Environmental Protection Act, 1999 (*CEPA*)*, the *Migratory Birds Convention Act, 1994* (MBCA), the *Species at Risk Act (*SARA*)*, and regulations made under these Acts, would be applicable to the Project and would be binding on the Proponent. EC also

advocates that Nalcor Energy adhere to the Federal Policy on Wetland Conservation.

The key pieces of relevant legislation and policy administered by EC that influenced the content of this submission are summarized in this chapter. The following summaries have been prepared for ease of reference and convenience only. For purposes of reliability and accuracy, and for interpreting and applying the Act, regulation or policy, it is recommended that the reader review the original document itself, including any subsequent amendments.

Environment Canada's comments and recommendations in this submission are intended to provide expert support to project proponents and decision-makers, in accordance with its program related responsibilities and associated guidelines and policies. These comments and recommendations are in no way to be interpreted as any type of acknowledgement, compliance, permission, approval, authorization, or release of liability related to any requirements to comply with federal or provincial statutes and regulations. Responsibility for achieving regulatory compliance and cost effective risk and liability reduction lies solely with the project proponent.

2.2 *Fisheries Act* – Pollution Prevention Provisions

The responsibility for the administration (including the enforcement) of the pollution prevention provisions of the *Fisheries Act* has been assigned to the Federal Minister of the Environment.

Subsection 36(3) of the *Fisheries Act* states that, unless authorized by federal regulation, no person shall deposit or permit the deposit of deleterious substances of any type in

water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water. The definition of "deleterious" in s. 34(1) of the *Fisheries Act* includes (a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or

(*b*) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water,

Subsection 36(3) makes no allowance for a mixing or dilution zone.

In the application of the *Fisheries Act*, court cases have established that a discharge or effluent that is acutely lethal to fish is deleterious. In other words, results of tests designed to determine whether fish will die in an effluent or discharge within a specified time period is one factor in determining whether a discharge is "deleterious". However, any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat would be deleterious. For example, substances that negatively alter or impact rearing areas or spawning grounds, or interfere with reproduction, feeding or respiration of fish, at any point in their life cycle would also be considered to be deleterious.

Meeting the requirements of the *Fisheries Act* is mandatory, irrespective of any provincial regulations or permits. In the absence of an applicable federal regulation authorizing their release and to the extent that the substance is a prescribed substance or that it can be demonstrated that this substance is a "deleterious substance" as defined in paragraph 34(1) of the *Fisheries Act*, any release from the construction, operation, reclamation or decommissioning stages of the Project to any waters frequented by fish, may constitute violations of the *Fisheries Act*.

Compliance with the terms and conditions of a provincial regulation or permit does not absolve Nalcor Energy from responsibility for compliance with the requirements of the *Fisheries Act* or other federal legislation. Further, this submission does not constitute an authorization pursuant to subsection 36(4) of the *Fisheries Act*, and any deposit of a deleterious substance into water frequented by fish may constitute a violation of the *Fisheries Act* and warrant enforcement action.

2.3 *Canadian Environmental Protection Act, 1999*

In Canada, the federal government, as well as provincial, territorial and Aboriginal governments, share responsibility for protecting the environment -- an approach that calls for close collaboration as governments work to support the well-being of Canadians. As a cornerstone of the Government of Canada's environmental legislation, CEPA 1999 is aimed at preventing pollution and protecting the environment and human health.

One of CEPA 1999's major thrusts is the prevention and management of risks posed by harmful substances. As well,

CEPA 1999 provides for the assessment and/or management of the environmental and human health impacts of new and existing substances. This includes products of biotechnology, marine pollution, disposal at sea, vehicle, engine and equipment emissions, fuels, hazardous wastes, environmental emergencies and other sources of pollution.

CEPA 1999 is a major legislative initiative guided by a set of principles that ensure consistent approaches for achieving clear objectives to:

- contribute to sustainable development by *preventing pollution;*
- promote coordinated action with provinces, territories, Aboriginal governments, and federal departments *to achieve the highest level of environmental quality for the health of Canadians;* and
- manage risks from harmful substances and *virtually eliminate releases of those substances determined to be the most dangerous.*

2.4 *Migratory Bird Convention Act, 1994*

The purpose of the *Migratory Birds Convention Act, 1994* is to implement the Migratory Birds Convention between Canada and the United States by protecting and conserving migratory birds, as populations and individual birds. The *Migratory Birds Regulations* provide for the conservation of migratory birds and for the protection of their nests and eggs. Section 5.1 of MBCA prohibits the deposit of a substance that is harmful to migratory birds in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. A

prohibition against the disturbance, destruction, or taking of a nest, egg or nest shelter of a migratory bird without a permit is set out in Subsection 6(a) of the *Migratory Bird Regulations*.

2.5 *Species at Risk Act*

The *Species at Risk Act* (SARA) is a result of the implementation of the Canadian Biodiversity Strategy, which is in response to the United Nations Convention on Biological Diversity. The purpose of SARA is intended to prevent wildlife species from becoming extirpated or extinct; to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity; and to manage species of special concern to prevent them from becoming threatened or endangered. The Act applies to all of Canada; all wildlife species listed as being at risk; their residences and their critical habitat.

The prohibitions under sections 32 and 33 of SARA, which came into force in June 2004, make it an offence to:

- Kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species;
- Possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species, or a threatened species, or any part or derivative; or
- Damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered or threatened species or that is listed as an extirpated species if a recovery strategy has recommended its reintroduction into the wild in Canada.

The federal government's responsibility for listed aquatic species under the *Fisheries Act*, and birds protected by the *Migratory Birds Convention Act, 1994* means that the SARA prohibitions in sections 32 and 33 apply to those species wherever they are found, and these prohibitions apply to all listed species on federal lands, and, in some cases, to provincial lands as well.

Schedule 1 of the SARA provides a list of wildlife species at risk in Canada that are considered extirpated, endangered, threatened, or of special concern. Once a species is listed on Schedule 1, the Competent Minister must prepare recovery strategies for wildlife species listed as extirpated, endangered, or threatened. Final recovery strategies are posted on the SARA Public Registry. Management plans are developed for species of special concern in much the same way as recovery strategies are developed.

The Minister of the Environment is the Competent Minister for all terrestrial species listed under SARA, while the Minister of Fisheries and Oceans is the Competent Minister for all aquatic species listed under the Act. Thus Environment Canada has responsibility for the SARA provisions for all terrestrial species when not found on National Parks (the Parks Canada Agency has responsibility for those listed species on National Parks lands).

2.6 The Federal Policy on Wetland Conservation

The Federal Policy on Wetland Conservation was adapted in 1991. The objective of this policy is to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future. The policy is a shared federal responsibility that directs all

departments to sustain wetland functions in the delivery of their programs, services or expenditures. The goals of the Policy include:

- maintaining the functions and values of wetlands;
- ensuring no net loss of wetland functions on all federal lands and waters;
- enhancing and rehabilitating wetlands in areas prone to degradation and loss;
- recognizing wetland functions in resource planning and management with regard to federal programs, policies and activities; and
- securing significant wetlands; and recognizing and utilizing sustainable management practices to conserve wetlands.

The policy promotes the concepts of cooperative approaches to wetland conservation, the need for linkages between wetlands conservation and other related initiatives (e.g. water policy, wildlife conservation), and the promotion of wetland protection through adequate consideration of wetland concerns in environmental assessments. Wetlands, as identified in the policy, include bogs, fens, marshes, swamps and shallow waters.

