

Keeyask Study Areas Report

Manitoba Hydro Keeyask Generation Station

Manitoba Wildlands - January 2014

ABSTRACT

This Manitoba Wildlands report documents the numerous study areas used throughout the Keeyask Generation Station Environmental Impact Statement materials, and concerns surrounding the use and reporting of those areas.



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Executive Summary

This document reviews the study areas and land areas utilized throughout the Manitoba Hydro (MBH) Keeyask Generation project (Keeyask Project) Environmental Impact Statement (EIS) materials, selected technical reports and select Clean Environment Commission (CEC) hearing PowerPoint presentations by MBH. The purpose of this report is threefold; 1) highlight the inconsistent use, poor definition and variance of study areas used throughout the EIS materials, 2) highlight the inconsistent use of study areas throughout the EIS materials compared to the technical reports and CEC PowerPoint presentations by MBH and 3) discuss how late filing of the technical reports by MBH impeded review of EIS materials, thereby preventing a thorough assessment of EIS materials and overarching methodology.

Study areas are those regions used to investigate and observe the potential environmental effects of the Keeyask Project on a particular ecological component. In the context of a large environmental assessment, such as for the Keeyask Project, it is important to define study areas that are consistent throughout the entirety of the environmental assessment, using scientific basis for selection of the study areas at the outset of the project. Individual studies are then conducted based upon pre-determined study parameters; study area, and technical reports produced outlining findings from each study. The EIS is then developed based upon the findings from the individual technical reports and meta-analysis of technical report conclusions and recommendations. In the case of the Keeyask Project EIS, a uniform set of study areas were not defined at the outset of the environmental assessment, as evidenced from the varied use of study areas throughout the EIS materials. Furthermore, the technical reports from which the EIS was developed were in draft format, incomplete or non-existent at the time that the EIS was filed in June 2012.

The documents we reviewed for this report include 1) EIS materials; Response to EIS Guidelines, Terrestrial Environment, Physical Environment Aquatic Environment and Socio-Economic, Resource Use and Heritage Resources Supporting Volumes, 2) technical reports; Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region and Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba, and 3) MBH CEC PowerPoint presentations; Regulatory Environment Assessment – Aquatics & Terrestrial Environment Part 1 & 2 Presentations.

In this report we present examples of the study areas utilized and land use throughout the EIS materials and technical reports, providing commentary on their deficiencies and lack of consistency. This report is not an exhaustive review of all study and land use areas pertinent to the Keeyask Project. In addition, analysis of study areas and land use was further impeded by late submission of critical technical reports by MBH. Below is a brief summary of report findings and recommendations;

January 1, 2014

- 1) Over 12 different types of study areas are utilized throughout the EIS materials and technical reports, without a complete description and list of all study areas used and why;
- 2) There is no scientific description underlying the rationale of study area selection;
- 3) The use of the terms Local Study Area (LSA) and Regional Study Area (RSA) to describe the study areas for all environmental studies is misleading, as it implies that the selection and use of study areas is uniform throughout the EIS materials;
- 4) EIS materials and technical reports utilized different study areas to investigate the same VECs and supporting topics;
- 5) VEC study areas differed between EIS materials and technical reports;
- 6) Total area impacted by the Keeyask Project during construction and operation phases of the project is not clearly defined;
- 7) Environmental effects identified within technical reports filed late or during round 1 and 2 information requests are not discussed within the EIS materials distributed in June 2012;
- 8) EIS materials identify construction and operation phase terrestrial impacts that are not consistent throughout all EIS materials, technical reports or MBH CEC hearing presentations;
- 9) The EIS materials present the Keeyask Project footprint area in different areas, using various descriptive terms to define that area and whether it occurs during construction or operation.

The EIS materials make strong recommendations supporting the claim that the Keeyask Project will have no (not significant) long-term negative environmental effects, based upon findings from the environmental assessment. However, we provide evidence showing the inconsistent and flawed use of study and land use areas throughout the EIS materials, technical reports and MBH CEC PowerPoint presentations. Therefore we recommend that the CEC that further environmental assessment be conducted combined with peer review of study methodology and results before any further recommendations are made regarding the Keeyask Project.

Disclaimer

This report is not intended as an exhaustive review of all Keeyask Project EIS materials, technical reports and CEC hearing PowerPoint Presentations. Unless indicated, the information contained in this report was extracted from the EIS materials, technical reports or CEC hearing PowerPoint presentations.

Due to time and resource constraints we were only able to briefly investigate the study and land areas in select EIS materials, technical reports and CEC hearing PowerPoint presentations. We did not have the opportunity compare MBH information request responses to the EIS materials and technical reports to assess for consistency.

The tables within this report were either extracted directly from the EIS materials or created from EIS materials, technical reports and CEC hearing PowerPoint presentations.

Table of Contents

Executive Summary 2

Disclaimer 4

List of Tables 6

Sources of Information 7

Acronyms & Abbreviations 7

Glossary 8

Study and Land Use Areas..... 11

Late EIS Material and Technical Report Submissions..... 12

Response to EIS Guidelines 14

Terrestrial Environment Supporting Volume 18

**Regulatory Environmental Assessment - Aquatic & Terrestrial Environment
Hearing Presentation Parts 1 and 2 29**

Aquatic Environment Supporting Volume 31

Physical Environment Supporting Volume..... 35

Socio-Economic, Resource Use and Heritage Resources Supporting Volume.. 38

Socio-Economic Study Areas..... 38

Resource Use Study Areas 41

Heritage Resources Study Areas 42

General Concerns..... 46

Summary 47

Recommendations 48

Conclusions..... 49

List of Tables

Table 1. Response to EIS Guidelines - Terrestrial Footprint and Reservoir Areas Impacted by the Keeyask Generation Station Project..... 16

Table 2. Keeyask Generation Station Maximum Area of Terrestrial Habitat Affected During Construction* 16

Table 3. Keeyask Generation Project Terrestrial Footprint and Reservoir Area by Category * 17

Table 4. Keeyask Generation Station Reservoir Clearing Footprint 17

Table 5. Terrestrial Environment geographic study zones 21

Table 6. Terrestrial Environment Supporting Volume: Study Zones from Map 1-1 That are Used as the Local and Regional Study Areas for each of the Valued Environmental Components and Supporting Topics, Organized by EIS Section* 22

Table 7. Terrestrial Environment Supporting Volume: Benchmarks for Moose Determination of Magnitude of Effects* 24

Table 8. Terrestrial Environment Proxy, Benchmark and Context Areas..... 25

Table 9. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Study areas* 26

Table 10. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Moose and Caribou Habitat* 27

Table 11. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Ecological Zones – Regional Study Areas 28

Table 12. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Regional Study Area Wetlands..... 28

Table 13. Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation – Bird Habitat Loss 30

Table 14. Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation - Mammals 31

Table 15. Aquatic Environment Supporting Volume Local and Regional Study Areas 33

Table 16. Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba LSA and RSAs 34

Table 17. Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba Technical Report: General suitable proxy areas for Keeyask* 34

Table 18. Physical Environment Supporting Volume Study Areas 36

Table 19. Socio-Economic, Resource Use and Heritage Resources Part 1: Socio-Economic Local Study Areas (KCN Areas)..... 40

Table 20. Socio-Economic, Resource Use and Heritage Resources Supporting Volume: Communities within the Churchill-Burntwood-Nelson Region* 41

Table 21. Socio-Economic, Resource Use and Heritage Resources Supporting Volume Parts 1-3 Study Areas 45

Note: Tables with an asterisk (*) within the title denotes tables already existing within the EIS materials and technical reports.

Sources of Information

- 1) Response to EIS Guidelines
- 2) Terrestrial Environment Supporting Volume
- 3) Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region
- 4) Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba
- 5) Regulatory Environment Assessment – Aquatics & Terrestrial Environment Part 1 & 2 Presentations: presented by James Ehnes
- 6) Aquatic Environment Supporting Volume
- 7) Physical Environment Supporting Volume
- 8) Socio-Economic, Resource Use and Heritage Resource Use Supporting Volume
- 9) Regulatory Environment Assessment – Socio-economic, Resource use and Heritage Resources PowerPoint CEC hearing presentation: presented by Janet Kinley

Acronyms & Abbreviations

AE-SV – Aquatic Environment Supporting Volume
CSA – Core Study Area
EIS – Environmental Impact Statement
EPP – Environmental Protection Program
FLCN – Fox Lake Cree Nation
GHG – Green House Gas
KCN – Keeyask Cree Nation
Keeyask Project – Keeyask Generation Station Project
LSA – Local Study Area
MBH – Manitoba Hydro
MWL – Manitoba Wildlands
PE-SV – Physical Environment Supporting Volume
RMA – Resource Management Area
RSA – Regional Study Area
SE-SV – Socio-Economic Supporting Volume
TCN – Tataskweyak Cree Nation
TE-SV – Terrestrial Environment Supporting Volume
VEC – Valued Ecological Component
WLFN – War Lake First Nation
YFFN – York Factory First Nation
* - Existing table within the EIS materials

Glossary

The definitions provided below are those from the EIS materials and technical reports. Instances where no description exists for a term, it is stated that no description was provided. A few definitions have been provided by Manitoba Wildlands, with sources shown.

