Lower Churchill Development
Fish Habitat Compensation Strategy Framework

Annotated Table of Contents

1.0 INTRODUCTION

The introduction will provide general background on the project and the Fish Habitat Compensation Framework.

1.1 Rationale and Approach

This section will provide an overview of the Fisheries Act and Compensation requirements. It will also describe the challenges associated with the scale of the project, species and existing methods of habitat quantification. It will lead the way for a description of the quantification method used for the project.

2.0 HABITAT QUANTIFICATION

This section will describe how the habitat quantification method was developed for the Project. It will describe the key tasks associated with the method including relevant data collection, description of existing habitat, description of existing habitat use by resident species, summary of how the habitat is predicted to change with the Project, and a summary of how the resident species are predicted to use the post-project habitat.

3.0 HADD DETERMINATION

The HADD determination will be presented in this section. It will provide a detailed breakdown/description of the habitat types included in the HADD as well as the rationale for their inclusion. This section will also describe the precautionary approach to the determination (i.e. no uncertainty associated with the habitat losses/alterations, rather, any inherent uncertainty associated with potential fish utilization of the altered habitat from the creation of the reservoir will be addressed through the compensation program).

It will be very clear on where the HADD units are and what is included. For example, it will break out the various determinations ("destroyed" and "harmful") and explain each. This section has to be very clear on where the units are located and what each represents.)

4.0 COMPENSATION APPROACH

This section will provide a discussion regarding fishery management/social objectives and the reasoning for adopting a multi species, risk management approach. For example, it will describe the results of user preference surveys as well as predictions regarding the species that will do relatively well over those that will not.

The Strategy will be presented and each approach will be described in relation to the Hierarchy of Compensation Options. The Compensation Program will follow a three-tiered approach as noted below.

4.1 Tier 1 – Post Impoundment Fish Utilization

This section will describe the predicted future habitat within the reservoirs (eg. characterization and quality) and will provide in-depth habitat analysis of the post impoundment environment as well as modelling results.

A description of the predicted response to habitat change by species will also be presented. This section will describe the model results used in predicting post-project habitat and use and will describe the certainty of the predictions. This section will also identify the Habitat Equivalent Units of the post-project habitat and how these are applied against the HADD.

DFO's potential recognition of reduced velocity and flooded areas as contributing towards compensation will require further detailed quantitative and qualitative analysis of post-impoundment habitat (eg. water quality, depths and substrates), and how resident species would use these areas. In addition, any predictions regarding utilization of reservoir habitat would require validation through an intensive long-term monitoring program – see below.

4.2 Tier 2 - Physical Compensation Works

Emphasis will be focused on the long term maintenance of fish populations within the reservoir with priorities being placed on implementing compensation/enhancement efforts on susceptible and/or socially important species/life-cycle stages. The section will outline biological criteria for susceptible species/life stages so that the habitat to be constructed can be put in context.

Potential Fish Habitat Compensation Options to be considered/described include:

- ***Gull Island Plateau*** *(creation of spawning and rearing habitat);*
- ***Creation/enhancement (both constructed and passive) of littoral habitat*** *within the post-project lacustrine habitat – approximately 150 km of littoral shoreline;*
- ***Creation/enhancement of delta*** *areas in the tributaries (potential river sites – Metchin River, Elizabeth River, Edwards Brook, Pinus River, Minipi, Beaver Brook);*
- ***Enhance Spawning Shoals*** *near the Pinus River and islands just downstream of Gull Island Dam;*
- ***Restoration of riverine*** *habitat above the Churchill Falls Tailrace;*
- ***Enhancement*** *of upstream habitat within flooded tributaries (i.e. creating spawning/rearing habitat);*
- ***Additional stream creation*** *within areas around some of the above noted potential delta areas;*
- ***Enhancement of habitat*** *downriver of Muskrat Falls.*

Also included in this section will be a description of standard compensation monitoring requirements to ensure structures remain stable and that they are being utilized.

4.3 Tier 3 – Adaptive Management Program

This section will describe the adaptive management approach and how it will allow negative issues related to the reservoir and its use to be identified and corrected before they reach predetermined cautionary-critical levels. In order for an adaptive management program to be effective, especially in terms of explaining unforeseen departures from predicted outcomes, an ecosystem approach encompassing appropriate physico-chemical variables will be adopted. If future cautionary-critical level situations regarding fish populations arise, an understanding of how they have evolved will be needed so a remedy can be quickly reached.