2.7 Wildlife Policy for Canada

A Wildlife Policy for Canada was adopted by the Wildlife Ministers Council of Canada in 1990. A guiding principle of the policy is that wildlife is an integral part of the environment in which Canadians live and is a key indicator of environmental health [Wildlife Minister's Council of Canada 1990]. The goal of this policy is to maintain and enhance the health and diversity of wild flora and fauna and other wild organisms, both for their own sake and for the benefit of present and future generations.

2.8 The Federal Water Policy

The Federal Water Policy addresses the management of water resources, balancing water uses with the requirements of the many interrelationships within the ecosystem. The policy takes into account the needs of all Canadians in its overall objective to encourage the use of freshwater in an efficient and equitable manner consistent with the social, economic and environmental needs of present and future generations.

To manage Canada's water resources, the federal government has defined two main goals:

- to protect and enhance the quality of the water resource; and,
- to promote the wise and efficient management and use of water.

The policy stresses that government action is not enough. Canadians at large must become aware of the true value of water in their daily lives and use it wisely. We cannot afford to continue undervaluing and therefore wasting our water resources.

2.9 Canada-Wide Standards

Canada-Wide Standards were established pursuant to the 1998 Canada-wide Accord on Environmental Harmonization of the Canadian Council of Ministers of the Environment (CCME) and its Canada-wide Environmental Standards Sub-Agreement, to which the Government of Canada and the Government of Newfoundland and Labrador are signatories.

These Standards are an important step towards the long-term goal of minimizing the risks that PM and ozone impose to human health and the environment. The Standards represent a balance to achieve health and environmental protection possible in the relative near term and taking into consideration the feasibility and costs of reducing the pollutant emissions that contribute to elevated levels of PM and ozone in ambient air.

The Standards commit federal, provincial and territorial (F/P/T) jurisdictions to undertake the implementation of continuous improvement, pollution prevention and keeping clean areas clean.

F/P/T jurisdictions should work with their stakeholders and the public to establish programs that apply pollution prevention and best management practices, by, for example:

- developing and implementing strategies consistent with the CCME commitment to pollution prevention;
- ensuring that new facilities and activities incorporate the best available economically feasible technologies to reduce PM and ozone levels;
- requiring that upgrades carried out in the course of normal capital stock turnover incorporate the best available economically feasible technologies to reduce PM and ozone ambient levels; and
- reviewing new activities that could contribute to an increase in PM and ozone level with stakeholders and the public in terms of their social, economic and environmental merits.

Application of best available technology and best management practices should result in the greatest probability that ambient air quality is maintained at levels

below the most stringent requirements imposed by F/P/T jurisdictions; and that trans-boundary air quality impacts, including increases in ambient concentrations of pollutants, increases in acid deposition, and decreases in visibility will be minimized.

2.10 The 1973 Cabinet Directive Relative to Environmental Emergencies

The Cabinet Directive from 29/11/73 directs Environment Canada to coordinate efforts to deal with environmental emergencies including reporting and responding to incidents in consultation with the provinces, other federal departments and agencies as well as industry. Environment Canada was required to establish Regional Environmental Emergencies Teams across the country to facilitate provision of coordinated and consolidated scientific and technical advice during an incident as well as the identification of environmental sensitivities. The Directive also ensured Environment Canada would take the lead for any incident which was not assigned to another department or in the case where the environment was not being protected. The Department was also given a mandate to conduct spill Research and Development, including testing and demonstration of response equipment.

CHAPTER 3 – ATMOSPHERIC ENVIRONMENT

3.1 Introduction

During construction and operation, emissions of air pollutants and greenhouse gases (GHG) from the Project could result in adverse effects to the atmosphere. The Proponent also identifies the overall reduction of GHG as a net benefit of the Project. Environment Canada has considered these effects in the context of our legislated mandate under *The Department of the Environment Act* and the national standards identified below.

Federal thresholds for air quality include *Canada-wide Standards* for ozone and particulate matter (PM) and National Ambient Air Quality Objectives (NAAQO), which are annual, 24-hour and 1-hour maximum acceptable concentrations for Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2) and Carbon Monoxide (CO). For further information on criteria for assessing air quality please refer to the Canadian Council of Ministers of the Environment *Canada Wide Standards* pages: http://www.ccme.ca/ourwork/environment.html?category_id=108, and Health Canada's page on the National Ambient Air Quality Objectives: http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/reg_e.html. Some new, single-tier NAAQO have been developed for certain substances (Particulate Matter and Ozone). However, for other substances such as NO_2 and SO_2, new standards have not been developed, and so the thresholds in the National Ambient Air Quality Objectives and Guidelines in Canada table remain valid.

Canada-Wide Standards for Particulate Matter (PM) and Ozone (O_3) state that new facilities and activities should

incorporate best available technologies and Best Management Practices to reduce emissions of PM and precursor pollutants.

With regard to greenhouse gas the Government of Canada has established a national greenhouse gas (GHG) target of 17% below 2005 levels by 2020, which will be aligned with the final economy-wide emissions target of the U.S. in enacted legislation. The Government of Canada has indicated that it intends to develop federal measures to address GHG emissions.

3.2 Air Quality

Environment Canada staff have reviewed the air pollutant emissions estimates and subsequent conclusions presented by the proponent in the EIS for the Lower Churchill Hydroelectric Project. Conventional air emissions relevant to this project include the Criteria Air Contaminants (e.g. Nitrogen Oxides (NOx), Sulphur Oxides (SOx), Volatile Organic Compounds (VOCs), PM, CO)

Emissions from transportation and off-road equipment have been estimated appropriately using information on expected equipment use and fuel requirements combined with standard emissions factors. Emissions factors for this type of activity are well-defined, so any uncertainty would be low. Similarly, the estimates of fugitive emissions (i.e. dust from roads and various earth moving activities) and the emissions from Concrete Batching are also well-characterized.

Work in other areas have shown that any potential effects of air emissions from the sources identified in the EIS are very local and of short duration, leaving no ongoing measurable

environmental effects once the emissions end. EC staff has compared the magnitude of emissions for this project with those for other projects and concur with the proponent's conclusion that air emissions will not result in a significant environmental effect. The emissions presented here are small and are often an order of magnitude smaller than levels which previous projects have shown might lead to exceedances of ambient air quality standards outside the immediate work site. No long term effects of the emissions would be expected after the construction periods end. There are no significant on-going emissions resulting from the operation of the project, therefore no air pollution effects would be expected from that phase.

Recommendation 3.1

During the site preparation and construction phases, potential air quality effects have been highlighted by in the EIS. However, various measures can be implemented to reduce dust and particle emissions/formation from the site preparation/construction activities to minimize air emissions including those from construction vehicles. EC recommends that the Best Management Practices outlined in the following document be implemented as a component of Nalcor's strategy to mitigate air quality effects during the site preparation and construction phase:
"Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (May 2005, prepared by ChemInfo Services Inc. for Environment Canada).

3.3 Climate

One of the reasons the Proponent gives for carrying out the project is the overall reduction in Greenhouse Gas (GHG) emissions. On its own, the construction of the project does not reduce GHG emissions. In fact, the construction of the project will produce GHGs, and the clearing/flooding of land as part of the reservoir preparation takes a potential GHG sink out of service. The project does, however, have the potential to displace other sources of electricity which can produce GHG emissions. A complete assessment of the GHG emissions related to the project must take into account the emissions created by the project, the emissions cost to taking a potential sink out of service, and an estimate of the possible displacement of GHG emissions. Environment Canada has reviewed the documents provided in the EIS and has determined that these components have been adequately represented. These are discussed below.