Benchmark Area – Areas unaffected by human development that are used to characterize patterns and dynamics in natural ecosystems.

Borrow Area – An area where earth material (clay, gravel or sand) is excavated for use at another location (also referred to as “borrow sites or borrow pits”).

Context Area – Area that provides a control region for conditions or factors that could confound the interpretation of information; animals moving into the Regional Study Area.

Core Study Area – A natural area that meets a minimum size criteria after applying an edge buffer on human features. Two minimum sizes (200 ha, 1,000 ha) after applying a 500 m buffer on human features were used in the intactness effects assessment.

Ecodistrict – A subdivision of Ecoregions from the National Ecological Framework for Canada into areas characterized by distinctive assemblages of relief, geology, landforms and soils, vegetation, water, fauna and land use.

Ecoregion – A subdivision of Ecozones from the National Ecological Framework for Canada into areas characterized by distinctive regional ecological factors including climate, physiology, vegetation, soil, water, fauna and land use.

Ecosite type – A classification of site conditions that have important influences on ecosystem patterns and processes. Site attributes that were directly or indirectly used for terrestrial habitat classification included moisture regime, drainage regime, nutrient regime, surface organic layer thickness, organic deposit type, mineral soil conditions and permafrost conditions.

Ecosystem - A dynamic complex of plant, animal and micro-organism communities and their non-living components of the environment interacting as the functional unit (Canadian Environmental Assessment Agency)

Ecological Zones/Ecozone – A classification system that defines different parts of the environment with similar land features (geology and geography), climate (precipitation, temperature and latitude), and organisms.

January 1, 2014

Effect - Any change that the Keeyask Project may cause in the environment. More specifically, a direct or indirect consequence of a particular Project impact.

Environmental Assessment – Process for identifying project and environment interactions, predicting environmental effects, identifying mitigation measures, evaluating significance, reporting and following-up to verify accuracy and effectiveness leading to the production of an Environmental Assessment report. Environmental Assessment is used as a planning tool to help guide decision-making, as well as project design and implementation (Canadian Environmental Assessment Agency).

False negative – type II error, whereby the null hypothesis is incorrectly accepted, and no effect is reported. A null hypothesis is a prediction that there will be no significant difference in a specific outcome of individuals or groups that are treated in different ways (<http://en.wikipedia.org/wiki/False-positive>).

False positive – type I error, whereby the null hypothesis is incorrectly rejected. A null hypothesis is a prediction that there will be no significant difference in a specific outcome of individuals or groups that are treated in different ways (<http://en.wikipedia.org/wiki/False-positive>).

Geographic Study Area – No specific definition provided. States that geographic study areas are the same as study zones.

Inland effects – No specific definition provided. Terrestrial inland ground water effects that are beyond the direct influence of a water body's water regime and ice regime

Inland Wetlands - A wetland that is beyond the direct influence of a water body's water regime and ice regime.

Keeyask Project – Manitoba Hydro Keeyask Generation Station Project

Local Study Area – 1) Area that captures the potential zone of Project influence on individuals in the case of species and individual elements in the of non-species topics. 2) The spatial area within which potential Project effects on individual organisms, or individual elements in the case of ecosystem attributes, may occur. Effects on the populations to which the individual organisms belong to, or the broader entity in the case of ecosystem attributes, were assessed using a larger regional study area; the spatial area in which local effects are assessed; within close proximity to the action where direct effects are anticipated.

Project Footprint – The surface area occupied by a structure or activity, the land or water area covered by the project. This includes direct physical coverage (the area on which the project physically stands) and direct effects (the disturbances that may directly emanate from the project, such as noise).

Proxy Area – Northern areas that provide examples of how Manitoba Hydro development could impact terrestrial ecosystems.

Regional Study Area – 1) Area that captures the area needed to assess how local effects are expected to affect population viability in the case of species or the regional manifestation of the attribute for non-species key topics. 2) The regional comparison area used for a particular key topic. Alternatively, the spatial area within which cumulative effects are assessed; extending a distance from the project footprint in which both direct and indirect effects are anticipated to occur.

Resource Management Area – An area to be jointly managed by a Resource Management Board established by agreement between Manitoba and a First Nation or a local Aboriginal community.

Resource Use - Subsistence and economic activities that make use of the resources derived from the natural environment.

Shoreline Wetland - A wetland where surface water level fluctuations, water flows and ice scouring are the dominant driving factors

Shore Zone – Areas along the shoreline of a waterbody including the shallow water, beach, bank and immediately adjacent inland area that is affected by the water body.

Study Area – The geographic limits within which effects on a VEC (valued environmental component or key topic is assessed.

Supporting Topic – A key topic that has a lower degree of concern than the Valued Environmental Components and improves the reliability of the assessment.

Upland - A land ecosystem where water saturation at or near the soil surface is not sufficiently prolonged to promote the development of wetland soils and vegetation.

Upstream Zones – No description within glossary

Wetland – Land that is wet for all or part of the year, including areas where the water is up to 2 meters deep. Water saturation is the dominant factor, determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Marshes and peatlands are types of wetlands.

January 1, 2014

Wildlife Management Area – Crown lands set aside for the better management, conservation and enhancement of the wildlife resources of the province.

Valued Ecological/Environmental Components – An element of the environment identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance. The value may be determined on the basis of cultural ideals or scientific concern (adapted from CEAA).

Study and Land Use Areas

The EIS materials and technical reports are based upon environmental assessment studies, designed specifically to address the environmental effects arising from the Keeyask Project. Study areas were based upon the environment or socio-economic parameter being investigated and typically include a Local Study Area (LSA) and a Regional Study Area (RSA). Although LSAs and RSAs are applied for the majority of studies conducted for the EIS, there are instances of new study areas; proxy, benchmark and core areas, being introduced for select studies.

As defined within the EIS materials an LSA is an area that captures the potential zone of Project influence on individuals in the case of species and individual elements in the case of non-species topics. Similarly, an RSA is an area that captures the area needed to assess how local effects are expected to affect population viability in the case of species or the regional manifestation of the attribute for non-species key topics.

Despite the use of the terms LSA and RSA, each LSA and RSA referenced is unique for each VEC and supporting topic, and cannot be compared based upon the use of the terms RSA and LSA. This is also the case for VECs and supporting topics investigated within technical reports, LSAs and RSAs differ for the same VEC and supporting topic between EIS materials, technical reports and CEC hearing PowerPoint presentations.

Land use areas are described in various sections of the EIS materials and CEC hearing PowerPoint presentations, stating the amount of land directly affected by the Keeyask Project. Land use is described by the Keeyask Project Footprint, which is defined by MBH to be; the surface area occupied by a structure or activity, the land or water area covered by the project (This includes direct physical coverage (the area on which the project physically stands) and direct effects (the disturbances that may directly emanate from the project, such as noise).

Late EIS Material and Technical Report Submissions

In addition to the EIS materials and related technical reports filed by MBH in June 2012, a series of documents including; technical reports, environmental management plan and cumulative effects assessment were submitted as late filings and during round 1 and 2 information requests in June and August 2013. The timely release of the above mentioned documents, prevented thorough review and analysis of those documents with submitted EIS materials. This is of importance, as MBH lacks consistency and transparency in its reporting methods, thereby withholding information from the public by virtue of omission and inundation, when there is no time for review.

The Keeyask Project EIS materials were submitted in June 2012. The documents included within the submission were:

- 1) Response to EIS Guidelines
- 2) Project Description
- 3) Terrestrial Environment Supporting Volume
- 4) Aquatic Environment Supporting Volume
- 5) Physical Environment Supporting Volume
- 6) Socio-Economic Supporting Volume
- 7) Public Involvement Supporting Volume
- 8) Keeyask Cree Nations Environmental Evaluation Reports
- 9) Map Folio
- 10) Draft Environmental Protection Program

The Draft Environmental Protection Program (EPP) submitted by MBH in June 2012 was incomplete, missing key environmental protection plans. The missing sections of the EPP were submitted in June 2013, and still certain sections of the EPP are absent or incomplete.

