

**Final Guidelines for the Comparative
Environmental Review (CER) of the
Mactaquac Project, Mactaquac,
New Brunswick**



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February 2015

FOREWORD

As part of the Mactaquac Project, Stantec Consulting has been retained by NB Power to conduct a Comparative Environmental Review (CER) of the three options being considered for the Mactaquac Generating Station (Station) at the end of its service life. The CER will seek out and evaluate impacts of the three options being considered in preparation for anticipated regulatory reviews at the federal and provincial levels, and help NB Power answer key questions in the selection of a preferred option for the Station in 2016.

This document, the final guidelines for the CER (Guidelines), provides "how-to" directions for carrying out the CER, outlining all of the different ingredients that need to be considered in order to produce a final document that will be useful to the public and to NB Power. To ensure issues of concern to the general public are considered during the CER, members of the public were invited to participate in a 45 day comment period on the draft Guidelines, which began on November 25, 2014 and ended January 8, 2015. During the public comment period, the draft Guidelines were also made available to the CER Advisory Committee and the St. John River Valley Community Liaison Committee for comment.

As would be expected, a Project of this nature and magnitude has generated considerable feedback from the public. During the review process over 50 submissions were received. Close attention has been paid to recording, tracking, and most importantly, sharing the public's comments and concerns with those responsible for Project design, engineering and ultimately the CER. The comments and questions received can be grouped into the following categories:

- concerns over the effectiveness of the public engagement process;
- questions on the scope of the Valued Components (VCs) or key issues being considered;
- the effectiveness of the CER Methodology being used and questions on the geographic area being assessed;
- concerns over the social, aesthetic, or ecological implications of one of the options;
- questions relating to the operational feasibility of one of the options;
- questions relating to the greater decision making process to be used by NB Power in the selection of a preferred option; and
- questions relating to the scope of other studies being completed to support the selection of a preferred option, and suggestions for additional considerations.

The issues brought forward during the public comment period have contributed to the development of the final CER Guidelines document. These inputs are also an important component of NB Power's broader public engagement process, which will inform the option selection process. It is anticipated that the CER will be completed and available for public review in the Fall of 2015.

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1.0 INTRODUCTION

This document presents the guidelines for the development of the Comparative Environmental Review (CER) of three options being considered for the Mactaquac Project (the Project) at the Mactaquac Generating Station (the Station) in Mactaquac, New Brunswick. The Station is owned and operated by the New Brunswick Power Corporation (NB Power; the Proponent).

The current end of service life of the Station is expected to be 2030. To address the issue, NB Power is considering three options for the Station (the Options). To assist in the understanding of environmental, social, and economic issues associated with each of the Options, NB Power has proposed a CER. The information collected as part of the CER will be considered by NB Power, along with other information (e.g., business case, engineering, other considerations), in its decision-making regarding the Station.

This document presents the guidelines for the development of the CER (the Guidelines).

Why do we Need Guidelines?

The Guidelines provide “how-to” directions for carrying out the CER. The Guidelines outline all of the different methods and issues that need to be considered and addressed in order to produce a final document that will be useful to the public and to NB Power.

1.1 BACKGROUND

The Station is a hydroelectric generating station with a capacity of approximately 670 megawatts (MW), located at Mactaquac, on the Saint John River approximately 19 km west of the city of Fredericton, New Brunswick (Figure 1.1). It was commissioned in 1968 with three turbine-generating units, and provides renewable electrical energy to New Brunswick. An additional three turbines were installed in 1972, 1979, and 1980.

The headpond upstream of the Station covers an area of approximately 87 km² between the Station and the town of Woodstock, approximately 96 km upstream of the Station. The dam also serves as an important highway link and bridge across the Saint John River, linking Routes 102 and 105 of the provincial highway system (Figure 1.1).

The concrete structures associated with the Station (namely the spillways, intake structure and powerhouse) are experiencing what is known as an alkali-aggregate reaction (AAR), which is causing the concrete to expand. The aggregate that was used for the construction of the Station is believed to be at least partially responsible for the AAR. NB Power has been monitoring the issue and carrying out maintenance work on the concrete portions of the structures, including cutting slots into the concrete to allow expansion to occur and thus reduce internal stresses in the concrete structures themselves. Though NB Power continues to maintain the Station-related structures so as to assure their continued structural integrity and dam safety, the AAR has reduced the life expectancy of the Station to approximately the year 2030, instead of the original 100-year design lifespan of 2068. The earthen dam itself is unaffected by the AAR issue, and will remain suitable for continued use beyond 2030 if needed.

As part of the Mactaquac Project, NB Power is currently considering the three options for the Station at its end of life. These Options were chosen for consideration in the CER because they are considered to be technically practicable; and they provide a long-term solution to problems facing the current Station.