Emissions from Construction and Reservoir Preparation

Estimates of the GHG emissions related to the project construction are straightforward calculations based on the estimated operation of fossil fuel using equipment. The Proponent has adequately estimated these emissions and they make up an insignificant proportion of the potential for the project to displace emissions from other sources of electricity.

Estimates of GHG emissions from reservoir preparation involves both the direct emissions from any land clearing (i.e., a function of fossil fuel actually used to carry out the clearing) as well as the emissions from the degradation of any remaining vegetation along with the taking out of service

of a potential sink. Standard emissions procedures for this have been developed by the Intergovernmental Panel on Climate Change (IPCC) and it is Environment Canada's opinion that the Proponent has estimated emissions using the most appropriate methodology.

The IPCC Tier 3 method, based on the use of a local, Churchill River watershed model, will produce the most accurate emissions estimates. The Tier 1 model uses aggregate data and default emissions factors, while the Tier 2 model uses country-specific emissions factors (which are likely more applicable to smaller countries rather than Canada with its wide range of land covers). The Tier 3 method uses detailed, more site-specific data. While Environment Canada lacks the specific forestry and land-use expertise to comment on whether they have applied the model correctly, the Department recognizes that the Tier 3 methodology is most appropriate.

The assumption that partial clearing would result in fewer direct emissions (i.e. due to the fuel used in the actual clearing operations) is sound and would, in part, offset the emissions resulting from the flooding of the land and eventual degradation of the vegetation, bringing the estimates for partial clearing and full clearing closer together. The estimated difference between the GHG emissions of the two options are very small (i.e. < 2%) and of a magnitude that will have no measurable effect on the atmosphere. Given this fact, it is appropriate that the selection of partial vs. full clearing options consider other factors such as dust and erosion, which may have a more immediate and significant effect.

Potential Displacement of Emissions from Other Sources of Electricity

In order to estimate the potential quantity of emissions that may be displaced by this project, some knowledge of exactly what sources of electricity will be displaced is required. Due to uncertainties in both the ultimate destination for the electricity that may be produced by this project, and the opportunities to displace specific emissions sources, a firm estimate cannot be given at this time.

In Attachment A of its response to IR#JRP.146, the Proponent provided a full assessment of the potential opportunities to replace other sources of electricity within the full range of potential markets for Lower Churchill. This assessment identified all of the reasonable possibilities, calculated the potential GHG displacement potential and then estimated and presented a full range of emissions scenarios. While this range may be narrowed somewhat with a better understanding of future GHG emissions and energy policies, Environment Canada is of the opinion that the range of scenarios presented by the Proponent provides an adequate tool for decision-making.

In summary, the actual construction of a dam or almost any other project will always produce GHGs rather than reduce them. The construction of this project, however, has the potential to displace far larger GHG emissions elsewhere, resulting in a net benefit in terms of GHG emissions. While the actual amount of GHGs that would be displaced can not be confirmed at this time, scenario options have shown that the project will be able to displace several times (greater than an order of magnitude) more GHG emissions than would be produced during the construction of the facility itself and the accompanying change in land cover.

CHAPTER 4 – AQUATIC ENVIRONMENT

4.1 Introduction

Construction of hydroelectric dams and flooding of the Lower Churchill River valley will cause mercury levels in local fish to increase for 10-20 years. This increase in fish mercury levels has been reasonably predicted in the Proponent's Information Requests Response IR# JRP.156. This section reviews the potential impacts of mercury on wildlife. Potential mercury impacts on the health of fish and humans are discussed by other agencies.

4.2 Ecological Risk Assessment for Mercury

The Proponent conducted an ecological risk assessment to evaluate the exposure of osprey and river otter in the Lower Churchill River to increased fish mercury levels after construction of the project (Minaskuat 2008). The general approach of the eco-risk assessments was reasonable, but some of the detailed calculations raised concerns.

In the osprey risk assessment, the exposure of osprey to mercury was underestimated. This concern was initially raised in Environment Canada's Information Request EC-23. The Proponent's response IR# JRP.22b did not correct the problem and in fact misrepresented the calculation methods used.

The osprey risk assessment only considered mercury exposure during the six months of each year that the birds are present in the project area and ignored their mercury

exposure during the other half of the year when the birds migrate south. Osprey will be affected by their total year-round mercury exposure, and the risk assessment needs to address this year-round exposure. Minaskuat (2008) clearly states in section 6.2.2 that in calculating the exposure of osprey to mercury in fish, that only "the fraction of the total ingestion rate from the site (f_{site}, assumed to be ... 0.5 for the migratory Osprey) ..." was considered. In Appendix B (ERA Calculations), Table 1 shows that mercury risks to osprey were calculated using an f_{site} value of 0.5. This led to a significant underestimation of osprey mercury exposure.

The eco-risk assessment should have calculated the osprey's mercury exposure by also including an estimate of exposure during the 6 months that osprey are away from the project site. This could have been done either by using the baseline fish mercury levels in Minaskuat (2008) as an estimate of offsite fish mercury levels, or by using fish mercury levels taken from the literature that are representative of osprey diets over the winter. For example, Kannan et al. (1998) found a mean mercury concentration of 0.31 ug/g (wet weight) in estuarine fish in southern Florida.

Re-calculating the osprey risk assessment correctly using the Proponent's data in Minaskuat (2008) and the updated data in IR# JRP.156d yielded very different results than those provided by the Proponent. The baseline fish mercury level of 0.13 mg/kg was used to estimate the offsite mercury exposure of osprey and the revised project-plus-baseline fish mercury level of 0.53 mg/kg was used to estimate the onsite exposure. These calculations yield a Hazard Quotient of 0.95 for the baseline plus project. This contrasts with the Hazard Quotients reported in Minaskuat (2008) of 0.67 and in IR# JRP.156d of 0.76 for the baseline plus project.

Checking the calculation of the Hazard Quotient for the river otter yielded a value of 0.96, which is higher than 0.83 reported in Minaskuat (2008) and 0.93 reported in IR# JRP.156d. As a result, the correct Hazard Quotient for osprey is 0.95 and for river otter is 0.96, both of which are significantly greater than 0.80, the value selected by the Proponent as the threshold for toxicity for the ecological risk assessment (section 6.4 of Minaskuat 2008).

In conclusion, using the Proponent's criteria and threshold, mercury increases associated with construction of the Lower Churchill Project will exceed the threshold for toxicity in both osprey and river otter which would indicate that additional monitoring is necessary.

4.3 Monitoring of Mercury Levels in Wildlife

Given the findings of the ecological risk assessment for mercury, it is important that the monitoring of mercury levels in osprey and river otter in the project area before and after construction be carried out in a scientifically defensible manner. This monitoring will assess the degree and extent of increases in mercury levels in osprey and river otter associated with the project.

In Information Request EC-24, EC raised concerns about the inadequate baseline monitoring of mercury levels in osprey. Osprey feathers were collected by the Proponent for mercury analysis from only five nests adjacent to the Lower Churchill River in a single year. This constituted an inadequate baseline sample on which to base follow-up monitoring. The Proponent's response in IR# JRP.22c incorrectly diminished the need for any baseline data, and focused instead on post-construction monitoring.