A list of technical reports was provided with the EIS materials in June 2012, referencing the use of 212 technical reports to draft the EIS materials. As of June 2012, 48 of the 212 technical reports were listed as incomplete/in preparation: 33 of the 48 incomplete technical reports were for the physical environment studies (Attachment #1). In May 2013, an updated list of technical reports was provided by MBH, in which the 48 incomplete technical reports previously listed in the June 2012 EIS materials were listed as complete (Attachment #2). However, upon inspection of the revised May 2013 list, many of the technical reports initially identified as incomplete as of June 2012, had completion dates that pre-dated submission of the EIS materials in June 2012. The technical reports identified within the June 2012 and revised May 2013 technical report lists were not provided with the EIS materials in June 2012.

Aside from the incomplete list of EIS technical reports, MBH took the opportunity to file additional EIS materials and technical reports during round 1 and 2 information

January 1, 2014

requests. The technical reports and documents submitted contained important large-scale environmental study results relevant to the review of EIS materials. The list of technical reports and EIS materials filed during round 1 and 2 information requests presented below is not exhaustive;

- 1) Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba (submitted August 15, 2013 with round 2 information requests)
- 2) Terrestrial Habitats and Ecosystems in the Lower Nelson River Region: Keeyask Regional Study Area (submitted July 12, 2013 with round 1 information requests)
- 3) Moose Harvest Sustainability Plan – Draft (submitted October 8, 2013 as late filing)
- 4) Adult Lake Sturgeon Movement Studies Memorandum: Adult Lake Sturgeon Movements in the Clark Lake to Kettle Generating Station Reach of the Nelson River (Submitted August 15, 2013 with round 2 information requests)
- 5) Cumulative Effects Assessment Summary (submitted August 19, 2013 with round 1 information requests)

Following round 1 and 2 information requests, MBH submitted additional documents as late filings that contained more information relevant to review of EIS materials. One technical report in particular entitled Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region is 456 pages in length, and presents information relevant to all aspects of the Keeyask Project environmental assessment.

In short, a complete review of the EIS materials and technical reports for the purposes of this report was difficult, given that relevant information pertaining to environmental studies were withheld until the end of the EIS review process. Therefore the study and land areas highlighted within this report constitute only as preliminary findings, thus requiring a more in-depth analysis of the complete EIS materials and technical reports once available.

Response to EIS Guidelines

The Response to EIS Guidelines (EIS) discussed areas impacted by the project based on type of activity being conducted by Manitoba Hydro, and the period in which the activity is taking place; construction or operation period.

The tables presented below present the terrestrial footprint and reservoir areas impacted by the Keeyask Project, as identified from tables presented within the EIS. Attention should be paid to the fact that there is no clear way of interpreting the total area impacted by the Keeyask Project, as various areas are presented throughout the EIS.

For example Table 1 lists the combined Keeyask Project footprint for both terrestrial and reservoir areas utilized by the project (Manitoba Hydro listed the values in km² and it was converted to hectares). However when those values are compared to the values presented in Tables 2, 3 and 4, they do not add up. Furthermore it is not clear from the labels provided by Manitoba Hydro, what is included within the construction and operation phases of the project and whether those values factor in mitigation reduction of land use and inland effects.

Review of the Aquatic and Terrestrial Powerpoint presentation entitled “Regulatory Environmental Assessment – Aquatic & Terrestrial Environment part 2 (Presented by James Ehnes), slide 32”, states that 9,416 ha of terrestrial habitat will be impacted directly and indirectly by the Keeyask Project. This value does not appear in the EIS or Terrestrial Environment Supporting Volume (TE-SV), and is not consistent with tables 1-4 presented in this report.

Overall we have a variety of concerns regarding the total amount of land impacted throughout the construction and operation phases of the Keeyask Project. The EIS materials go to great lengths to present incomplete data sets of land use by direct and indirect activities during construction and operation phases of the project throughout the EIS as seen in Tables 1-4. Furthermore, table 2 presents areas of land preserved through mitigation measures, and it is unclear whether those mitigation areas are factored into the overall land use figure.

MWL concerns identified;

- 1) No all-in chart was provided by MBH that listed all the terrestrial and aquatic areas directly and indirectly impacted by the Keeyask Project.
- 2) A reduction in terrestrial footprint as a result of mitigation measures by MBH, implies that MBH intentionally overestimated land use or size of areas so as to report on land preserved through mitigation measures.

January 1, 2014

- 3) It is unclear whether the land amounts reported for the terrestrial footprint include the areas mitigated that are reported in table 2.
- 4) It is still unclear how much terrestrial land will be impacted by the Keeyask Project throughout construction and operation phases of the Keeyask Project; including reservoir expansion, inland effects and any additional habitat disturbance.
- 5) Table 3, provided within the EIS materials, lists land use areas during the construction and operation phases of the Keeyask Project. The land use areas reported do not make sense; existing water surface is greater during the construction phase of the project and less during operation.
- 6) The land use areas presented in table 1 (derived from Response to EIS Guidelines text) do not match up with the areas presented in table 3 (table derived from Response to EIS Guidelines) of this report: Begging the question of what is the true land use area for the Keeyask Project?
- 7) The Keeyask Project Footprint reported in table 2 (table derived from Response to EIS Guidelines) does not match up with the land use areas reported in table 1 or 3 (tables derived text and pre-existing table from Response to EIS Guidelines respectively).
- 8) Unclear whether upland peatlands cleared for the Keeyask Project (Table 4) are factored into the Project Footprint area presented in tables 1-3.

Table 1. Response to EIS Guidelines - Terrestrial Footprint and Reservoir Areas Impacted by the Keyyask Generation Station Project

Footprint Area	Area (km ²)	Area (hectares)	Description
Construction Phase	133.5	13,350	Includes primary, supporting and areas that are unlikely to be used until final design adjustments are made.
Operation phase	138.2	13,850	The area for operation includes primary, supporting and reservoir area.
Keyyask Reservoir	93	9,300	Made up of 48 km ² of existing waterways and 45 km ² of newly inundated lands.
Keyyask Reservoir expansion	7-8	7,000 – 8,000	Over the first 30 year period.

Source: Response to EIS Guidelines, Section 4, page 4-20.

Table 2. Keyyask Generation Station Maximum Area of Terrestrial Habitat Affected During Construction*

Location	Terrestrial Habitat Affected (Hectares)
Project Footprint	6,872
Direct and Indirect Effects in Surrounding Areas	2,055
Total for Terrestrial Areas Before Mitigation	8,927
Mitigation – Avoided site at borrow area N-6	-57
Total for Terrestrial Areas After Mitigation	8,870

Source: Response to EIS Guidelines, Section 6, Table 6-24, page 6-311.

January 1, 2014

Table 3. Keyask Generation Project Terrestrial Footprint and Reservoir Area by Category *

Footprint Category	Area (Hectares)	
	Construction Phase	Operation Phase
Roads	621	637
Road Corridors	122	119
Infrastructure	317	208
River Management	27	1
Borrow Areas	1,321	1,052
Camp and Work Areas	154	154
Excavated Material Placement Area	181	99
Mitigation and Compensation Area	133	--
Possible Disturbed Area	672	219
Reservoir Clearing	3,602	--
Areas Unlikely to be Used	945	936
Existing Water Surface Area	5,161	5,038
Dewatered Area	100	100
Flooded Area		4,463
Reservoir Expansion (1 st 30 years)		800
Total Area	13,354	13,824

Source: Response to EIS Guidelines, Section 4, Table 4-2, page 4-21.

Note: The Terrestrial Environment Supporting Volume presentation references the value of 9,416 ha (direct and indirect effects to terrestrial habitat only).

Table 4. Keyask Generation Station Reservoir Clearing Footprint

Land Type	Area (Hectares)
Uplands and peatlands affected by reservoir clearing	7,434
Clearing inside reservoir prior to reservoir impoundment	3,446

Source: Response to EIS Guidelines, Section 6, page 6-202.

Terrestrial Environment Supporting Volume

For the Terrestrial Environment Supporting Volume (TE-SV), geographic study zones, Local Study Areas (LSA) and Regional Study Areas (RSA) were defined. Six geographic study zones were selected, in which the Local and Regional Study Areas reside in. Each LSA and RSA were individualized depending on the Valued Ecological Component (VEC) and Supporting Topic being evaluated.

The geographic study zones identified are somewhat of an enigma, regarding the rationale behind area selection. The 6 study zones are presented in Table 1, which includes a short description of each zone, and how the area for each was determined. The descriptions provided are derived from the TE-SV, and do not expand on overarching rationale for area selection (Table 5).