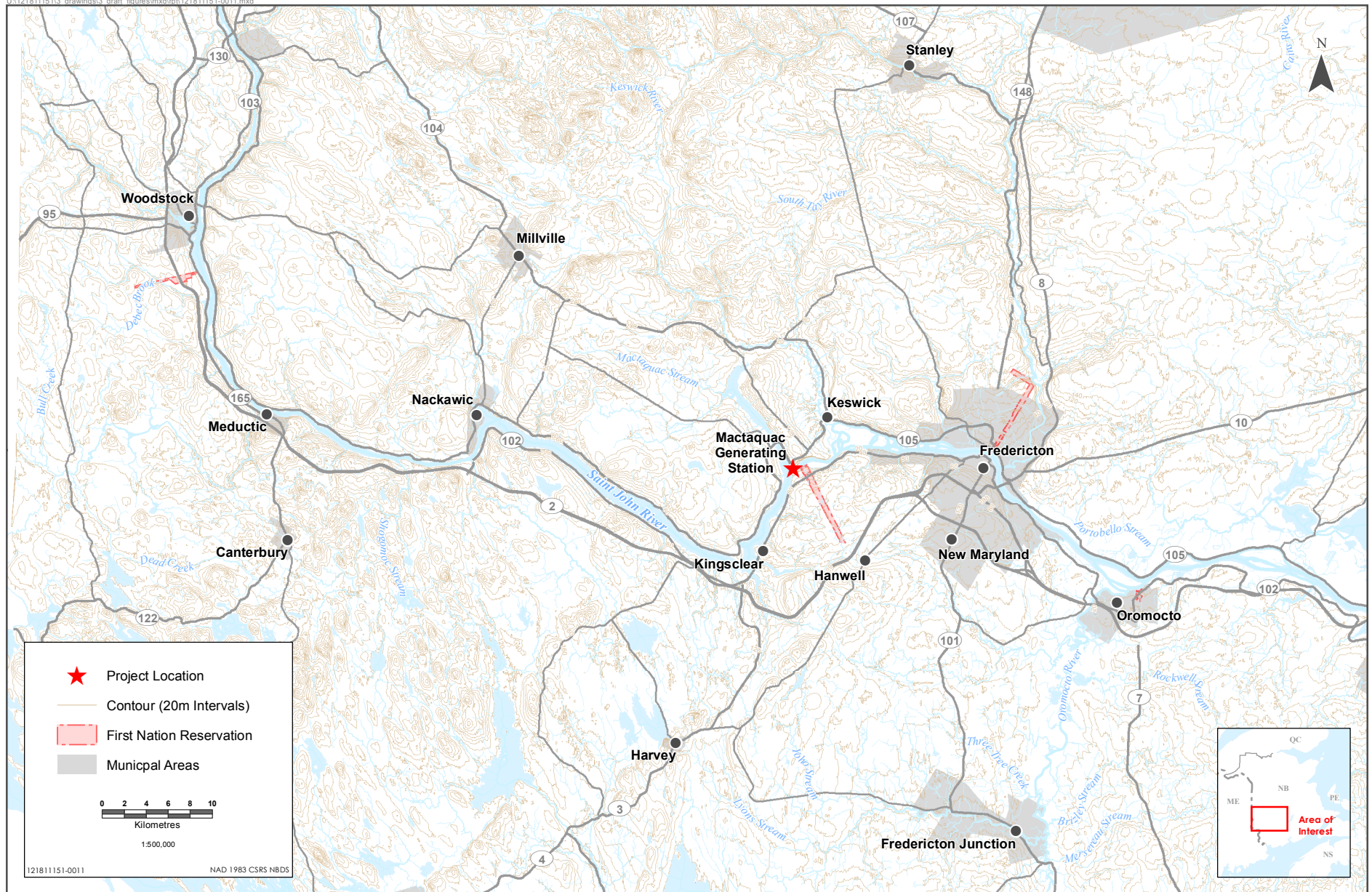
- **Option 1, Repowering:** Refurbish the Station by constructing a new powerhouse, spillway, and other components, followed by the removal of the existing concrete structures at the Station.
- **Option 2, Retain the headpond (no power generation):** Build a new concrete spillway and maintain the dam as a water control structure without power generation, followed by the removal of the existing concrete structures at the Station.
- **Option 3, River restoration:** Remove the Station and enable the river to return to a free-flowing state.

One of these Options (the Preferred Option) will be selected by NB Power based on a review of engineering, constructability, environmental, and economic considerations. Section 1.2 provides a description of other studies being completed, and the decisions making process.

Further details on the Options as currently conceived at this early planning stage are provided in the document entitled, "Preliminary Project Concept: Mactaquac Project, Mactaquac, New Brunswick" (NB Power 2014b).

NB Power is continuing to review the projected 2030 end of service life for the Station. That work includes exploring ways to continue operations within the current footprint beyond 2030. The work done on the Station during this review would not likely require a material change from current operations, thus, there would likely be minimal incremental upstream or downstream effects compared to current operations at the Station.

NB Power is not subjecting these potential approaches for continuing operations within the current footprint to the CER process because they have not been determined to be technically or economically feasible, and therefore, this work is not discussed further in this document.



Base Data: Contours and Roads are from Service New Brunswick and Waterbodies and Watercourses data from New Brunswick Department of Natural Resources. All data downloaded from GeoNB.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

1.2 PROJECT PLANNING

NB Power is undertaking various studies and analyses to identify the Preferred Option. The planning process includes consideration of engineering, constructability, financial, social, and environmental factors. These studies include but are not limited to the following:

- engineering design, cost estimates, and schedule;
- development of business case and analysis of financial considerations, including an evaluation of the cost of replacement power (including Green House Gas (GHG) emissions) under each of the Options;
- consideration of how each Option aligns with NB Power policies and obligations (for example, NB Power's obligation to increase the provincial Renewable Power Portfolio standard of 40% by 2020);
- the results of the Mactaquac Aquatic Ecosystem Study (MAES), a whole ecosystem study of the aquatic environment upstream and downstream of the dam;
- comparative environmental review of the Options, including potential environmental interactions and required mitigation;
- social impact assessment of the Options;
- Aboriginal engagement; and
- public and stakeholder engagement.

These and other inputs will be considered by NB Power in the course of selecting its Preferred Option for the Project, as summarized in Figure 1.2.

More Information on Public and Stakeholder Engagement in 2015.

The results of the CER will support a broader public engagement process that is currently scheduled for the fall of 2015. This public engagement effort will include presentations of engineering, scientific, environmental, social, and economic research and will provide opportunities for New Brunswickers to give their thoughts and comments face-to-face and in writing through facilitated workshops and online tools.



Figure 1.2 Inputs to the Decision Making Process for a Preferred Option

What are Environmental Interactions?

This term is used to describe an action which may cause a change to the environment. For this document, it refers to how building and operating any of the three Options may cause a change to any of the VCs.

Example: Planting a tree in your backyard causes a change to the landscape because soil is displaced. This might affect some of the creatures living in the dirt (change to wildlife), but the change will be minimal as they can continue living in the soil.