Recommendation #4.1
Additional baseline data on osprey mercury levels are necessary to provide an accurate basis for evaluating trends in osprey mercury levels after project construction. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

EC raised similar concerns about the absence of any baseline monitoring data on mercury levels in river otter in the project area (Information Request EC-24). The Proponent's response (IR# JRP.22d) provided an explanation of logistical difficulties in collecting samples and an indication that monitoring of mercury levels in river otter might be abandoned.

Recommendation #4.2
Given the selection of river otter as a valued ecosystem component (VEC) for mercury monitoring, and the predicted mercury toxicity from the eco-risk assessment, additional baseline and follow-up monitoring data of mercury levels in river otter are vital to evaluate mercury trends in otters after project construction. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

Recommendation #4.3
Given the findings of the ecological risk assessment for mercury, it is important that the monitoring of mercury levels in osprey and river otter in the project area before and after construction be carried out in a scientifically defensible manner. This monitoring will assess the degree and extent of increases in mercury levels in osprey and river otter associated with the project. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

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CHAPTER 5 – TERRESTRIAL ENVIRONMENT

5.1 Introduction

During the development and operation of the Project, there will be negative effects on migratory birds, biodiversity, wetlands and any species at risk that may be present within the project area due to the near complete removal of existing habitat within the Project's footprint. Environment Canada (EC) has considered these impacts in the context of our legislated mandate under the *Migratory Birds Convention Act, 1994* (MBCA) and the *Species at Risk Act* (SARA).

The recommendations that follow are guided by the following:

- Compliance with MBCA and *Regulations*, including no disturbance or destruction of migratory birds or their nests;
- Compliance with SARA, including the prohibition against the killing or harming of species listed under federal authority, or the damage or destruction of residences of the individuals of a species or destruction of the species' critical habitat;
- Mitigation and monitoring for adverse effects on species at risk that are consistent with recovery strategies and action plans;
- Adherence to the draft "*Federal Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada* (Environment Canada, 2004)" for mitigation in absence of finalized recovery planning documents; and
- Maintenance of regional stability of migratory bird populations and species diversity.

Environment Canada's review of the terrestrial environment Valued Ecosystem Component (VEC) was focused on the three key indicators relevant to our mandate. These were waterfowl, forest songbirds, and species of concern. EC has concerns which have not been addressed with respect to waterfowl and forest song birds as specified below.

5.2 Migratory Birds within the Project Development Area

Breeding Birds – General

The Proponent has undertaken monitoring of the existing terrestrial environment on the Lower Churchill River since 2006, and has provided information in the EIS on the species of wildlife found at the site, including migratory birds. A total of 72 species of birds have been documented as confirmed or probable breeding at the site to date, primarily utilizing upland hardwood and white spruce forests, wetlands and riparian habitats. The majority of these species are common breeders in the larger ecoregion, with a few exceptions. The few species at risk or of conservation concern are discussed further in the sections below.

Land clearing activities for site development of the Project, if conducted during the migratory bird breeding season, could result in the destruction of migratory birds, their eggs and nests. Birds that have fledged from nests often rely upon parental help for food and protection from predators for a period that extends beyond nesting. Clearing on a large scale can displace birds from territories, food, and shelter from predation.

Recommendation #5.1
EC recommends that, in order to minimize impacts to breeding migratory birds, the Proponent avoids habitat destruction (e.g. vegetation clearing, initial grading) at a minimum between the period May 1 and July 31 of any year. Environment Canada expects the proponent to use best management practices to minimize impacts on migratory birds, in order to facilitate due diligence in case of inadvertent destruction of nests or killing of birds.

Surf Scoters

EC considers that the baseline characterization of waterfowl in the Proponent's Waterfowl Component Study does not predict the effects of the project on late-breeding waterfowl with desired degree of confidence.

This view is based on the following:

During the early spring, areas of open water with high levels of upwelling nutrients (known as ashkui) are often used by migrant waterfowl prior to dispersal to their breeding sites, especially in years where spring breakup is late. Open water forms first in along sections of rivers with high stream flows or warm water, and these areas may provide the only available habitats for resting and foraging waterfowl during early spring. The operation and maintenance phase of the project is predicted to reduce the extent of early open water, and delay ice breakup by about two weeks, along the main steam of the Lower Churchill River.

The ecological function of ashkui that form at the confluences of the new reservoir will likely be much different

than naturally occurring ashkui. Fluctuations of the reservoir's water level will not be natural and may negatively influence development of the associated benthic littoral communities. The EIS implies that new ashkui that form at the confluences along the reservoir may mitigate the loss of similar habitat lost during the flooding of the reservoir. However, the ecological function of the new ashkui may not be the same as those that are lost. Hence, new ashkui may not replace habitat lost when natural ashkui are flooded.

As part of the Waterfowl Component Study, approximately 1,900 diving ducks, of which more than 1,000 were Surf Scoters, were observed on a single spring-staging survey of the Lower main stem of the Churchill River on 25 May 2007. Total use of the river is unknown, but some degree of turn-over is expected at staging areas and it is probable this represents a minimum estimate of use. The impact of the reduction in early open water and delayed ice-out on migrant waterfowl is unknown. Regardless, the main stream of the Lower Churchill River appears to provide important spring staging habitat for large number of Surf Scoters with the Proponent speculating that thousands of Surf Scoters may stage on the Lower Churchill River in some years.

Energy and nutrients are essential during the breeding season for successful reproduction in many waterfowl species (Ankney et al. 1991, Alisauskas and Ankney 1992), particularly with respect to egg-laying and incubation (Afton and Paulus 1992). These may be acquired prior to arrival on the breeding areas and stored as fat and protein, or acquired from food local sources around or in the breeding area (Drent and Dann 1980). Stored energy is considered beneficial when resources on breeding grounds are unpredictable or scarce, and to some extent, most northern

breeding waterfowl are thought to rely on stored reserves (Blums and Clark 1991).

Food available to spring migrant waterfowl may influence reproduction by affecting the timing of reproduction, breeding propensity, clutch size, egg mass and composition, egg fertility, and occurrence and frequency of re-nesting (Krapu and Reinecke 1992). Generally, larger bodied waterfowl, like Common Eiders and geese, rely more on stored reserves than smaller-bodied waterfowl which instead rely more on local energy sources (Afton and Paulus 1992). For these species, arrival on spring staging sites often coincides with good foraging conditions.

The Surf Scoter is poorly studied, and little is known about their breeding ecology (Savard et al. 1998). Because these ducks are intermediate-sized, long-distance migrants, they are expected to rely both on stored and locally acquired nutrients for breeding. Hence, we expect that spring staging sites may provide an important source of food immediately prior to breeding. There is some evidence to support this as similar sized ducks (i.e., Greater Scaup, Tufted Ducks, Long-tailed Ducks and Black Scoters) are thought to rely heavily on local food available on the breeding areas for producing clutches (Bengtson 1971, Peterson and Ellarson 1979, Kellett et al. 2005). Behavioural studies also show that Surf Scoters spend a large portion of their day foraging at marine spring-staging sites (O'Conner et al. *in prep.*) which suggests these sites may provide important sources of nutrients just prior to reaching their nesting sites.