The LSAs are regions that encompass the potential area of Keeyask Project influence on individual species and elements. The RSAs are regions that allow assessment of how local effects impact population viability or regional manifestation of an impact. Please note, that the Terrestrial Environment Supporting Volume states that the “majority” of environmental assessment studies fall within the geographic zones, however there is no further clarification regarding which studies extend outside of the defined geographic zones. Furthermore the cumulative effects assessment for each Terrestrial VEC and supporting topic utilized the RSA for analysis, rather than the corresponding LSA. The LSA and RSA for each VEC and Supporting Topic within the TE-SV are presented in Table 2.

Proxy and benchmark areas were also used within various terrestrial environmental studies to act as control areas. Proxy areas are defined as those northern regions already impacted by Manitoba Hydro development, and can thereby provide examples of anticipated Keeyask Project terrestrial and ecosystem effects. Benchmark areas are those regions unaffected by Manitoba Hydro and human development and are regarded as the negative control areas. Benchmark areas are those lakes and rivers off-system to the Nelson River, located within geographic study zone 6. Benchmark areas were utilized for wetland studies, but not for uplands or inland peatlands. Context Areas are additional control areas that are used when parameters have the potential of confounding information analysis.

Throughout the TE-SV, there are multiple LSAs, RSAs, proxy areas, benchmark areas and context areas used for the terrestrial environment studies: Each study area differs depending on the VEC or supporting topic being examined. Technical reports pertaining to the terrestrial environment were later released in August, September and October 2013, over a year after submission of the EIS materials in June 2012 (discussed previously in report); Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba (August 15, 2013) and Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region (September 17, 2013).

January 1, 2014

Review of the technical reports revealed that within the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report, the LSAs and RSAs for specific VECs differ from the LSAs and RSAs used for the same VECs presented within the TE-SV. For example, in the TE-SV the LSA and RSA for moose are study zones 3 and 5 respectively (Table 6). Whereas in the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report, the LSA and RSA for moose are study zones 2/4 and 4/5 respectively (Table 9 and 10).

Also of note, the LSA and RSA for the olive-sided flycatcher within the TE-SV are zones 3 and 4 respectively (Table 6). However within the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report, the LSA for Olive-sided flycatcher is distributed amongst 3 study zones; zone 1-3, but only accounts for 86% of the total LSA referenced (no mention of remaining 14%) (Table 8). Finally within the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report the study areas listed for the VECs are presented in greater detail (Table 10) than presented within the TE-SV (Table 6).

It is unclear whether the EIS materials were written prior to completion of all technical studies by virtue of the technical reports being completed after the EIS materials were submitted. The gross oversight by MBH to apply consistent and reliable methodology to their terrestrial studies within EIS materials and technical reports warrants further investigation and peer review, to test the merits of all environmental studies conducted by MBH.

MWL concerns identified;

- 1) The geographic study zones defined within the TE-SV lack scientific justification and the rationale provided is vague.
- 2) It is unclear how the geographic study zones (Table 5) were determined, as the EIS materials reference selection criteria that rely on environmental studies to first be conducted prior to the areas being defined. For example zone 2 was defined based on the assumption that it is maximum potential local zone of influence on terrestrial habitat alteration. However, preliminary studies were not referenced within the EIS materials, from which MBH could have derived the information to determine what the minimum and maximum local zone influence on terrestrial habitat alteration could possibly be.
- 3) It is unclear whether each consecutive geographic study zone incorporates the area of the zone previous to it. For example does zone 3 incorporate zones 1 and 2, or is it simply the area in zone 3 surrounding zones 1 and 2?

- 4) It is unclear what percent of each geographic study zone was utilized for each individual environmental study. It seems unrealistic that 100% of each geographic study zone was assessed for each study, particularly if there is an LSA and RSA. Furthermore, if there was more than a single LSA and RSA for each study or if proxy or benchmark areas were incorporated, what percent of each area was assessed?
- 5) It is unclear whether there were minimum and maximum amounts of land areas to be assessed within each study area; LSA, RSA, proxy area, benchmark area, etc, assigned to each environmental study.
- 6) It is not discussed in the EIS materials why geographic study zones 2 and 3 are determined based on buffer zones around geographic study zone 1, whereas geographic study zones 4 to 6 do not use a buffer zone around geographic study zone 1 to define the zones.
- 7) LSA and RSAs utilized within the TE-SV and Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report for VECs and Supporting Topics are not consistent between the two documents.
- 8) It is difficult to identify the study areas used for all terrestrial environment studies, given that there is no all-in list of the terrestrial study areas used.
- 9) LSA and RSAs utilized within the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report, are dispersed for some species between several geographic study zones, making analysis and interpretation of the material difficult.
- 10) The Habitat Relationships and Wildlife Habitat Quality Models technical report does not make reference to the use of proxy or benchmark areas that were referenced within the TE-SV when assessing the terrestrial environment.
- 11) Additional ecological zones and RSAs were identified in the Habitat Relationships and Wildlife Habitat Quality Models technical report, compared to the TE-SV.
- 12) The Habitat Relationships and Wildlife Habitat Quality Models technical report provides the land area value for the primary and secondary habitats for VECs and Supporting Topic. However primary and secondary habitat listed in the TE-SV for VECs and Supporting Topics is presented as a percent of the LSA and RSA during construction and operation phases of the project.

Table 5. Terrestrial Environment geographic study zones

Zone	Buffer	Total Area (Hectares)	Total Land (Hectares)	Description
zone 1	NA	13,010	7,591	Combined potential Project Footprint during construction and operation phases of Keeyask project that are likely and unlikely to be used.
zone 2	150 m buffer around study zone 1	18,689	13,043	Maximum potential local zone of influence on terrestrial habitat alteration. Used as the local study area for terrestrial habitat and species with the smallest individual home range.
zone 3	1,150 m buffer around study zone 1	41,996	33,339	Projects maximum potential local zone of influence on landscape elements. Used as the regional study area for species with the smallest population home range.
zone 4	NA	221,509	167,255	Area large enough to capture repeating landscape types. Used as the regional study area for species with small to moderate population home range. Used as local study area for species with large individual home range.
zone 5	NA	1,420,000	1,240,000	Area large enough to support the key boreal ecological processes and the population home ranges for most the resident wildlife species. Zone that was large enough to maintain a relatively stable habitat in response to the natural fire regime. Regional study area for most of the habitat and ecosystem key/supporting topics.
zone 6	NA	3,050,000	2,700,000	Area needed to characterize the fire regime. Used as the regional study are for species with large population home ranges.

Source: 1) Terrestrial Environment Supporting Volume, Section 1, page 1-16 – 1-17, Map 1-1.

Table 6. Terrestrial Environment Supporting Volume: Study Zones from Map 1-1 That are Used as the Local and Regional Study Areas for each of the Valued Environmental Components and Supporting Topics, Organized by EIS Section*

EIS Section and Topic	Geographic Study Zone				
	Zone 2 ¹	Zone 3	Zone 4	Zone 5	Zone 6
Section 2 – Terrestrial Ecosystems and Habitat VECs and Supporting Topics					
Terrestrial habitat	LSA			RSA	
Fire Regime		LSA			RSA
Ecosystem Diversity (VEC)	LSA			RSA	
Intactness (VEC)		LSA		RSA	
Soil Quantity and Quality	LSA			RSA	
Wetland Function (VEC)	LSA			RSA	
Section 2 – Terrestrial Invertebrates					
Invertebrate community		LSA	RSA		
Section 3 – Terrestrial Plants					
Priority Plants² (VEC)	LSA			RSA	
Invasive Plants	LSA			RSA	
Section 4 – Amphibians and Reptiles					
Priority amphibians ³		LSA	RSA		
Section 5 - Birds					
Canada Goose (VEC)		LSA		RSA	
Mallard (VEC)		LSA	RSA		
Bald Eagle (VEC)		LSA		RSA	
Olive-sided flycatcher (VEC)		LSA	RSA		
Common Nighthawk (VEC)		LSA	RSA		
Rusty blackbird (VEC)		LSA	RSA		
Other priority birds ^{4,5}	Not defined				

Keeyask Study Areas Report

January 1, 2014

Section 6 - Mammals					
Caribou (VEC)			LSA		RSA
Moose ⁶ (VEC)		LSA		RSA	
Beaver (VEC)		LSA	RSA		
Other priority mammals ^{5,7}	Not defined				
Section 7 - Mercury					
Mercury in wildlife			LSA	RSA	
<ol style="list-style-type: none"> 1. Codes in the table indicate which of the study zones shown in Map 6-28 were used as the local Study Area (LSA) and Regional Study Area (RSA) for each VEC and Supporting Topic. 2. Priority plant species include those native species that are highly sensitive to human features, make high contributions to ecosystem function and/or are favored for use by local people. A species was considered to be highly sensitive to human features if is globally, provincially or regionally rare, near a range limit, has low reproductive capacity, depends on rare environmental conditions and/or depends on the natural disturbance regime. Rare species that are endangered or threatened are of particularly high concern. 3. Includes Species at Risk. 4. Includes other Species at Risk, colonial waterbirds and species at the edge of their known breeding range. 5. Study areas vary too greatly by species to generate in this table. 6. The Moose LSA also includes the offset areas where individual moose are harvested (see the off-set harvest program description in the SE SV, Resource Use). Assumes that a moose population residing in an area approximating the size 7. Includes endangered, threatened, provincially rare and regionally rare species, small mammals and large carnivores as high contributors to ecosystem function and furbearers highly valued by local people. 					