Example: Harvesting trees for commercial purposes also causes a change to the landscape. Trees are removed which can affect animals who live there (change in wildlife); there may be a change to how water moves across the ground and collects (change in surface water); the machinery used to harvest trees produce emissions, which may contribute to pollutants in the air (change in air quality).

1.3 PURPOSE OF THE COMPARATIVE ENVIRONMENTAL REVIEW

The information gathered as part of the CER will be considered by NB Power in its decision-making regarding the Station, and will also be used to support the scoping and conduct of any future formal provincial or federal environmental assessment that may be required for the Preferred Option.

As provided in the Terms of Reference for the CER (NB Power 2014a), the purpose of the CER is to:

- evaluate, at a preliminary level, the likely potential interactions of each Option with the surrounding environment;
- identify the key mitigation and management actions necessary to make each Option an environmentally acceptable option, if it were selected;
- support NB Power's selection of a Preferred Option in 2016, based on the environmental, economic, engineering, energy policy, and social considerations that are identified through the CER process and other parallel studies being carried out by NB Power;
- provide a mechanism by which Aboriginal, public, and stakeholder input regarding environmental issues associated with the Options can be considered by NB Power in its future decision-making; and
- aid in the scoping and conduct of any required future environmental assessment of the selected Preferred Option.

In addition, the CER will support informed discussions on the Options for the Project during NB Power's broader public engagement effort.

About the Comparative Environmental Review (CER) Process

The CER process is not part of a formal or legal environmental regulatory process. This unique process, developed by NB Power for the Mactaquac Project, is self-driven by NB Power. Its purpose is to contribute to NB Power's choice of a Preferred Option by offering a means of comparison. In addition, the CER will inform and prepare for a focused formal environmental assessment of the Preferred Option, once it is selected by NB Power.

1.4 POTENTIAL REGULATORY FRAMEWORK APPLICABLE TO THE PROJECT

1.4.1 Environmental Assessment Requirements

Formal discussions with regulatory agencies in respect of the potential federal and provincial environmental assessment and permitting requirements for each Option have not been initiated. However, the following requirements could apply to the Preferred Option.

- The New Brunswick *Environmental Impact Assessment Regulation of the Clean Environment Act* requires that proponents register specific information about certain types of development proposals with the Province. Any of the three Options, if selected, would likely require registration, at minimum, under the New Brunswick *Environmental Impact Assessment Regulation*. All registered proposals undergo a review by the New Brunswick Department of Environment and Local Government (NBDELG) to identify and evaluate environmental issues and ultimately determine if additional or more comprehensive studies are required. Though not known at this time, it is possible that a review could conclude that a comprehensive review of the Preferred Option is required, based on the anticipated amount of change to the environment.
- Until federal authorities are formally engaged, it is uncertain if any of the Options would require a federal environmental assessment under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). Given the likelihood of public, stakeholder and Aboriginal interest, and the degree of federal jurisdiction over matters affected by them, any Option could be designated as requiring an assessment under CEAA 2012. Further clarity will be sought from the Canadian Environmental Assessment Agency in this regard.

1.4.2 Other Possible Environmental Regulatory Requirements

In addition to the potential requirements described above, the following federal and provincial legislation could apply to one or more of the Options, and will be factored in to the CER where applicable:

- *Fisheries Act* – Fisheries and Oceans Canada;
- *Canadian Environmental Protection Act* – Environment Canada;
- *Species at Risk Act* – Environment Canada/Fisheries and Oceans Canada;
- *Navigation Protection Act* – Transport Canada;

- *Clean Environment Act* – NBDELG;
- *Clean Water Act* – NBDELG;
- *Clean Air Act* – NBDELG;
- *Species at Risk Act* – New Brunswick Department of Natural Resources (NBDNR);
- *Fish and Wildlife Act* – NBDNR; and
- *Heritage Conservation Act* – New Brunswick Department of Tourism, Heritage and Culture.

2.0 SCOPE AND METHODS

The following sections describe what will be included in the CER and a general overview of the methods to be used to carry out the CER.

What is a Valued Component?

A Valued Component (VC) is a term that refers to aspects of the environment that have scientific, social, cultural, economic, historical, archaeological, or aesthetic values to society. This term is common in environmental assessment and is used throughout this report to refer to the aspects of the environment under consideration. The VCs to be considered as part of the CER are listed in Section 2.2.

2.1 SCOPE OF THE PROJECT OPTIONS

The CER will include detailed descriptions of the Options, including the construction and operation phases to the level of detail that is available at this early planning stage. These descriptions will be supported with appropriate maps, engineering drawings, and diagrams. The description of Options will be sufficient to support the analysis of environmental interactions with each Option and mitigation measures likely to be required. Decommissioning, abandonment, and future site rehabilitation will be presented at the conceptual level for all Options, and will include reclamation and rehabilitation of exposed sediments under Option 3. The description of Options will include the information described below.

- The rationale for including each option.
- A description of the existing facility, including land ownership and tenure.
- A description of the Options including location, size, materials, planned mitigation, and operational details to the extent known through parallel engineering studies being carried out.
- A description of the activities for each Option, including a description of the activities, best management practices, and other related issues, to the extent known at the time of carrying out the CER.

A description of reasonably foreseeable potential accidents, malfunctions, and unplanned events will further assist in planning and the identification of mitigation, as applicable. These will be discussed in the context of appropriate planning for each Project Option to reduce the likelihood of an incident occurring. Appropriate contingency and emergency response planning to reduce or lessen the potential environmental interactions, should an incident occur, will also be discussed.

Public safety considerations will be included in the description of Options where they relate to Project planning and design (e.g., access to the construction area; access to dewatered areas that may be unstable). These will be discussed in the context of appropriate planning for each Project Option to reduce the likelihood of an incident occurring. Information pertaining to relevant engineering standards, occupational health and safety standards, and public safety considerations will be included, where they apply.

As conceived in the Preliminary Project Concept document (NB Power 2014b), Table 2.1 provides a preliminary understanding of the phases and activities that make up each of the Options.