The flooding of the reservoir is predicted to reduce the extent of early open water and delay ice breakup along the main stem of the Lower Churchill River. The impact of changes to the river's ice dynamics on reproduction of Surf Scoters and

other diving ducks is unknown. The EIS does not provide information on the timing, abundance, distribution and function of early open water, but does predict that new areas of early open water will occur at the river inlets around the reservoir. The Proponent implies that these new areas of early open water may mitigate impacts of similar habitat lost during the flooding of the reservoir. However, the ecological function of these new habitats may not be equivalent to those that are lost and may not be suitable for diving ducks.

The modification of spring ice dynamics by the flooding of the Lower Churchill River is expected to compromise reproductive potential of waterfowl that use early areas of open water in spring. The extent of effects on these waterfowl will depend on the length-of-stay and on the importance of these sites as source of food just prior to breeding. These effects may not be restricted to birds that use the Lower Churchill, but may also affect birds that use unaffected sites, if birds from the Lower Churchill are displaced to the unaffected sites and competing for resources.

Information from satellite tracking studies of the Pacific population of Surf Scoters has shown that the length-of-stay on inland spring staging sites is short (3.3 to 6.6 days; De la Cruz et. al. 2009), Similarly, recent satellite telemetry studies of the Atlantic population of Black Scoters suggest that their length-of-stay on inland sites were also short (Gilliland and Savard unpublished data). Further data collection and analysis is required to determine the implications of this.

In summation, there are two major information gaps with respect to Surf Scoters. There is a lack of information on timing, abundance, distribution and turn-over rates for the late breeding waterfowl at spring staging sites on the Lower

Churchill River. There is also a lack of information on ecological function of spring staging sites.

Recommendation #5.2:
Additional baseline studies are required prior to and/or during construction to establish the importance of the Churchill River (and ashkui in particular) as a staging area for late nesting waterfowl. Specifically, a series of surveys throughout late May and early June are required to better determine the timing, abundance and distribution of late breeding waterfowl on the Lower Churchill River, in order to better assess the value of these open areas. We suggest that an additional year of work is required to provide adequate information for these baseline studies. All survey protocols should be sent to CWS for review prior to the beginning of any surveys. CWS is also available to help with survey design.

Recommendation #5.3
A behavioral study is needed to determine whether ashkui are used for feeding. These studies should reduce uncertainty as to the importance of open water areas on rivers in early spring and permit better evaluation of the new open waters created within the reservoir in providing alternative breeding and feeding sites. We suggest that an additional year of work is required to provide adequate information for these baseline studies. All survey protocols should be sent to CWS for review prior to the beginning of any surveys. CWS is also available to help with survey design.

5.3 Species at Risk within the Project Development Area

SARA provides for the protection and recovery of listed species at risk in Canada. SARA requires the identification of any adverse impacts on listed species or their critical habitat, to identify measures to avoid or lessen those impacts, and to undertake monitoring to determine the effectiveness of mitigation or identify where further mitigation is required. SARA prohibitions protecting individuals and residences apply to species that are listed as extirpated, endangered or threatened but do not apply to species listed as special concern. For species other than Migratory Birds under the MBCA and aquatic species under the Fisheries Act, these prohibitions initially only apply on federal lands although there are provisions that allow these prohibitions to apply on non-federal lands should the species deemed to not be effectively protected by the laws of the province.

The Environmental Impact Statement (EIS) for the Lower Churchill River Hydroelectric Power Generation Project highlights the species at risk issues pertaining to the project at-hand. The EIS indicates all those species that may utilize the area in question - however remote. For the purposes of this review, only the Schedule 1 listed species (as of February 2011) under SARA will need to be addressed. Schedule 1 is updated every year, so operation of this project must consider additional species as they are added to Schedule 1 of SARA. The current list includes the following species:

1) *Special Concern* – Harlequin Duck, Polar Bear, Barrow's Goldeneye, Peregrine Falcon, and Rusty Blackbird;

2) *Threatened* – Woodland Caribou (boreal population), Common Nighthawk, and Olive-sided Flycatcher; and

3) *Endangered* – Piping Plover, Wolverine (eastern population), Eskimo Curlew, and Ivory Gull.

The EIS correctly determines that any sightings of Polar Bear, Piping Plover, Wolverine, Eskimo Curlew, or Ivory Gull would be highly unlikely, and are aptly referred to as incidental, or accidental. Additionally, other species at risk on this list are correctly labelled as irregular or vagrants within the scope of this EIS. This list includes the following: Barrow's Goldeneye, and Peregrine Falcon. Therefore, the remaining species to be addressed by the EIS review are **Harlequin Duck, Rusty Blackbird, Woodland Caribou, Common Nighthawk,** and **Olive-sided Flycatcher.**

Once a species is listed on Schedule 1 of the *Species at Risk Act,* the Act does provide protection for species listed as extirpated, endangered or threatened through general prohibitions intended to protect the individual and their residence, as well as through mechanisms to protect their critical habitat needed for the survival or recovery of the species. While SARA is primarily focused toward federal species and federal lands (i.e. migratory birds and marine species), the Provincial *Endangered Species Act* protects species listed under that legislation in Newfoundland and Labrador. This cooperative approach is based on the principles of the *Accord for the Protection of Species at Risk* (1996). Under the Accord, the ministers recognize that intergovernmental cooperation is crucial to the conservation and protection of species at risk, that they must play a leadership role, and that complementary legislation and programs are essential to provide effective protection for species at risk and their habitats throughout the country.

The Newfoundland and Labrador *Endangered Species Act* (2001) addresses the provinces responsibilities under the *Accord*.

Critical Habitat is identified within recovery strategies or actions plans for extirpated, endangered and threatened species. Recovery documents have not been completed for Woodland Caribou, Common Nighthawk, or Olive-sided Flycatcher so critical habitat has not been identified for these species. There is a Management Plan posted for the Harlequin Duck, but critical habitat is not identified for species of special concern. A management plan has not been finalized for the Rusty Blackbird but this species is also listed as special concern so critical habitat will not be identified.

However, the general prohibitions (Sections 32 and 33 of SARA) would still apply to extirpated, endangered and threatened species under which it is illegal to kill, harm, harass, capture, or destroy the residence. These prohibitions apply automatically to SARA listed migratory birds and aquatic species (i.e. federal species) regardless of their location and to any SARA listed species on federal lands. Newfoundland & Labrador's *Endangered Species Act* (NL ESA) has similar prohibitions to protect individuals and their residences for any species listed as extirpated, endangered, or threatened by the NL ESA. Furthermore, there is an option under SARA to invoke the general prohibitions for the protection of any SARA listed species on provincial lands if the Minister is of the opinion that the laws of the province do not *effectively* protect the species or the residences of its individuals.

As mentioned above, species of Special Concern (i.e. Harlequin Duck and Rusty Blackbird) are not protected by

the general prohibitions of SARA. Harlequin Ducks are protected by the prohibitions of the *MBCA*. However, management responsibility for the Rusty Blackbird lies with the province.

Environment Canada's Canadian Wildlife Service, in co-operation with all other relevant jurisdictions, is leading the development of the national management plan for the Rusty Blackbird, and the national recovery strategy the Woodland Caribou, boreal population, of the as prescribed by the *Species at Risk Act.* It must be recognized, however, that the province has primary management responsibility and is the lead in the conservation and recovery of the Rusty Blackbird and strategy the Woodland Caribou, boreal population in Labrador.

Through habitat modelling and wildlife surveys, the EIS recognizes that habitat loss is inevitable for the five species at risk in question. The extent of that habitat loss will vary among species: Common Nighthawk (11.6 km^2), Olive-sided Flycatcher (14.3 km^2), and 26.6 linear km of tributary habitat that may possibly have Harlequin Duck breeding habitat will be absorbed into the reservoir, and staging areas for the species will be changed as a result of flooding.