Source: Terrestrial Environment Supporting Volume, Section 6, Table 6-6, pg 6-82

Table 7. Terrestrial Environment Supporting Volume: Benchmarks for Moose Determination of Magnitude of Effects*

Threat to Population Persistence	Range of Values Relative to Magnitude Effect	
Physical habitat loss	Low	< 1% of the region
	Moderate	1-10% of the region
	High	> 10% of the region
Harvest	Low	< 10% of regional population
	Moderate	11-20% of regional population
	High	>20% of regional population
Gray wolf density	Low	< 4 wolves/1,000 km ²
	Moderate	4-6 wolves/1,000 km ²
	High	>6 wolves/1,000 km ²

Source: Terrestrial Environment Supporting Volume, section 7, table 7-33, page 7-125.

Table 8. Terrestrial Environment Proxy, Benchmark and Context Areas

Proxy Area	Description
Stephens Lake	Terrestrial habitat and ecosystem assessment used Stephens Lake as the primary proxy area.
Notigi Reservoir	Utilized for some studies
Wuskwatim Lake	Utilized for some studies
Long Spruce Reservoir	Utilized for some studies
Borrow areas	Proxy areas for vegetation and soil recovery in cleared and excavated areas were selected from borrow areas developed for PR 280 and for the Kettle, Limestone and Long Spruce generating stations.
Habitat Regeneration sites	10 sites downstream of Kettle and Long Spruce Generating Station
Benchmark Area	Description
Off-system lakes	Shown in maps, but no description or location provided
Fox River	Portions of the river used, but does not specify
Context Area	Description
No location provided	No description of location provided

Source: Terrestrial Environment Supporting Volume, Section 1, page 1-27. 2) Terrestrial Environment Supporting Volume, Section 2, page 2-7.

Table 9. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Study areas*

Study Area	Description	Comments
Study zone 1	LSA	46% of LSA of Olive-sided flycatcher
Study zone 2	LSA	Used for all habitat relationship models, section 3
	LSA	Moose habitat quality model
	LSA	19% of LSA of Olive-sided flycatcher
Study zone 3	LSA	Beaver study area
	LSA	21% of Olive-sided flycatcher
Study zone 4	LSA	Moose study area aerial surveys (conducted 2002 – 2006), section 4
	LSA	Caribou studies
	RSA	Beaver study area
	RSA	Olive-sided flycatcher
Study zone 5	RSA	Used for all habitat relationship models, section 3
	RSA	Moose habitat quality model
Study zone 6	RSA	Moose study area aerial surveys, section 4
	RSA	Caribou study area

Source: Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region, section 2, page 2-11, Map 2-1; section 3, page 3-19; section 4, page 4-27; section 4, page 4-41; section 5, page 5-6; section 6, Table 6-10, page 6-25; section 7, page 7-7.

Note: LSA for Olive-sided flycatcher distributed amongst 3 study zones, but only accounts for 86% (no mention of remaining 14%).

Keeyask Study Areas Report

January 1, 2014

Table 10. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Moose and Caribou Habitat*

Habitat type	Area (Hectares)	Description
Moose Primary Habitat	Study Zone 2 = 4,437.43 LSA Area/Zone 4 = 35,094.53 RSA Area/ Zone 5 = 256,111.30	Sampled from study zone 4, coarse habitat types preferred by moose.
Moose Secondary Habitat	Study Zone 2 = 7, 678.46 LSA Area/ Zone 4 = 128,647.39 RSA Area/Zone 5 = 972,393.56	Sampled from study zone 4, coarse habitat types
Moose Primary and Secondary total	Study Zone 2 = 12,115.89 LSA Area/Zone 4 = 163,741.92 RSA Area/ Zone 5 = 1,228,504.80	Combination of primary and secondary habitats
Caribou Primary Habitat total	Study Zone 2 = 19,963.71 LSA Area/ Zone 4 = 112,591.13 RSA Area/ Zone 5 = 851,030.76	Coarse habitat types for caribou. Different RSAs for caribou are identified; zone 5 and 6.
Beaver primary habitat	Study Zone 2 = 171.71 LSA Area/Zone 3 = 416.15 RSA Area/Zone 4 = 1301.33	Preffered ecosites for beavers
Beaver secondary habitat	Study Zone 2 = 929.88 LSA Area/Zone 3 = 2993.96 RSA Area/Zone 4 = 19,354.63	Ecosites for beavers
Beaver primary and secondary habitat	Study Zone 2 = 1,101.59 LSA Area/Zone 3 = 3,410.11 RSA Area/Zone 4 = 20,655.96	Primary and secondary habitats for beavers
Olive-sided flycatcher primary habitat	Total = 9,513 Study Zone 1 = 352 Study Zone 2 = 244 LSA/Zone 3 = 1,084 RSA/Zone 4 = 7,867	Preffered ecosites for Olive-sided flycatchers
Olive-sided flycatcher secondary habitat	Total = 8,039 Study Zone 1 = 1,172 Study Zone 2 = 354 LSA/Zone 3 = 1,276 RSA/Zone 4 = 5,226	Ecosites for Olive-sided flycatchers
Olive-sided flycatcher primary and secondary habitat	Total = 17,552 Study Zone 1 = 1,524 Study Zone 2 = 598 LSA/Zone 3 = 2,360 RSA/Zone 4 = 13,093	Primary and secondary ecosites for Olive-sided flycatchers

Source: Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region, section 4, Table 4-18, page 4-42; section 5, Table 5-18, page 5-42; section 6, Table 6-10, page 6-25; section 7, page 7-18.

Table 11. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Ecological Zones – Regional Study Areas

Ecological Zone	Description
Upland	A land ecosystem where water saturation at or near the soil surface is not sufficiently prolonged to promote the development of wetland soils and vegetation
Inland wetland	A wetland that is beyond the direct influence of a water body’s water regime and ice regime
Shore zone	Areas along the shoreline of a water body including the shallow water, beach, bank and immediately adjacent inland area that is affected by the water body
Inland Wetland (recently burned)	No direct description provided in glossary
Shoreline Wetland	A wetland where surface water level fluctuations, water flows and ice scouring are the dominant driving factors

Source: Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region, section 3, page 3-17. Photo 3-2

Note: description of ecological zones from glossary within Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region technical report.

Table 12. Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Regional Study Area Wetlands

Regional Study Area Wetlands	Description
Shoreline wetlands	Areas located along the shorelines of a waterbody; surface water areas larger than 0.5 hectares
Inland wetlands	Remaining wetlands

Source: Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region, section 3, page 3-11

January 1, 2014

Regulatory Environmental Assessment - Aquatic & Terrestrial Environment Hearing Presentation Parts 1 and 2

During the Keeyask CEC Hearings, MBH delivered two PowerPoint presentations during the CEC hearing entitled “Regulatory Environmental Assessment – Aquatic & Terrestrial Environment Part 1 and 2”. MBH presented limited data on habitat use and loss for birds and specific mammals, and did not discuss how the study areas for each VEC or Supporting Topic were selected and utilized; what percentage of the area was assessed.

The tables listed below account for the areas referenced within the two presentations; part 1 and 2. It is not an exhaustive list of all the areas discussed within the presentations, but it provides an example of how limited the presentation was on information and impacts to the terrestrial habitat. We only discuss the information relevant to the terrestrial environment CEC hearing presentation as an example to show the deficiencies in information provided.

Based on what was previously presented in this report regarding terrestrial study areas, it is evident that the presentations are lacking in information and therefore misleading.