Table 2.1 Project Option Phases and Activities

Phase/Activity	Option 1 – Repowering	Option 2 – Retain the Headpond (No Power Generation)	Option 3 – River Restoration
Construction (Options 1, 2)			
Site Preparation	✓	✓	✓
Powerhouse Construction	✓		
Spillway Construction	✓	✓	
Switchyard Construction	✓		
Construction of Fish Passage Facility	✓	✓	
Establishment of Ancillary Facilities	✓	✓	✓
Demolition of Existing Structures (Options 1, 2)			
Preparation for Demolition	✓	✓	
Demolition of Existing Diversion Sluiceway	✓	✓	
Demolition of Existing Main Spillway	✓	✓	
Demolition of Existing Powerhouse	✓	✓	
Demolition of Existing Switchyard	✓	✓	
Decommissioning of Existing Structures (Option 3)			
Preparation for Decommissioning			✓
Removal of Existing Concrete and Steel Structures			✓
Removal of Earthen Dam			✓
Site Reclamation and Rehabilitation			✓
Operation			
Power Generation	✓		
Water Level Control	✓	✓	
Fish Passage Facility	✓	✓	
Natural Flow Regime			✓

What are Mitigation Measures?

Mitigation measures are steps that can be taken to lessen the environmental changes caused by a project. These steps may arise from project design considerations, or be in the form of timing restrictions (e.g., sensitive periods for wildlife), physical mitigation (e.g., hay bales to catch sand and silt), or engineered solutions (e.g., changing a building design to avoid a sensitive wetland). As an important part of adaptive management, mitigation is considered throughout the life of a project to reduce the environmental interactions.

2.2 SCOPE OF THE COMPARATIVE ENVIRONMENTAL REVIEW

The CER will consider the following:

- potential environmental interactions for each Option with VCs and key issues of concern;
- issues raised through Aboriginal, public, stakeholder, or regulatory engagement;
- mitigation measures that are technically and economically feasible and that may reduce or lessen any substantial interaction with the environment for each Option, including design, engineering, and construction specifications where appropriate;
- requirements for additional analysis (e.g., studies, research, modeling) needed to evaluate environmental interactions for any required environmental assessment of the Preferred Option; and
- Aboriginal traditional knowledge and community knowledge that is available at the time of conducting the CER.

The Valued Components (VCs) and key issues of concern listed in Table 2.2 below are proposed for the CER. These were developed through consideration of the following:

- a review of the Options, as currently conceived at this early planning stage;
- the experience and judgment of the Study Team, which includes NB Power professionals, environmental assessment practitioners, academia, biologists, archaeologists, and engineers; and
- consideration of the known environmental assessment requirements of other similar projects (e.g., hydroelectric developments and decommissioning projects).

The CER will consider potential interactions with the environment for the VCs presented in Table 2.2, with particular emphasis on the identified issues of concern. Additional information for the requirements of each VC grouping is presented in Section 5.0. The VCs and key issues may be updated to include any issues or concerns expressed through Aboriginal, public, or stakeholder engagement that are not currently represented.

Table 2.2 Valued Components and Key Issues of Concern to be Considered for the Comparative Environmental Review

Valued Component (VC)	Key Issues of Concern for the VC
Atmospheric Environment VCs	
Air Quality	<ul style="list-style-type: none"> • Change in Air Quality (including dust, odour and others) • Change in GHGs • Change in Climate
Acoustic Environment	<ul style="list-style-type: none"> • Change in Sound Quality (including vibration)
Water Resources VCs	
Groundwater Resources	<ul style="list-style-type: none"> • Change in Groundwater Quality • Change in Groundwater Quantity and Flow Patterns
Aquatic Environment	<ul style="list-style-type: none"> • Change in Surface Water and Sediment Quality • Change in Surface Water Flow • Change in Fish Habitat (including benthic and macrophyte) Quality and Quantity • Fish Mortality • Species of Conservation Concern
Vegetation and Wildlife VCs	
Vegetation and Wetlands	<ul style="list-style-type: none"> • Change in Vegetation Communities • Change in Wetland Area • Change in Wetland Function
Wildlife and Wildlife Habitat	<ul style="list-style-type: none"> • Changes to Wildlife Habitat Size and Composition (including birds) • Direct Mortality • Species of Conservation Concern
Social and Economic Environment VCs	
Economy and Business	<ul style="list-style-type: none"> • Change in Economy • Change in Employment
Human Occupancy and Resource Use	<ul style="list-style-type: none"> • Change in Land and Resource Use (includes residential, resource, industrial, and recreational land use; also includes aesthetic enjoyment) • Change in Property Values • Change in Navigation • Change in Community
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	<ul style="list-style-type: none"> • Change in Traditional Use
Heritage Resources	<ul style="list-style-type: none"> • Change in Heritage Resources (including archaeological, historic, architectural, or palaeontological resources)
Infrastructure and Services VCs	
Infrastructure and Services	<ul style="list-style-type: none"> • Change in Infrastructure and Access • Change in Public Services • Change in Housing and Accommodation
Transportation	<ul style="list-style-type: none"> • Change in Transportation (including road infrastructure, railway infrastructure, traffic and traffic safety)

Issues related to human health and the environment will be addressed qualitatively through consideration of changes to the Atmospheric Environment VC and the Aquatic Resources VC.

2.3 COMPARATIVE ENVIRONMENTAL REVIEW METHODS

The methods used to undertake the CER will be similar to what is used in an environmental assessment, with basic elements including a description of:

- the scope of the VC;
- existing environmental conditions for the VC, to the extent known;
- potential environmental interactions for each VC, as conceived at the time of conducting the CER; and
- recommendations for mitigation and follow-up.