Considering that habitat availability is not recognized as a limiting factor for any of the five species at risk in question for Labrador, it is believed that this relatively small loss of habitat will result in small scale displacement of species, but it is not believed that this will have a population level effect for any species at risk. To offer context to that statement, it is important to reference the magnitude of the effect within the greater ecosystem. The *Eco-district* in question where the Lower Churchill River Hydroelectric Power Generation Project is taking place is ~17,000 km^2 in size. An *Eco-district*

is a sub-unit within the Ecological Land Classification (ELC) system. The ELC, sometimes called ecological stratification, seeks to address all the dimensions of ecosystems and as such incorporates the interactions among landforms, soil, water, climate, fauna and human activities. In other words, this approach classifies natural environments based on a limited number of ecological factors, none of which is predominant[1].

Recommendation #5.4
EC recommends that, in order to minimize impacts to migratory avian species at risk, the Proponent avoids habitat destruction (e.g. vegetation clearing, initial grading) at a minimum between the period May 1 and July 31 of any year. It should be ensured that water-level control protocols are in place for the created reservoir during the breeding season to keep water levels relatively constant.

5.3 Wetland Conservation and Forest Songbirds – Wetland Sparrows

The assemblage of wetland sparrow species present in the lower Churchill River valley is dependent upon the availability of wetland and riparian habitat. The amount of suitable habitat affected by the project formed the basis for the assessment of potential impacts to wetland dwelling song birds such as Swamp Sparrows, Song Sparrows, Lincoln's Sparrows and Savannah Sparrows.

As part of its commitment to wetlands conservation, the Government of Canada has adopted The Federal Policy on

[1] http://ecosys.cfl.scf.rncan.gc.ca/classification/intro-classification-eng.asp

Wetland Conservation (FPWC) with its objective to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future." In support of this objective, the Government of Canada strives for the goal of No Net Loss of wetland function for federal lands, for federal programs and activities when wetlands or certain types of wetlands are limiting on the landscape. The Government of Canada and several provincial jurisdictions have all adopted the mitigation hierarchy of avoidance, minimization and compensation as a best practice to reduce impacts on wetlands. When reviewing the loss of wetlands in this project, EC has used the FPWC as a guideline for its comments.

The Proponent has conducted an acceptable wetland analysis and has determined that the project will result in the loss of up to 60% of primary habitat in the Lower Churchill River Valley. Further, the extent of primary habitat outside the planned reservoir has not been quantified but is believed to be limited. The Proponent concludes that while the effect of the project on wetland sparrows is adverse, high in magnitude, irreversible, and highly likely to occur, it is not significant because it is localized in extent.

The Proponent indicates that the creation of comparable habitat along the riparian fringe of the newly created reservoir is under consideration and has identified that it will encourage formation of riparian marsh wetland during construction. Follow-up monitoring of the creation of suitable riparian wetland habitat would be needed to confirm the effectiveness of this mitigation.

Recommendation #5.5
The Proponent is encouraged to implement the goal of No Net Loss of wetland function by undertaking the creation of a comparable amount of riparian wetland habitat, implementing a monitoring and follow-up program to determine the effectiveness of habitat creation, and committing to an adaptive management mechanism if the proposed mitigation fails to perform. We recommend that the goals of the FPWC be considered in the assessment of this project, and we recommend that the hierarchical sequence of mitigation alternatives (avoidance, minimization, and as a last resort, compensation) recommended in the FPWC is followed. The creation of riparian wetland habitat should furthermore replace the lost habitat function for wetland sparrows. All survey protocols should be sent to CWS for review prior to the beginning of any surveys. CWS is also available to help with survey design.

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CHAPTER 6 – ENVIRONMENTAL EMERGENCIES AND PREPAREDNESS

6.1 Emergency Plans and Preparedness

At this stage of the project, the Proponent's commitments made in the EIS regarding best management practices and emergency preparedness are satisfactory. Environment Canada does not expect to see detailed design, detailed failure scenarios, or detailed emergency response plans at the EIS stage.

However, once the design stage has been finalized, yet prior to the commencement of the undertaking at the construction and operation stage, detailed Emergency Response Plans and project element specific protocols and standard operating procedures (SOPs) need to be developed. These detailed plans should be reviewed by the lead regulatory agency (i.e. the agency with jurisdiction over the issuance of construction and operation approvals and/or permits) prior to the initiation of any construction activities. Environment Canada would be prepared to work with the lead agency in reviewing such plans.

6.2 Emergency Plans and Preparedness - Gaps

In the EIS, the Proponent identifies that sewage and wastewater will be treated at approved sewage treatment plants located at the construction campsites. However, no information with respect to the design of waste water and sewage treatment plants was provided.

The Proponent also identifies several hazardous materials that will need to be managed over the life of the project including battery acid, concrete preparation fluids, alkaline materials, explosives, and petroleum products. No technical information with respect to the design of hazardous materials storage areas, fuel storage tanks, filling stations or waste oil storage is provided in the EIS.

The Proponent also identifies the possibility of an environmental emergency during transport of hazardous materials and estimates that the probability of such an incident is 0.04 percent over the life of the project. However, no detailed emergency plan is provided.

6.3 Development of Emergency Response Plans

When detailed emergency response plans are developed, the Implementation Guidelines for Part 8 of the *Canadian Environmental Protection Act* - Environmental Emergency Plans and the Risk Management Guide for Major Industrial Accidents (CRAIM) utilize the premise that potential consequences arising from an environmental emergency should be identified using the worse probable case and alternative scenarios. That same rationale should be applied to the potential release or spill of untreated sewage or waste and hazardous waste or materials including petroleum products. Emergency response plans should be developed based on the assumption that a release would occur over the life of the project.

6.4 Government Oversight of Spill Responses

In Canada, the polluter who causes a release or spill has the first responsibility for initiating effective actions to counteract the effects of the release. The polluter also has financial responsibility for damage and clean-up costs incurred as a result of the spill or release. This is known as the "polluter pays" principle.

Depending on the source of a spill of oil or other hazardous waste or material, specific governmental organizations have responsibility as lead agency to ensure that appropriate clean-up measures are taken and that the environment is protected. The lead agency's role is to monitor the responsible party's actions, ensuring its actions are reasonable under the circumstances; to be the point of contact between the resource agencies and the responsible party; and to appoint an On Scene Commander, if the responsible party is unable or unwilling to undertake a response.

Provincial Environment Departments assume the role of lead agency in situations where a spill emanates from a land-based facility or outfall under provincial jurisdiction, and for land-based mystery spills. Spills associated with development of the Lower Churchill Project would fall under provincial jurisdiction.

Environment Canada assumes the lead agency role when a spill emanates from a federal facility (e.g. a federal government department, federal ships, or Crown Corporation); or if a spill impacts waters frequented by fish (exclusive of those situations where the Province or others

assume the lead). Environment Canada has residual authority through the 1973 Cabinet Directive Relative to Environmental Emergencies to ensure that the environment is adequately protected, if others fail to do so

If an incident is significant enough to warrant, the Regional Environmental Emergencies Team (REET) is convened to monitor the response activities and to coordinate environmental advice and assistance, or to convey concerns to the lead agency or the On Scene Commander (OSC). This coordination ensures an efficient and effective spill response. The Environmental Emergencies Section of Environment Canada chairs the Atlantic REET. Members of the REET may be drawn from any federal, provincial or municipal government department as well as from First Nations, Aboriginal groups and community groups.