MWL concerns identified;

- 1) The MBH Aquatics & Terrestrial Environment PowerPoint Presentation did not provide a complete listing of LSAs and RSAs used for terrestrial VECs and Supporting Topics.
- 2) Inconsistent information provided on habitat loss and description for VECs and Supporting Topics.
- 3) The LSAs and RSAs for VECs and Supporting Topics were discussed in terms of percent of habitat lost; land areas were not provided.
- 4) Land areas used to describe caribou habitat impacted by the Keeyask Project are inaccurate; calving and rearing areas are not the same, and should not be grouped into the same category (Table 14).
- 5) No definitions were provided in the PowerPoint presentation to define the difference between caribou habitat areas; wintering habitat is usually defined based on food access.
- 6) The PowerPoint presentation did not discuss which caribou herd was being discussed, lumping all caribou together as a single mammal (Table 14).

Table 13. Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation – Bird Habitat Loss

Bird	Habitat loss	Description
Mallard	2,958 ha lost, revised from 1,908 based on IR request	Presentation indicated increased habitat loss does not impact the EIS, as it would not impact the regional sustainability of mallards
Bald eagle	No number or percentage provided to indicate amount of habitat loss	Reported that nests lost will be replaced with artificial platforms
Common nighthawk	Short term increased habitat generation by 15% due to land clearing. Long-term habitat loss during project operation <10%	Does not indicate land amounts or locations (LSA or RSA) in hectares used for analysis
Olive-sided flycatcher	Indicates only 9% habitat loss	Does not indicate land amounts or locations (LSA or RSA) in hectares used for analysis
Rusty blackbird	Up to 6% of breeding habitat affected	Does not indicate land amounts or locations (LSA or RSA) in hectares used for analysis
Colonial waterbirds	No discussion of habitat affected	

Source: Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation, Presenter James Ehnes.

Table 14. Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation - Mammals

Mammal	Comments
Caribou assessment <ul style="list-style-type: none"> - Calving and rearing - Caribou wintering habitat - Caribou habitat intactness 	<ul style="list-style-type: none"> < 1% of RSA impacted (loss of roughly 6,000 ha out of 210,000 ha) < 1% of RSA impacted (loss of roughly 50,000 ha out of 900,000 ha) No land value provided on map, but appears that >50% is disturbed

Source: Regulatory Environment Assessment: Aquatic & Terrestrial Environment – Part 2 PowerPoint Presentation, Presenter James Ehnes.

Note: The presentation does not indicate which caribou herd or type is affected.

Aquatic Environment Supporting Volume

The aquatic environment was studied by assessing numerous aquatic environment areas, the bulk of which have already been altered by Manitoba Hydro developments. The study areas are listed within the Aquatic Environment Supporting Volume (AE-SV) and include; Split Lake, Keeyask, Stephens Lake and the Downstream area (Kettle Generation Station along Nelson River up to Gillam). For the terrestrial studies, the geographic study zones (

January 2014

Table 5) were used as a basis to define the study areas. However, the study areas listed for the aquatic studies are different and independent from the geographic study zones presented in TE-SV (Table 15). Thus showing that there is a lack of consistency between the terrestrial and aquatic studies regarding the use of study areas.

During the second round of information requests for the CEC hearing, MBH submitted a technical report on August 15, 2013 entitled “Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba”. The technical report describes the use of LSAs and RSAs (**Table 16**) in relation to the geographic study zones 1-6 described in the TE-SV (

Table 5), which are different from those used in the AE-SV. In addition, the technical report lists 6 proxy areas, which are not referenced or utilized in the AE-SV to conduct the aquatic environment studies (Table 17).

The fact that the aquatic studies presented in the AE-SV did not use proxy or benchmark areas as a control, indicates that study findings are potentially biased due to lack of information from adjacent water bodies not impacted by existing MBH development. New information is presented within the technical report, which should have been made available at the outset of EIS review, not at the end.

Overall, the study areas utilized within the AE-SV and Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba technical report are highly inconsistent and warrants greater scrutiny through peer review.

MWL concerns identified;

- 1) All technical reports should have been finalized and filed with the EIS materials in June 2012;
- 2) Within the AE-SV aquatic studies, MBH failed to use proxy or benchmark control areas;
- 3) New information was presented within the Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba technical report regarding the aquatic environment that was released in August 15, 2013.;
- 4) The Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba technical report used different study areas compared to those listed in the AE-SV;
- 5) The Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba technical report used Wuskwatim Lake as a proxy area. However the MBH Wuskwatim Generation Station only became fully operational in January 2013. Therefore Wuskwatim Lake could not have been used as a proxy for the Keeyask Reservoir, as the inundation period for a new generation station is greater than 6 months, and the technical report was submitted on August 15, 2013.

Table 15. Aquatic Environment Supporting Volume Local and Regional Study Areas

Study Area	Description	Local/Regional	Aquatic Sections Applied to
Split Lake Area	Split, Clark and Assean Lakes and tributaries to Split Lake	LSA	1, 2, 3, 4, 5
Keeyask/Nelson River Area	The Nelson River from the outlet of Clark Lake to the inlet of Stephens Lake, including small tributaries.	LSA	1, 2, 3, 4, 5
Stephens Lake Area	Stephens Lake and associated tributaries including the North and South Moswakot Rivers and Looking Back Creek.	LSA	1, 2, 3, 4, 5
Downstream Area	Kettle Generating Station along the Nelson River up to Gillam Island.	LSA	1, 2
Combined Area	Includes Split Lake, Keeyask and Stephens Lake Areas. No mention of whether it includes Downstream Area.	RSA	Referenced in section 1
Access road stream crossings	Stream crossings along the north and south access roads		2

Source: 1) Aquatic Environment Supporting Volume, Section 1-3 Study Area, page 1-15; Section 1, Map 1-5; Section 2, Map 2-1, 2) Aquatic Effects Monitoring Plan, Section 2, Map 4.

Table 16. Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba LSA and RSAs

Study Area	Description
Local study area	Geographic study zones 1 & 2 (Same as in Terrestrial Supporting Volume)
Regional study area	Geographic study zone 5 (Same as in Terrestrial Supporting Volume)

Source: Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba, section 2, page 2-19, Map 2-1.

Table 17. Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba Technical Report: General suitable proxy areas for Keeyask*

Proxy Area	Description
Kelsey Reservoir	Nelson River ~80 km upstream of Gull Lake
Gull Lake	Nelson River between Split Lake and Kettle
Kettle Reservoir	Nelson River immediately downstream of Gull and upstream of Long Spruce
Long Spruce Reservoir	Nelson River immediately downstream of kettle and upstream of limestone
Notigi Reservoir	Burntwood River immediately downstream of South Indian
Wuskwatim Lake	Burntwood River ~80 km downstream of Notigi dam

Source: Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba Study Areas, section 2, table 2-3, page 2-24.

Note: The technical report does not provide a value for the total direct and indirect terrestrial land impacted by the Keeyask Project. The Terrestrial Environment Supporting Volume presentation references the value of 9,416 ha (direct and indirect effects to terrestrial habitat).

Physical Environment Supporting Volume

The Physical Environment Supporting Volume (PE-SV) focused on reviewing the physical properties of the surrounding environment that may be impacted by the Keeyask Project. The study areas selected for this portion of the assessment are varied, and cannot be compared between sections of the PE-SV.

For example section 4: Surface Water and Ice Regime of the PE-SV utilizes an aquatic study area; Split Lake to Stephens Lake along the Nelson River, which does not correspond directly to any of the specific LSAs defined within the AE-SV (Table 15) or in the PE-SV. However, in section 5: Physiography of the PE-SV, the study areas used to investigate the physical characteristics of the surrounding environment, matched those described in the TE-SV, corresponding with the geographic study zones. Yet in section 6: Shoreline Erosion of the PE-SV, it reverts back to using vague study areas with little description that do not correspond with the previously described terrestrial environment study areas within the TE-SV.

So in keeping with previous MBH patterns of study area variability as presented in the TE-SV and AE-SV, the PE-SV is no different: The variability is extreme and the areas are vaguely defined within the EIS materials, which prevents effective review of the study areas used for the physical environment studies.

MWL concerns identified;

- 1) The study areas selected for the physical environment studies lack scientific rationale and proper description within the text of the PE-SV;
- 2) The LSAs and RSAs used to assess the VECs and Supporting Topics are inconsistent and not comparable throughout the PE-SV and with the TE-SV or AE-SV;
- 3) Surface permafrost was assessed within the PE-SV, but sub-surface permafrost was not. Sub-surface permafrost of an issue of contention for the MBH Bipole III Transmission Line Project, however it has been ignored for the Keeyask Project;
- 4) New upstream study zones were used for the shoreline erosion study that do not appear in any other areas of the EIS materials.