Although efforts will be made to mirror as closely as possible the methods that are normally used for a formal environmental assessment, the CER will differ somewhat from a typical environmental assessment, in that:

- it will be carried out largely through qualitative means, rather than through quantitative means, except where sufficient data and information exist to carry out the review quantitatively; and
- it will not provide a determination or judgment as to whether the environmental interactions are acceptable or not in comparison to legislation, objectives, standards, sustainability targets, or other thresholds (*i.e.*, what is known as significance criteria in a formal environmental assessment).

The focus of the CER will be to compare and contrast the potential ways in which the Options will interact with the VCs identified in Table 2.2, and identify possible mitigation measures that could be employed to reduce those environmental interactions. Potential environmental interactions will be identified and discussed separately for each Option. Potential environmental interactions with Options will be considered using a standard framework for each VC, with standard tables and matrices to document details of the review, and to facilitate comparison. The following describes the main steps in the CER process:

- **Step 1** - Select VCs.
- **Step 2** - Identify the key issues of concern for each VC.
- **Step 3** - Describe the existing conditions of the environment.
- **Step 4** - Identify and describe environmental interactions for each Option by focusing on the interactions identified for the key issues of concern for each VC.
- **Step 5** - Identify and describe specific mitigation that may be required to lessen the environmental interactions of the Option with the VC.
- **Step 6** - Identify additional information requirements, follow-up, or monitoring that will be required to carry out the environmental assessment of the Preferred Option, in any formal future process.

What do we mean by Quantitative and Qualitative?

Information may be either qualitative or quantitative. Quantitative information can be measured, whereas qualitative information is usually observed, and described.

For example, the number of jelly beans in a jar can be described quantitatively if they are counted, or weighed and reported with numbers and units such as kilograms. The same jelly beans can also be described qualitatively, by describing their colour, shape, or how full the jar is.

Both approaches are routinely used and accepted in environmental assessment.

The CER will consider credible and foreseeable environmental interactions for each Option. Standard good practices and procedures will be described, and additional mitigation that would be required for the Option to be environmentally acceptable will be presented. Potential cumulative interactions (*i.e.*, overlapping interactions) with other projects or activities will not be considered as part of the CER. However, where this potential is known or reasonably foreseeable, potential cumulative interactions will be presented and discussed.

2.4 ANTICIPATED CONTENT OF THE CER REPORT

The CER Report will provide a description of the Options, including planning, construction, demolition, and operation and maintenance. The following information will be included:

- Executive Summary;
- Definitions/Glossary;
- Introduction;
- Regulatory Framework;
- Scope of the Project;
- Aboriginal, Public, and Stakeholder Engagement;
- Scope of the Comparative Environmental Review and Methods;
- Description of the Options;
- Comparative Environmental Review of the Options, including:
 - description of the existing environment;
 - identification of environmental interactions with each Option;
 - mitigation measures;

- environmental management planning, monitoring, and follow-up;
- Summary and Comparison of Environmental Interactions;
- Summary of Mitigation Measures;
- Summary of Follow-Up and Recommendations; and
- References.

3.0 PLANNED ABORIGINAL ENGAGEMENT

Aboriginal engagement is an integral part of the scoping and conduct of the CER. Through early and ongoing engagement, there will be a variety of mechanisms for integrating Aboriginal concerns and information.

NB Power has initiated discussions with Aboriginal communities and organizations about the Project. The Aboriginal Engagement Plan is being implemented by a team including NB Power, Dillon Consulting, and the Kingsclear Economic Development Corporation.

The goals of the Aboriginal Engagement Plan are to:

- identify and build an understanding of the issues, challenges and interests;
- bring clarity about the criteria that Aboriginal communities and organizations would like NB Power to consider in the design and evaluation of the Options;
- seek ways to address issues and concerns;
- identify and explore common interests;
- integrate inputs into a future environmental assessment process;
- invite Aboriginal communities to participate in the engagement process;
- recommend next steps to advance the Preferred Option for the Station; and
- identify potential impacts to Aboriginal and treaty rights.

The Aboriginal engagement process does not fall under the Guidelines for the CER, however, information gathered through these processes will be used to inform the CER and the decision regarding the Preferred Option in 2016.

3.1 PLANNED ENGAGEMENT METHODS

NB Power will design a number of methods and tools for communicating information about the Project, as well as to solicit feedback and to provide mechanisms for questions and concerns to be registered with the individual Aboriginal communities and organizations. Using this approach, engagement is tailored to each community and organization culture. The following methods are among those that NB Power and Aboriginal communities and organizations may explore and implement during the CER:

- announcements and communications;
- open houses and community sessions;
- formal meetings;
- workshops and targeted discussions;

- web-based tools including social media and surveys;
- information materials and sources; and
- tracking and responding to interests and issues of concern.

3.2 ENGAGEMENT INITIATIVES CONDUCTED TO DATE

General announcements have been shared with communities and organizations prior to being made public whenever practical and possible.

To date, general presentations have been delivered to Kingsclear First Nation, the Assembly of First Nation Chiefs of New Brunswick, the Aboriginal Peoples Council, and the Maliseet Nation Conservation Council with follow-up dialogue having occurred with Kingsclear First Nation. An update meeting has taken place with the Assembly of First Nations Chiefs of New Brunswick.

Discussions are underway for including the remaining Maliseet communities in engagement activities.

4.0 PLANNED PUBLIC AND STAKEHOLDER ENGAGEMENT

Public and stakeholder engagement is an integral part of the scoping and conduct of the CER. Through early and ongoing engagement, there will be a variety of mechanisms for integrating public and stakeholder concerns and information.

NB Power is committed to engaging interested individuals, stakeholder groups, and community leaders to understand their issues and concerns, and to integrate those concerns into the CER framework where relevant information can be shared and discussed.