The REET supports the lead agency by providing a One Window Approach for provision of spill response advice. The REET easily adapts to the situation at hand and can facilitate the advice of outside expertise when members of the REET require additional scientific or technical support. The REET provides a forum for reaching a consensus on spill response priorities for the responsible party and identification of environmental sensitivities that require protection. REET provides advice to the lead agency, which, in turn, communicates with the responsible party.

Recommendation #6.1

Once the design stage has been finalized but prior to the commencement of the undertaking at the construction and operation stage, detailed Emergency Response Plans and project-element specific protocols and SOPs need to be developed. These detailed plans should be reviewed by the lead regulatory agency (i.e., the agency with jurisdiction over the issuance of construction and operation approvals and/or permits) prior to the initiation of any construction activities. In accordance with the Implementation Guidelines for Part 8 of the *Canadian Environmental Protection Act*, response plans should be developed based on the worse probable case and alternative scenarios. All detailed emergency plans should be sent to EC for review prior to the beginning of construction.

Recommendation #6.2

The Proponent should prepare an Emergency Environmental Effects Monitoring Program based on scientifically defensible methods. The EEEMP should present testable hypothesis and demonstrate how they will be tested/validated. All monitoring protocols should be sent to EC for review prior to the beginning of any monitoring. EC is also available to help with EEEMP design.

CHAPTER 7 – MONITORING AND FOLLOW-UP

7.1 Introduction

The environmental assessment process as mandated under the Canadian Environmental Assessment Act makes provision for any follow-up programs that are necessary or required as an integral component of the EA process. Follow-up programs are necessary for verifying the accuracy of the environmental assessment and for determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project. Follow-up programs support the application of adaptive management, or revised mitigation strategies where prescribed mitigation measures are ineffective or where unexpected effects occur. Follow up programs can also be used to support future environmental assessment including cumulative effects assessments and can be used in support of any environmental management systems that are being used to manage the environmental effects of the project.

7.2 Environmental Effects Monitoring Programs

Follow-up programs range in complexity from relatively straight forward check lists to rather complex environmental effects monitoring programs (EEMP). EEMPs are scientifically defensible programs designed to statistically test hypothesis related to the effects of the project on valued ecosystem components or indicator species as appropriate. EEMPs are more restrictive in the definition of significance than are EAs in general. For example a typical definition of significance in an EA is that of an environmental effect that

results in the loss of 10 percent of the individuals residing in the project area. Within an EEMP the definition of significance is any detectable change in the environment that cannot be attributed to chance alone at an acceptable level of probability, say probability less than 0.05 ($p<0.05$) otherwise expressed as 5% or 19 times out of 20.

Environment Canada has identified the need for follow-up programs with regard to mercury accumulation in fish eating wildlife, re-establishment of wetlands, and in preparation for environmental emergencies. It is also likely that numerous submitters will identify the need for follow-up programs in relation to their areas of expertise and concern. And, although the CEA Act clearly indicates that the details of those programs including the results of any follow-up programs are made public, Environment Canada is concerned that the results of such programs have in the past been provided in synthesized or summary form only. Although, EC recognizes the value of summary data for various purposes, we recognize also that any follow-up reports should also include the raw data in tabular form.

As Federal Authority on this project Environment Canada is prepared to assist the Responsible Authorities in the design and implementation of any follow-up program that we have recommended. Environment Canada is also willing to assist in the design, implementation and review of any follow-up program for which we posses the expertise necessary to the development of that program.

Where EC has recommended follow-up programs we are satisfied at this point in the process for there to be a requirement or commitment to design the program after the Project is sanctioned but before construction begins. We are

requirement or commitment to design the program after the Project is sanctioned but before construction work begins. We are not concerned that the Proponent has not presented detailed design of the EEMP at this point.

7.1 Recommendations

Recommendation #7.1
EC recommends that all follow-up monitoring reports include the raw data on which the reports are based in a tabular form as well as whatever summary form is appropriate to demonstrate the basis of the conclusions of the report.

Recommendation #7.2
EC recommends that detailed design of any follow-up programs be presented to the appropriate lead agency for approval prior to construction. Any required baseline studies in support of follow-up programs must be conducted and approved prior to construction to ensure that wildlife will not be significantly impacted by the project. Environment Canada is prepared to assist in the design of these programs where we have requested them or where assistance is requested in areas of EC expertise.

CHAPTER 8 – CUMULATIVE EFFECTS

8.1 Introduction

The Guidelines and the Canadian Environmental Assessment Act require the Proponent to consider the cumulative effects of the Project in association with other planned, existing or reasonably foreseeable projects. The Proponent has done so in a manner consistent with the CEA Agency Operational guidance on cumulative effects assessment (CEA) and has met the requirements of the guidelines. However, it is recognized that there are challenges in assessing the cumulative effects of human development in the region.

Given the temporal and spatial scale of the proposed Project, it is appropriate to consider cumulative effects resulting from all Project components. In particular, with the potential time difference between the construction of some components, the recovery time required for a particular VEC (e.g. wetlands, migratory birds) and the impact of subsequent and repeated disturbance needs to be better understood. For example, if a particularly sensitive species of migratory bird has its breeding season disrupted or its habitat requirements altered repeatedly by Project-related activities, the cumulative effect at the population level could become evident over time.

One of the recognized challenges of cumulative effects assessment is defining reasonable temporal and spatial boundaries and determining the relative contribution of each stressor on a particular VEC. One way of examining this issue and identifying appropriate mitigation is to refer to

management plans that may have been prepared for VECs and the planning tools developed by various levels of government, community-based organizations and resource users in a particular region.

In terms of project-specific planning and subsequent monitoring and follow-up, the Proponent should fully describe the methods used for assessing and managing cumulative effects including:

- identification of regional issues of concern;
- a comprehensive description of how the VECs were chosen;
- justification for the spatial and temporal boundaries used;
- identification of applicable management plans, regulatory objectives and stakeholder initiatives;
- a description of the analysis undertaken, and presentation of the results;
- a description of how mitigation measures address the cumulative environmental effects; and,
- the rationale and methods for determining whether residual cumulative effects are significant.

Examining cumulative effects using general VECs like air quality and fish and aquatic habitat make it difficult to get a sense of whether, and to what extent, cumulative effects are of concern. For example, individual species at risk are often the most vulnerable to cumulative effects. In some cases, the use of indicator species may provide a more meaningful analysis.

Ultimately, the promotion and implementation of regional scale approaches and tools can not only support the assessment of the project under review, but also the

assessment of any other projects that may be proposed in this area in the future. Importantly such tools and approaches help to identify effective means for managing cumulative effects. As an example, the Canadian Council of Ministers of the Environment (CCME) has identified Regional Strategic Environmental Assessment (RSEA) as an inherently proactive and futures oriented approach to ensure that planning and assessment for a region support the most desired outcomes rather than the most likely ones. In doing so, RSEA can support the preparation of a preferred regional development strategy and environmental management framework, and inform subsequent project-based environmental assessment and decision processes. In this regard RSEA is intended to:

- improve the management of cumulative effects;
- increase the effectiveness of project-level environmental impact assessment; and
- identify preferred directions, strategies and priorities for the future management and development of a region.