The approach will be one of "continual improvement" in that it will have a predicted series of post-project outcomes related to measured parameters and species habitat use (eg. positive, neutral, negative). Monitoring programs will be established to confirm/dispute these predictions and results may trigger actions outlined in the plan. Results confirming neutral predictions will not trigger changes to the plan. Results that indicate a failure to meet predetermined cautionary-critical levels will trigger timely investigations into possible mitigations. The outcome of these investigations will guide modification of the actions to be taken under the compensation plan so as to achieve overall objectives related to productivity of fish habitat. Conversely, positive results which indicate that predictions are exceeded will allow for compensation and or monitoring activities to be modified or reduced if appropriate.

4.3.1 Management Monitoring Program

An adaptive management approach will be based on an intensive monitoring program that would determine whether the predictions being forwarded by Nalcor concerning post-project parameters and habitat utilization are accurate. Standard compensation monitoring programs will be inadequate to address the complexity and numerous core issues associated with the creation and use of post-project habitats (eg. species assemblage and maintenance of species diversity, reservoir productivity (primary and fish), oligotrophication, sediment transport/loading).

The monitoring program will include the following cycle of actions:

1. *Monitoring of predicted post-project habitat formation/stabilization and utilization by resident fish species;*
2. *Monitoring of appropriate physico-chemical variables to measure potential reservoir-level biological and ecological linkages associated with reservoir development and stabilization;*
3. *a cyclic standardized review of monitoring results compared against predetermined caution/critical level values;*
4. *directed research initiatives on reservoir dynamics and processes related to caution/critical level values; and*
5. *Review of monitoring/research results and, if necessary, implementation of additional mitigation measures.*

4.3.2 Directed Research on Reservoir Dynamics and Processes

While the above approach brings a level of certainty to the success of the compensation efforts, there still remains a residual possibility that an unanticipated situation could occur that may negatively affect a species or assemblage or that predicted conditions were significantly inaccurate. While the Adaptive Monitoring Program will be designed to detect a possible situation before it becomes critical, it does not address what could be done to correct it.

As such, caution/critical parameter levels identified in the Adaptive Management Program (eg. from action #3 above) will trigger directed research on reservoir dynamics and processes related to those parameters as well as possible mitigation measures that can be implemented. This dedicated research will be an integral component of the adaptive management approach and will ensure management decisions and applied mitigations are made based on credible scientific practices.

5.0 Public Consultation

This section will describe the Public Consultation process associated with the Strategy. While typical public consultation associated with Compensation Planning occurs at the final acceptance of a Plan by the proponent and DFO, it is envisioned that additional consultation should be completed in this situation to ensure that the outlined approach is reviewed by the public and their initial comments received.

It is currently planned that the accepted strategy framework will require public input/display to measure the degree of understanding and acceptance of the process and the direction the strategy is going in terms of compensation options. This will allow both Nalcor and DFO to address any concerns prior to expending excess effort on planning. Once the strategy is accepted and a Plan developed, further public consultation will be required as per the typical compensation planning process.

Nalcor will implement a public consultation program with respect to the Fish Habitat Compensation Strategy Framework and will include the following:

- *Consultation with aboriginal and nearby communities;*
- *Contact with outfitters and others whose operations utilize the local freshwater resources;*
- *Contact with sport fishing and environmental organizations in the local area;*
- *Inclusion of material provided at public meetings; and*
- *An offer to nearby communities to attend consultation meetings on the proposed compensation strategy.*

REFERENCES

AGRA. 1999. Fish and Fish Habitat, Churchill River Power Project (LHP98-07). Prepared for Labrador Hydro Project, St. John's, NF.

AGRA 2000. Freshwater Fish Mercury Sampling, Churchill River, Labrador (LHP99-07). Prepared for Labrador Hydro Project, St. John's, NF.

AMEC. 2001. Churchill River Power Project: A Proposed Framework for HADD Determination (LHP00-07). Prepared for Labrador Hydro Project, St. John's, NF.

AMEC Earth & Environmental Limited. 2007a. Lower Churchill Hydroelectric Development Fish and Fish Habitat Baseline Study: catch-based Utilization Index Validation and Additional Habitat Surveys. Prepared for Labrador Hydro Project, St. John's, NF ii + 54 pp. + Appendices

AMEC-Sikumiut 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. viii + 129 pp. + Appendices

AMEC. 2008. Bank Stability Study for the Proposed Lower Churchill Hydroelectric Generation Project: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Beak Consultants. 1978. Lower Churchill River biophysical study. Abstract Report for: Newfoundland and Labrador Hydro 2 v + atlas (2 v.)