4.1 PUBLIC AND STAKEHOLDER GROUPS

The public and stakeholder groups and representatives identified to date for participating in the CER include, but will not be limited to, the following:

- adjacent private property owners and community leaders;
- Atlantica Centre for Energy;
- Cabinet, government Members of Legislative Assembly, Members of Parliament, opposition caucuses and political staff;
- Executive Council Office of the Government of New Brunswick;
- unelected leaders of political parties;
- Canadian Federation of Independent Business;
- Canadian Manufacturers and Exporters (CME), including NB Power commercial and industrial customers;

- Chambers of Commerce, Regional Economic Development Advisory Councils;
- Consumers' Association of Canada;
- Energy and Utilities Board members and staff;
- environmental non-governmental organizations (e.g., Conservation Council of New Brunswick, Sierra Club of Canada, Atlantic Salmon Federation, NB Salmon Council, World Wildlife Fund, Waterkeeper Alliance); independent power producers (e.g., The Canadian Wind Energy Association);
- St. John River Valley Community Liaison Committee;
- municipalities and Regional Service Commissions (emphasis on those adjacent to the Saint John River and watershed areas);
- NB Power customers;
- NB Power employees (especially at the Station);
- New Brunswick Business Council;
- New Brunswick Department of Energy and Mines;
- permanent NB Power Community Liaison Committees;
- the academic community; and
- tourism and recreation public interest groups and associations adjacent to Mactaquac and Saint John River.

4.2 PLANNED ENGAGEMENT METHODS AND EVENTS

NB Power will employ a number of methods and tools for communicating information about the Project, as well as to solicit feedback and to provide mechanisms for questions and concerns to be registered. The following methods are among those that NB Power will explore and implement as feasible during the CER:

- announcements and communications;
- formal and informal meetings;
- email newsletters;
- information materials and sources;
- open houses and public information sessions;

- stakeholder workshops and targeted discussions (e.g., open space technology, citizen science);
- tracking and responding to issues of concern; and
- web-based tools including social media and surveys.

5.0 VALUED COMPONENTS (VCS) TO BE CONSIDERED IN THE CER

The following sections define the key issues and interactions between Options and the environment for the VC groupings presented in Table 2.2. The issues will be evaluated using the information sources that are identified.

5.1 ATMOSPHERIC ENVIRONMENT VCS

5.1.1 Definition

VCS relating to the atmospheric environment include: Air Quality and Acoustic Environment. Table 5.1 presents the issues and potential interactions with the environment that will be considered.

Table 5.1 Summary of Key Issues and Environmental Interactions for Atmospheric Environment VCS

Key Issues	Description	Nature of Interaction
Change in Air Quality	Emissions of dust and/or criteria air contaminants; emissions of volatile organic compounds, reduced sulphur, or methane (odour).	Equipment and activities may produce air emissions, GHGs, and dust that could change air quality. Dewatering of the headpond for Option 3 may create odour and dust as a result of exposed sediment.
Change in GHG emissions	GHG emissions.	Equipment may produce GHGs; dewatering may cause a change to GHGs because of the loss of the headpond, which may be a carbon sink; and dewatering may result in the generation of GHGs including methane from biological processes in residual sediments
Change in Climate	The headpond has created various microclimates (e.g., rain shadows, wind patterns, thermoclines) specific to different areas of the headpond.	Dewatering the headpond for Option 3 may cause a change to microclimates in specific areas of the headpond.
Change in Sound Quality	Noise levels.	Equipment and activities may create noise that is noticeable to nearby receptors.

5.1.2 Sources of Information

The information that will be used for the CER will be based primarily on existing knowledge, which will be drawn from the following sources:

- existing air quality information (e.g., regional ambient air quality monitoring data);
- regional climatic information (e.g., temperature, winds, precipitation);
- literature-based sound levels for similar locations (i.e., semi-rural);
- known information about emissions (as available); and

- the experience and judgment of the Study Team.

5.1.3 Identification of Interactions with the VC

Identification of interactions with the Air Quality VC will focus primarily on emissions of dust, Criteria Air Contaminants (a group of air pollutants that cause smog, acid rain and other health hazards), and GHGs during construction activities. This will be considered largely through a qualitative analysis; it is not anticipated that quantitative modeling will be required to compare the Options nor that sufficient engineering detail would be available to support such an analysis as part of the CER. Interactions with the Air Quality VC will also consider how odour levels may change as a result of volatile organic compounds, and reduced sulphur and/or methane. GHGs may be created through construction activities. Removing the headpond could change carbon cycling processes, as the headpond currently acts as a carbon sink. In addition, methane release is possible in dewatered areas, which may also contribute to GHGs. Removing the headpond for Option 3 may also cause a change to microclimates in specific areas of the headpond.

Changes to Acoustic Environment VC will be considered primarily for construction and demolition equipment and activities. This will be considered largely through qualitative analysis; it is not anticipated that quantitative modeling will be required to compare the Options, nor that sufficient engineering detail would be available to support such an analysis as part of the CER.

5.2 WATER RESOURCES VCs

5.2.1 Definition

VCs relating to the water resources include: Groundwater Resources and Aquatic Environment. Table 5.2 presents the issues and potential interactions with the environment that will be considered.

It is noted that extensive study and information relating to the aquatic environment is being gathered through the MAES. As it becomes available, information gathered as part of that study will be used to inform and carry out the CER.

Table 5.2 Summary of Key Issues and Environmental Interactions for Water Resources VCs

Key Issues	Description	Nature of Interaction
Change in Groundwater Quality and Quantity (flow)	Groundwater level and flow patterns. Groundwater quality parameters.	Groundwater levels near the headpond may be affected. Residential wells and municipal water supplies, both upstream and downstream of the Station may be influenced by groundwater at the headpond. Surface water quality mixing with groundwater may be reduced, and could change water quality parameters such as water temperature.