Environment Canada has been working collaboratively with other federal departments, and with our provincial and aboriginal partners to develop a predictive tool in support of an ecosystems approach. A technical working group has been established to evaluate the merit of developing an ALCES® model (A Landscape Cumulative Effects Simulator) specific to Labrador. The ALCES® model is currently being used in Alberta, the Yukon and Alaska in support of integrated regional land use planning and initial work to date indicates that it is suitable for Labrador and that much of the required data is available. In fact, Labrador landscape data has already been programmed into the model for demonstration and teaching purposes.

Recommendation #8.1
Monitoring and follow-up programs should be designed to allow for the identification of cumulative impacts by ensuring appropriate VECs are selected and applicable management plans and tools are referenced. The development and implementation of regional scale tools and approaches such as the ALCES® model should be promoted.

8.2 Literature Cited

CCME. 2009. Regional Strategic Environmental Assessment in Canada: Principles and Guidance. Canadian Council of Ministers of the Environment, Winnipeg, MB.

CHAPTER 9 – CONCLUSION & SUMMARY OF RECOMMEDATIONS

At this time there is a number of outstanding information gaps with respect to several components of the project, the specifics of which have been discussed in this submission. However, it is recognised that additional information will become available as the design process unfolds. This additional information should be analysed to confirm predictions made in the EIS and Proponent responses to stakeholder comments.

Environment Canada is of the opinion that these issues can be addressed as the design process unfolds provided that the Proponent commits to the recommendations outlined in this submission. Specifically, the Proponent must commit to: develop and implement detailed monitoring plans; to establish appropriate follow-up and mitigation strategies; and to engage Environment Canada and other appropriate stakeholders in the development and implementation of these programs. Furthermore, this additional information and further analysis must be provided to the satisfaction of the appropriate government departments prior to the issuance of regulatory approvals and authorizations, and therefore prior to construction of the Project.

Overall, if the project and associated mitigation activities are well executed, Environment Canada expects there will not be any significant adverse effects on environmental matters within the Department's mandate. Furthermore, execution of this project could have a beneficial environmental impact through its potential to offset greenhouse gas emissions elsewhere.

Recommendation #3.1

During the site preparation and construction phases, potential air quality effects have been highlighted by in the EIS. However, various measures can be implemented to reduce dust and particle emissions/formation from the site preparation/construction activities to minimize air emissions, including those from construction vehicles. EC recommends that the Best Management Practices outlined in the following document be implemented as a component of Nalcor's strategy to mitigate air quality effects during the site preparation and construction phase:
"Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (May 2005, prepared by ChemInfo Services Inc. for Environment Canada).

Recommendation #4.1
Additional baseline data on osprey mercury levels are necessary to provide an accurate basis for evaluating trends in osprey mercury levels after project construction. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

Recommendation #4.2
Given the selection of river otter as a valued ecosystem component (VEC) for mercury monitoring, and the predicted mercury toxicity from the eco-risk assessment, additional baseline and follow-up monitoring data of mercury levels in river otter are vital to evaluate mercury trends in otters after project construction. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

Recommendation #4.3
Given the findings of the ecological risk assessment for mercury, it is important that the monitoring of mercury levels in osprey and river otter in the project area before and after construction be carried out in a scientifically defensible manner. This monitoring will assess the degree and extent of increases in mercury levels in osprey and river otter associated with the project. All survey protocols should be sent to EC for review prior to the beginning of any surveys. EC is also available to help with survey design.

Recommendation #5.1
EC recommends that, in order to minimize impacts to breeding migratory birds, the Proponent avoids habitat destruction (e.g. vegetation clearing, initial grading) at a minimum between the period May 1 and July 31 of any year. Environment Canada expects the proponent to use best management practices to minimize impacts on migratory birds, in order to facilitate due diligence in case of inadvertent destruction of nests or killing of birds.

Recommendation #5.2:
Additional baseline studies are required prior to and/or during construction to establish the importance of the Churchill River as a staging area for late nesting waterfowl. Specifically, a series of surveys throughout late May and early June are required to better quantify the timing, abundance and distribution of late breeding waterfowl on the Lower Churchill River, in order to better assess the value of these open areas.

Recommendation #5.2:
Additional baseline studies are required prior to and/or during construction to establish the importance of the Churchill River (and ashkui in particular) as a staging area

for late nesting waterfowl. Specifically, a series of surveys throughout late May and early June are required to better determine the timing, abundance and distribution of late breeding waterfowl on the Lower Churchill River, in order to better assess the value of these open areas. We suggest that an additional year of work is required to provide adequate information for these baseline studies. All survey protocols should be sent to CWS for review prior to the beginning of any surveys. CWS is also available to help with survey design.

Recommendation #5.4

EC recommends that, in order to minimize impacts to migratory avian species at risk, the Proponent avoids habitat destruction (e.g. vegetation clearing, initial grading) at a minimum between the period May 1 and July 31 of any year. It should be ensured that water-level control protocols are in place for the created reservoir during the breeding season to keep water levels relatively constant.

Recommendation #5.5

The Proponent is encouraged to implement the goal of No Net Loss of wetland function by undertaking the creation of a comparable amount of riparian wetland habitat, implementing a monitoring and follow-up program to determine the effectiveness of habitat creation, and committing to an adaptive management mechanism if the proposed mitigation fails to perform. We recommend that the goals of the FPWC be considered in the assessment of this project, and we recommend that the hierarchical sequence of mitigation alternatives (avoidance, minimization, and as a last resort, compensation) recommended in the FPWC is followed. The creation of riparian wetland habitat should furthermore replace the lost habitat function for wetland sparrows. All survey protocols should be sent to CWS for

review prior to the beginning of any surveys. CWS is also available to help with survey design.

Recommendation #6.1

Once the design stage has been finalized but prior to the commencement of the undertaking at the construction and operation stage, detailed Emergency Response Plans and project-element specific protocols and SOPs need to be developed. These detailed plans should be reviewed by the lead regulatory agency (i.e., the agency with jurisdiction over the issuance of construction and operation approvals and/or permits) prior to the initiation of any construction activities. In accordance with the Implementation Guidelines for Part 8 of the *Canadian Environmental Protection Act*, response plans should be developed based on the worse probable case and alternative scenarios. All detailed emergency plans should be sent to EC for review prior to the beginning of construction.

Recommendation #6.2

The Proponent should prepare an Emergency Environmental Effects Monitoring Program based on scientifically defensible methods. The EEEMP should present testable hypothesis and demonstrate how they will be tested/validated. All monitoring protocols should be sent to EC for review prior to the beginning of any monitoring. EC is also available to help with EEEMP design.

Recommendation #7.1

EC recommends that all follow-up monitoring reports include the raw data on which the reports are based in a tabular form as well as whatever summary form is appropriate to demonstrate the basis of the conclusions of the report.

Recommendation #7.2

EC recommends that detailed design of any follow-up programs be presented to the appropriate lead agency for approval prior to construction. Any required baseline studies in support of follow-up programs must be conducted and approved prior to construction to ensure that wildlife will not be significantly impacted by the project. Environment Canada is prepared to assist in the design of these programs where we have requested them or where assistance is requested in areas of EC expertise.

Recommendation #8.1

Monitoring and follow-up programs should be designed to allow for the identification of cumulative impacts by ensuring appropriate VECs are selected and applicable management plans and tools are referenced. The development and implementation of regional scale tools and approaches such as the ALCES® model should be promoted.