Beak. 1980. Fisheries Resources of Tributaries of the Lower Churchill River. Prepared by Beak Consultants Limited for the Lower Churchill Development Corporation, St. John's, NF.

Bruce, W.J.; Morry, C.J.; Rowe, L.W.; Wiseman, R.J. 1975. An overview of fisheries problems associated with the proposed Lower Churchill hydroelectric development, Gull Island, Labrador. Fisheries and Marine Service. Newfoundland Region; Lower Churchill Hydroelectric Project. Internal report series (Canada. Fisheries and Marine Service. Newfoundland Region); NEW/I-75-2. 1 v.

DeGraaf, D. A. 1980. Aquatic monitoring of selected streams with respect to potential disturbance resulting from Lower Churchill Development transmission lines: baseline studies summer 1979. Other Title: Lower Churchill development: stream monitoring surveys, 1979. St. John's, Nfld.: Atlantic Biological Services Ltd., 1980, 102 p.

DFO (Department of Fisheries and Oceans). 2004. Informal Requirements for the Development of a Compensation Strategy and Plan. Marine Environment and Habitat Management Division, September 2004.

FEARO (Federal Environmental Assessment Review Office).1980. Lower Churchill Hydroelectric Project. Report of Environmental Assessment Panel.

Gosse, M.M., A.S. Power, D.E. Hyslop and S.L. Pierce. 1998, Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans, St. John's, NF. X + 105pp., 2 appendices.

Hatch Ltd. 2007. Ice Dynamics Study Draft Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. v + xx pp, plus xx appendices.

JWEL (Jacques Whitford Environment Limited). 2000. Fish Migration and Habitat Use of the Churchill River (LHP98-03). Prepared for Labrador Hydro Project, St. John's, NF.

JWEL (Jacques Whitford Environment Limited). 1999a. Benthic Invertebrate Study of the Churchill River , Prepared for Newfoundland and Labrador Hydro, St. John's, NL. iv + 69 pp, plus 4 appendices.

JWEL (Jacques Whitford Environment Limited). 1999b. Primary Productivity and Plankton Biomass. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. v + 70 pp, plus 7 appendices

Lower Churchill Development Corporation. 1980. Environmental Impact Statement. Prepared for the Federal Environmental Assessment and Review Office for the Proposed Gull Island and Muskrat Falls Hydroelectric Generation Projects. Vol. I.

McCarthy, J.H., C.G.J. Grant and D.A. Scruton. (2007 Draft). Standard Methods Guide for the Classification and Quantification of Fish Habitat in Rivers of Newfoundland and Labrador.

McCarthy, J.H., L.J. LeDrew and B.R. LeDrew. 2008. A Framework for Aquatic Habitat Classification and Quantification for Large Northern Ecosystems: Application to the Proposed Churchill River Power Project, Churchill River, Labrador, Canada. Pages 587-603 In: American Fisheries Society Symposium, 2006, Proceedings of the 4th World Fisheries Congress, May 2-6, 2004, Vancouver, British Columbia, Canada.

Minaskuat Limited Partnership. 2008. Water and Sediment Modelling in the Lower Churchiull River, Lower Churchill Hydroelectric generation Project. Prepared for Newfoundland and Labrador Hydro Report No. MIN0338.22.

Northland Associates Ltd. 1980. Biophysical Assessment of the Proposed Lower Churchill Transmission Line. Volumes I and II.

Northwest Hydraulic Consultants (NHC). 2008. Lower Churchill Hydroelectric Generation Project Sedimentation and Morphodynamics Study – Final Report. AMEC Earth & Environmental, Newfoundland and Labrador Hydro, February 2008.

Riche, Lester G. 1965. A Preliminary Biological Survey of the Naskaupi, Kenamu and Lower Churchill Rivers, Fish Culture Development Branch, Newfoundland Area.

Ryan, P.M. 1980. Fishes of the Lower Churchill River, Labrador. Fisheries and Marine Service Technical Report No. 922.

Smokorowski, K.E. and Derbowka, D. 2007. Draft: Methods of Measuring Productive Capacity in Canada: Summaries for review at a national workshop, October 15-16, 2007. Can. Tech. Rep. Fish. Aquatict. Sci. iii + 146 p + Appendices.

Tetra Tech Inc. 2008. Lower Churchill Hydroelectric Generation Project Environmental Baseline Report: Assessment of the Potential for Increase Mercury Concentrations. Prepared for: AMEC Earth & Environmental, St. John's, NL. iii + 51 pp.