Table 18. Physical Environment Supporting Volume Study Areas

Study Area	Description
Section 2 - Climate	
Gillam airport weather station	56°21'N 94°42'W. Used to assess climate conditions.
Grid points in close proximity to the Keeyask Project	54.3°N to 58.3°N lat, and 93.2°W to 98.2°W long. Points used to assess future climate change scenarios
Life Cycle Assessment (LCA) geographic area	Stated that LCA is not subject to geographic restriction
Section 3 - Air Quality and Noise	
Regional air quality and noise study area	Thompson to Gillam
Local air quality and noise study area	Footprint of the Keeyask Generating Station and Keeyask reservoir
Section 4 - Surface Water and Ice Regime	
Water and ice regime study area	Extends along the Nelson River from Split Lake to Stephens Lake
Section 5 - Physiography	
Bedrock and Surface Geology	The LSA corresponds to geographic study zone 4 and the RSA corresponds to geographic study zone 5 as described in the Terrestrial Environment Supporting Volume.
Soils and Peatlands	The LSA corresponds to geographic study zone 4 and the RSA corresponds to geographic study zone 5 as described in the Terrestrial Environment Supporting Volume.
Coarse Ecosite	The LSA corresponds to geographic study zone 4 and the RSA corresponds to geographic study zone 5 as described in the Terrestrial Environment Supporting Volume.
Surface Permafrost	The LSA corresponds to geographic study zone 4 and the RSA corresponds to geographic study zone 5 as described in the Terrestrial Environment Supporting Volume.

Section 6 – Shoreline Erosion Processes	
Upstream zones – total of 6 zones (not the same as the geographic study zones 1-6 in TE-SV)	<ol style="list-style-type: none"> 1) Riverine shorelines upstream of Birthday Rapids 2) Riverine shorelines at Birthday Rapids 3) Riverine shorelines downstream of Birthday Rapids to the inlet of Gull Lake 4) Lake shorelines in Gull Lake 5) Riverine shorelines at Gull Rapids 6) Riverine shorelines immediately below Gull Rapids (extends approximately 1 km downstream of Keeyask Project)
Downstream zones	No description of where the downstream location is
Section 7 - Sedimentation	
Upstream Peat Modeling zones: 1 - 13	Peat modeling zones (1-13) extend from Birthday Rapids to the Keeyask Generation Station
Downstream Peat Modeling	Not performed
Upstream Mineral Sedimentation reaches: 1-9	Upstream reaches extend from the opening of Clark Lake, up the Nelson River, to the Keeyask Generation Station
Downstream Mineral Sedimentation	Includes Stephens Lake from Gull Rapids to Kettle Generation Station
Section 8 – Groundwater	
Groundwater regime	565 km ² area (60 km east to west and 15 km north to south). Groundwater elevation ranged from 120 m to 140 m. Not defined based on zone or area.
Section 9 – Surface Water Temperature and Dissolved Oxygen	
Upstream study area	Outlet of Clark Lake along the Nelson River to the Keeyask Generation Station
Downstream study area	Stephens Lake - Keeyask Generation Station to Kettle Generation Station.
Section 10 - Debris	
Keeyask Generation Station open-water hydraulic zone of influence	Large study area that encompasses Split Lake up to the middle of the Burntwood River up to Stephens Lake just past the Kettle Generation Station. There is no defined area (Map 10.2-1).

Source: Physical Environment Supporting Volume, section 2, page 2-3 ; section 3, page 3-4; section 4, page 4-11; section 5, page 5-2; section 6, page 6-16; section 7, page 7-7; section 8, page 8-5; section 9, page 9-10; section 10, page 10-6.

Note: Reference to Stephens Lake in this table means the Stephens Lake Reservoir.

Socio-Economic, Resource Use and Heritage Resources Supporting Volume

The Socio-Economic, Resource Use and Heritage Resources Supporting Volume (SE-SV) is divided into three sections; Socio-Economic, Resource Use and Heritage Resources. The Local and Regional Study Areas defined for each section within the SE-SV differed, and require individual analysis.

Socio-Economic Study Areas

According to MBH, study areas selected for the Socio-Economic, Resource Use and Heritage Resource Supporting Volume (SE-SV) reflect impacts on the four Keeyask Cree Nation (KCN) partners; Tataskweyak Cree Nation (TCN), Fox Lake Cree Nation (FLCN), War Lake First Nation (WLFN) and York Factory First Nation (YFFN). Eleven LSAs were selected in relation to the four KCNs, and also included the Township of Gillam and City of Thompson (SE-SV, Map 1-1, pg 1-24).

Gillam and Thompson were included as LSAs due to the following reasons, as stated in the SE-SV (Table 19);

- The Town of Gillam is MBH's northern operations base and operation staff would be located in Gillam. Gillam is also home to FLCN Members living both on and off reserve;
- Construction worker interaction, since some construction workers are likely to visit Gillam and Thompson and possibly Split Lake during their leisure time;
- Transportation/traffic for construction equipment, materials and people would flow primarily through Thompson, with some via Gillam;
- The City of Thompson is the regional centre for the Project and as such, can be expected to experience increased expenditures on retail goods and services due to re-spending of wages by the Project commercial workforce. Some commercial and industrial services in Thompson could see increased demand. As well, Thompson could receive additional pressure on regional health and social services.

According to MBH, the eleven LSAs were selected in order to assess the effects of the Keeyask Project on;

- Physical/biophysical effects on resource use/traditional use areas and heritage resources;
- Employment and business effects;
- Construction worker interaction within the partners' home communities;
- Investment income.

The eleven socio-economic LSAs are not described in the text of the SE-SV, and are only available in the map provided (SE-SV Map 1-1, page 1-24). In addition, the

January 1, 2014

LSAs only correspond to those Cree Nations that are involved with MBH on the Keeyask Project, and neglect other First Nation and Metis communities that are impacted by the Keeyask Project, but not involved with MBH. For example Peguis and Shamatawa First Nations have traditional territory within the Keeyask Project geographic study areas (zones 1-6), but were not included in the socio-economic studies. In addition, the eleven LSAs referenced in the SE-SV were not disclosed in the Regulatory Environment Assessment – Socio-economic, Resource use and Heritage Resources PowerPoint CEC hearing presentation: presented by Janet Kinley (slide 24).

The Regional Study Area (RSA) applied to the Socio-Economic studies include all of northern Manitoba, encompassing Canada Census Divisions 19, 21, 22 and 23, and includes the Churchill-Burntwood-Nelson communities (SE-SV, Map 1-2, pg 1-25). Map 1-2 identifies 15 northern communities and 4 Manitoba communities. It is not explained why some communities are identified as northern communities and others as Manitoba communities. The exact area of the RSA is also not clearly defined, or how exactly these areas were assessed. The complete list of communities located within the RSA was not available within the SE-SV.

MBH consistently fails to define the LSAs and RSAs using descriptive text and maps that contain the same information. For example, the socio-economic LSAs and RSAs are depicted through the use of maps (Map 1-1, page 1-24 and Map 1-2, page 1-25), which do not correlate with the written description of the study areas provided within the materials and methods section of the SE-SV (pages 1-18 and 1-19).

For example, the SE-SV states that LSAs were defined based on the four KCN communities, inclusive of Gillam and Thompson. However the map provided (Map 1-1, pg 1-24) lists five LSAs, with an additional eleven LSAs or KCN Reserve Areas embedded within them. The eleven KCN Reserve Areas are not identified by name within the text of the document, just within the legend of Map 1-1. Furthermore, it is not clear how each of the eleven KCN Reserve Areas are utilized within the context of the five identified LSAs, or which KCN Reserve Areas are related to which KCN. Similarly, a table was provided in the SE-SV listing the First Nation communities, Northern Affairs Communities, Towns and City within the Churchill-Burntwood-Nelson Region (Table 20). The communities, towns and city are not the same as the communities, towns and city depicted on Map 1-2: Socio-Economic Regional Study Area (page 1-25 SE-SV). The SE-SV states that the Churchill-Burntwood-Nelson Region is included within the socio-economic RSA, yet the communities, towns and city within that region are not all depicted on Map 1-2 (page 1-25).