Table 5.2 Summary of Key Issues and Environmental Interactions for Water Resources VCs

Key Issues	Description	Nature of Interaction
Change in Surface Water and Sediment Quality	Water and sediment quality.	Water flow changes could affect surface water quality through sediment-release, and a reduction of water flow. Sediment transport may change water quality parameters.
Change in Surface Water Flow	Water flow pattern changes.	The current flow of surface water may be affected. This will include consideration of changes to ice flow and flood control capacity.
Change in Fish Habitat (including benthic and macrophyte) Quality and Quantity	Includes habitat changes, species composition, richness, and diversity.	The characteristics of fish and benthic habitats may change, including quality and quantity of the habitats, which may affect the species present.
Fish Mortality	Includes direct and indirect mortality of fish species.	Fish mortality may occur during construction and operation activities.
Species of Conservation Concern	Includes individual fish species, as well as consideration of important habitat.	Changes to fish populations and habitats could affect species of conservation concern.

5.2.2 Sources of Information

Information to be used for the CER will be based on:

- existing GIS databases (e.g., geological maps; depth-to-water table);
- Aboriginal, public, stakeholder, and regulatory engagement;
- interview-based inventory of existing groundwater users proximate to the headpond;
- existing well-log data including chemistry information upstream and downstream;
- water-flow modelling (qualitative), if available;
- fish habitat characterization and modeling (qualitative), if available;
- description of fish presence: species, abundance, and distribution;
- other information available from the MAES; and
- the experience and judgment of the Study Team.

5.2.3 Identification of Interactions with the VC

The existing conditions for the Water Resources VCs will focus on describing current quality parameters for water, fish, and sediment. Existing flow patterns will be described based on available data, and qualitative modeling where appropriate. Species composition and distribution will be described, including Species of Conservation Concern.

The identification of interactions with the Groundwater Resources VC will focus on describing potential changes to water quality and quantity for existing water users, including local users as well as the city of Fredericton water supply. This will be undertaken through a review of existing information and qualitative prediction where appropriate.

Surface water flow changes will be considered based on qualitative water flow models for potential ecological and water management changes. This will include potential changes to the ice regime, and flood control.

Fish habitat (including benthic and macrophyte) quality and quantity includes physical and chemical changes to fish habitat, including ecosystem function, which may also affect species composition, diversity and abundance. The MAES, being carried out by the Canadian Rivers Institute (CRI), is a whole ecosystem study of the aquatic environment upstream and downstream of the Station and is focusing on three key themes: fish passage; whole ecosystem; and environmental flows. The review will be based on habitat modeling if available, and qualitative predictions of change.

The occurrence of fish mortality will be considered based on water flow changes and anticipated construction methods.

5.3 VEGETATION AND WILDLIFE VCs

5.3.1 Definition

VCs relating to the vegetation and wildlife include: Vegetation and Wetlands, and Wildlife and Wildlife Habitat. Table 5.3 presents the issues and potential interactions with the environment that will be considered.

Table 5.3 Summary of Key Issues and Environmental Interactions for Vegetation and Wildlife VCs

Key Issues	Description	Nature of Interaction
Change in Vegetation Communities	Includes direct and indirect disturbance or removal of habitat. Changes to species richness and diversity.	Construction in previously undisturbed areas will result in the loss of vegetation and wetland, where they are present in those areas. Option 3 will cause a change to vegetation and wetland upstream and downstream of the Station. Changes to the water regime for Option 3 will cause changes to the function of wetlands.
Change in Wetland Area	The direct loss of wetland area.	
Change in Wetland Function	Includes vegetation assemblages; hydrological patterns; and soils.	

Table 5.3 Summary of Key Issues and Environmental Interactions for Vegetation and Wildlife VCs

Key Issues	Description	Nature of Interaction
Change to Wildlife Habitat Size and Composition	Includes direct and indirect disturbance or removal of habitat, including migratory bird habitat.	Construction in previously undisturbed areas will result in changes to wildlife habitat in those areas. Changes to the water regime in Option 3 will cause a change to wildlife habitat types.
Direct Mortality	Direct interactions with wildlife species that results in death.	Construction and demolition activities have the potential for direct interactions with wildlife causing death.
Species of Conservation Concern	Includes individual wildlife and vegetation species, as well as consideration of important habitat.	Changes to vegetation and wildlife habitats could affect species of conservation concern.

5.3.2 Sources of Information

The information that will be used for the CER will be based primarily on existing knowledge, which will be drawn from the following sources:

- existing GIS databases (e.g., Atlantic Canada Conservation Data Centre (AC CDC); depth-to-water table);
- Aboriginal, public, stakeholder, and regulatory engagement; and
- the experience and judgment of the Study Team.

5.3.3 Identification of Interactions with the VC

The existing conditions for the Vegetation and Wildlife VCs will focus on describing current habitat types, including vegetation communities and wetland as described in existing information. Known species occurrence and areas of high potential for species of conservation concern will be identified.

The identification of interactions with the Vegetation and Wetlands VC will focus on changes to vegetation communities and wetland area. Potential changes to wetland function will be described based on available information.

Consideration of changes to the Wildlife and Wildlife Habitat VC will describe potential direct and indirect changes to wildlife habitat including migratory bird habitat. The potential for the Options to result in direct mortality of wildlife species will be considered based on available information.

5.4 SOCIAL AND ECONOMIC ENVIRONMENT VCs

5.4.1 Definition

VCs relating to the social and economic environment include: Employment and Business; Human Occupancy and Resource Use; Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons; and Heritage Resources. Table 5.4 presents the issues and potential interactions with the environment that will be considered.

Table 5.4 Summary of Key Issues and Environmental Interactions for the Social and Economic Environment VCs

Key Issues	Description	Nature of Interaction
Change in Economy	Includes consideration of business revenues and provincial tax contributions.	Construction activities may cause changes to local businesses. Long term changes may affect provincial tax and residential property tax contributions. Capital costs of the Options will be considered separately and are not part of the CER.
Change in Employment	Includes consideration of recreation and tourism, fisheries and Aboriginal businesses.	Disruptions or losses in employment may occur as a result of local changes to business. Long or short term employment opportunities may be created.
Change in Land and Resource Use	Includes residential, resource, industrial, recreational land use (e.g., recreational boating) and aesthetic enjoyment (e.g., visual landscape).	Local activities through changes in access or enjoyment of land and resources, including changes to aesthetics (e.g., visual landscape). Option 3 may cause substantial changes to land use and property values. Dewatering under Option 3 will expose previously inaccessible lands.
Change in Community	Includes consideration of changes in community structure or dynamics.	Access between parts of the community may change, which could cause a change to how people access services, and interact with one another.
Change in Navigation	Navigation of rivers, in consideration of the <i>Navigation Protection Act</i> .	Navigation could be affected due to changes in access to existing waterways, water level fluctuation, and potential long term changes to the Saint John River.
Change in Traditional Use	Includes direct interactions with traditional land use in the areas of new disturbance, as well as changes to the landscape under each Option.	Traditional land use may be affected through changes to access or enjoyment of land and resources; Option 3 may cause substantial changes to traditional land use through changes to the landscape.

Table 5.4 Summary of Key Issues and Environmental Interactions for the Social and Economic Environment VCs

Key Issues	Description	Nature of Interaction
Change in Heritage Resources	Includes consideration of archaeological, historic, architectural, or paleontological resources in consideration of the <i>Heritage Conservation Act</i> .	Previously buried or inundated heritage resources may be uncovered.

5.4.2 Sources of Information

The information that will be used for the CER will be based primarily on existing knowledge, which will be drawn from the following sources:

- existing GIS databases;
- the New Brunswick Department of Tourism, Heritage and Culture;
- public and stakeholder engagement, including local business and enterprise groups, and local heritage groups;
- informal directed interviews with stakeholders and individuals;
- research of available documentation (e.g., archives, databases of known heritage sites, archaeological potential maps, property value trends);
- review of bedrock geology and historic context;
- engagement with Aboriginal communities, individuals, and groups;
- predictive water level modeling (qualitative); and
- the experience and judgment of the Study Team, including property valuation professionals.

5.4.3 Identification of Interactions with the VC

The existing conditions for the Economy and Business VC, and the identification of environmental interactions, will focus on local businesses and activities, including an indication of seasonality and comparative (qualitative) contributions to the local and provincial economies. Estimates will be given as to the number of jobs that are provided in the area of the Project, where this information is available; businesses owned and/or operated by Aboriginal persons will also be described.

Potential changes to the Human Occupancy and Resource Use VC will focus on local residential, recreational, resource-based, and industrial land uses. The identification of environmental interactions will focus on availability of land uses under each Option, as well as a description of the potential changes in the perceived quality of land usage. A description of the existing residential housing market including valuation will be provided for the area, and expert input will be sought to identify potential

changes. Current navigational opportunities will be described, and changes to these will be considered in the context of the *Navigation Protection Act*.

Potential interactions with Aboriginal land use will focus on the current use of land and resources for traditional purposes by Aboriginal persons. Current land use for other goals, such as recreation or commercial use will be included in the relevant VC.

Potential interactions with Heritage Resources will focus on the potential for direct interaction or disturbance of heritage resources, as well as the potential to uncover previously inundated resources. An inventory of built resources will be developed, including their historical context. This inventory and consideration of interactions will include Kings Landing Historical Settlement.

5.5 INFRASTRUCTURE AND SERVICES VCs

5.5.1 Definition

VCs relating to infrastructure and services include: Infrastructure and Services, and Transportation Network. Table 5.5 presents the issues and potential interactions with the environment that will be considered.

Table 5.5 Summary of Key Issues and Environmental Interactions for Infrastructure and Services VCs

Key Issues	Description	Nature of Interaction
Change in Infrastructure and Access	Including physical structures such as water and sewage outfalls and intakes, and electrical infrastructure.	Water level changes associated with construction, or dewatering may affect existing users.
Change in Public Services	Includes emergency services, schools, and training institutions.	Construction activities may require temporary road closure and/or increased vehicle wait times which could affect public services. The influx of workers may stress existing services.
Change in Housing and Accommodations	Including the availability of temporary and permanent accommodations.	The influx of workers may stress existing services.
Change in Transportation	Includes changes to the road transportation network including level of service, safety, and infrastructure.	The existing roadway linking Routes 102 and 105 will be removed; however, the transportation link between Route 102 and 105 will be maintained. Construction activities may require temporary road closures and/or increased vehicle wait times. Heavy equipment may damage the existing infrastructure.

5.5.2 Sources of Information

Information for the CER will be drawn from the following sources:

- existing GIS databases;
- public and stakeholder engagement, including local community organizations, and service providers;
- informal directed interviews with stakeholders and individuals;
- research of available documentation (e.g., vacancy rates; public service statistics);
- transportation study including traffic-count data; and
- the experience and judgment of the Study Team.

5.5.3 Identification of Interactions with the VC

The description and identification of interactions with the Infrastructure and Services VC will focus on physical infrastructure that may be affected by the Options. Public services such as emergency fire, police and ambulance will be included, as well as other community establishments such as social services, and schools. A description of existing housing and accommodation availability will be included. This information will be provided at a preliminary level, and in qualitative terms. These VCs will also include consideration of interactions with the Kingsclear First Nation.

The Transportation VC will focus on the road network infrastructure, level of service, and safety.

6.0 SUMMARY AND CONCLUSION OF THE CER

A summary of environmental interactions will be developed where possible, to facilitate a comparison between Options. Recommended mitigation, follow-up, and additional information requirements will also be provided.

As noted in Section 1 of this document, the purpose of the CER is not to make a determination of which Option would be the most preferred; however, the Options will be compared and contrasted for informational purposes, on a VC-by-VC basis, to aid in future decision making by NB Power.

7.0 REFERENCES

NB Power. 2014a. Terms of Reference for the Comparative Environmental Review (CER) of Options for the Mactaquac Project, Mactaquac, New Brunswick. New Brunswick Power Corporation, Fredericton, New Brunswick. November, 2014.

NB Power. 2014b. Preliminary Project Concept: Mactaquac Project, Mactaquac, New Brunswick. New Brunswick Power Corporation, Fredericton, New Brunswick. November, 2014.