MWL concerns identified;

- 1) The eleven socio-economic LSAs listed only correspond to those areas that impact the Keeyask Cree Nation partners, and not other First Nation or Metis communities;
- 2) The eleven socio-economic LSAs were only described visually on a map and not in text format within the SE-SV;
- 3) There is no discussion of proxy or benchmark communities to act as control areas when assessing the eleven socio-economic LSAs.
- 4) The RSA described in the SE-SV includes all of northern and central Manitoba, making the RSA excessively large and not representative of northern Manitoba.
- 5) The LSAs and RSA described within the SE-SV are different from the areas described within the Regulatory Environment Assessment – Socio-economic, Resource use and Heritage Resources PowerPoint CEC hearing presentation part 2.
- 6) It is unclear whether the 16 northern communities and 3 Manitoba communities within the RSA

Table 19. Socio-Economic, Resource Use and Heritage Resources Part 1: Socio-Economic Local Study Areas (KCN Areas)

Study Area	Area (hectares)	Description
A Kwis Ki Mahka Reserve	1.3	Reserve land of FLCN
Fox Lake 1	562	Reserve land of FLCN
Fox Lake 2	40	Reserve land of FLCN
Fox Lake West 3	1,139	Reserve land of FLCN
Moosecoot	6.8	Reserve land of WLFN
Moosecoot 2	142	Reserve land of WLFN
Moosecoot 3	52	Reserve land of WLFN
Split Lake 171	14,468	Reserve land of TCN
Split Lake 171A	2,991	Reserve land of TCN
Split Lake 171B	136	Reserve land of YLFN
York Landing	976	Reserve land of YLFN

Source: Socio-Economic, Resource Use and Heritage Resources Supporting Volume, section 1, pages 1-18, Map 1-1.

Note: The description of the Socio-Economic LSA was provided by the authors of this document and not by MBH.

Table 20. Socio-Economic, Resource Use and Heritage Resources Supporting Volume: Communities within the Churchill-Burntwood-Nelson Region*

Type of Community	Name of Community
First Nation Communities	Nisichawayasihk Cree Nation Tataskweyak Cree Nation York Factory First Nation War Lake First Nation Norway House Cree Nation Cross Lake First Nation
Northern Affairs Communities	Granville Lake Nelson House Ilford Wabowden Thicket Portage Pikwitonei Norway House Cross Lake
Towns	Town of Gillam Town of Leaf Rapids Churchill
City	City of Thompson

Source: Socio-Economic, Resource Use and Heritage Resources, section 1, Table 1-1, page 1-20

Resource Use Study Areas

The study areas defined for Section 2: Resource Use portion of the SE-SV, list a single LSA and 3 RSAs. The LSA is defined as the region between Traplines 07, 09, 15 and 25, bounded northwest by Provincial Road 280, southeast by the rail and encompasses Clark Lake and the Town of Gillam. The LSA is the area where direct effects to terrestrial, aquatic and social environment were studied.

The RSAs utilized include; the Split Lake Resource Management Area (SLRMA) (which contains the War Lake Traditional Territory), the Fox Lake Resource Management Area (FLRMA) and the York Factory Resource Management Area (YFRMA) which includes the YFFN trapline 13 (Map 1-1, page 1-109). The combined RMAs total 50,000 km². Of the 3 RMAs listed, it states that the SLRMA was focused on for the majority of studies, thereby limiting the studies for the other KCN communities and First Nation or Metis communities that might also share Traditional or Treaty land.

According to MBH, the RMAs are the areas where indirect effects of the Keeyask project are anticipated to occur. The RSAs and LSAs used within the Resource Use section of the SE-SV, are not the same as the RSA used within the Socio-Economic section of the SE-SV.

The use of 3 identified RMAs as the study areas for the Resource Use portion of the EIS introduces a variety of problems with overall clarity and study design.

MWL concerns identified;

- 1) Of the three RMAs identified, there is no discussion of whether resource use by other communities has been included within the resource use study that may be directly or indirectly impacted by the Keeyask Project;
- 2) No control areas (Proxy, Benchmark or Context Areas) have been identified to act as control communities/sites for investigation;
- 3) The LSA defined just barely incorporates the land around the area planned for inundation by the future Keeyask Reservoir, The LSA is not an appropriate study area to investigate the direct effects of the Keeyask Project on communities, as it does not factor in reservoir expansion;
- 4) It is not clear from the information presented, what portion of the 3 RMAs were sampled for resource use studies;
- 5) The LSA and RSAs for the Resource Use (Part 2) section of the SE-SV, are not similar to the LSAs and RSAs used for the Socio-Economic (Part 1) and Heritage Resources (Part 3) sections of the SE-SV (Table 21);
- 6) No acknowledgement, accommodation or study of resource use by non-KCN First Nation communities.
- 7) The resource use study areas do not factor in the subsistence economy.
- 8) No clear rationale provided as to why the study areas selected for resource use studies were the KCN RMAs.

Heritage Resources Study Areas

For the Heritage resources studies, 3 types of study areas were identified rather than just an LSA and RSA. The 3 study area types are listed include; the Core Study Area (CSA), the LSA and RSA. This is the first time within the EIS materials, that a CSA was used. The rationale behind the use of a CSA in addition to an LSA and RSA was not explained within the SE-SV.

The CSA encompasses an area that includes the reach of the Nelson River between its outflow to Clark Lake and the inflow into Stephens Lake. The description of the CSA indicates that it is an area that accounts for impacts caused by varying degrees

January 1, 2014

of the Keeyask Project, but does provide further explanation of what “varying degrees” actually means. On the map provided (Map 1-1, page 1-42), the CSA is visually depicted, appearing to resemble combined geographic study zones 1, 2 and 3. However no information is available within the text that describes or relates the CSA to geographic study zones 1, 2 and 3. It is further noted, that no heritage sites were registered within the CSA prior to the Keeyask Project, and after the archeological studies were conducted, 50 sites were identified (Map 1-1, page 1-42).

The heritage resource LSA includes the CSA and 7 additional geographic ranges; Clark, Carscadden, Moose Nose, Stephens, Fox, Kettle Lakes and Landing River. The RSA encompasses both the CSA and LSA previously described, and incorporates traditional lands of TCN, WLFN, FLCN and YFFN, and stays within the Swampy Cree region.

MWL concerns identified;

- 1) The CSA description does not indicate if it is an area that accounts for direct impacts of the Keeyask Project only, or both direct and indirect.
- 2) The CSA description needs to elaborate on what is meant by “varying degrees” of the Keeyask Project, complete with identification of time frame and discussion of what the “degree of change” entails.
- 3) Visually the CSA looks to include geographic study zones 1, 2 and 3, without mention of these areas within the description of the CSA. A discussion needs to be provided on the association between the CSA and the geographic study zones.
- 4) Given the significance of the Gull Rapids area, it is unlikely that no heritage sites were identified near or around this area that lies within the CSA.
- 5) The total number of heritage sites impacted during both the construction and operation phases of the project are not depicted in a map, to show the corresponding CSA, LSA and RSA.
- 6) The LSA incorporates FLCN and WLFN reserve lands, but does not include TCN or YFFN reserve lands.
- 7) There is the reference to the use of proxy areas within the LSA, however proxy areas are not discussed in relation to the RSA.
- 8) There is no discussion on how the area for the LSA was arrived at.
- 9) It is not clear how the area for the RSA was arrived at, or how the interactions with Upland and Rock Cree were factored into area selection.

- 10) It is not clear whether the three RMAs and combined into a single RSA, or individually studied;
- 11) The LSA and RSAs for the Heritage Resources (Part 3) section of the SE-SV, are not similar to the LSAs and RSAs used for the Socio-Economic (Part 1) and Resource Use (Part 2) sections of the SE-SV (Table 21);
- 12) Appears that MBH ignored the past, present and future resource use by Aboriginal Rights holders who are not members of a KCN community;
- 13) The CSA, LSA and RSA omit the Shamatawa First Nation lands, especially those used for YFFN traplines out of consideration.
- 14) Clear discussion of the inundation losses of heritage resources assumed by the project, and their CSA, RSA, LSA, RMA locations is missing.
- 15) Not clear whether the geographic ranges selected for the heritage resource use study areas were based upon information from the National Topographic Series.
- 16) It is not clear whether the heritage resources study areas overlap with other First Nation heritage areas.

Table 21. Socio-Economic, Resource Use and Heritage Resources Supporting Volume Parts 1-3 Study Areas

Study Area	Description
Socio-Economic Study Areas: Part 1 of SE-SV	
LSAs	A Kwis Ki Mahka Reserve, Fox Lake 1, Fox Lake 2, Fox Lake West 3, Moosecoot, Moosecoot 2, Moosecoot 3, York Landing, Split Lake 171, Split Lake 171A and Split Lake 171B
RSA	All of northern Manitoba, encompassing Canada Census Divisions 19, 21, 22 and 23, and includes the Churchill-Burntwood-Nelson communities
Resource Use Study Areas: Part 2 of SE-SV	
LSA	Region between Traplines 07, 09, 15 and 25, bounded northwest by Provincial Road 280, southeast by the rail and encompasses Clark Lake and the Town of Gillam
RSA	The Split Lake Resource Management Area (SLRMA) (which contains the War Lake Traditional Territory), the Fox Lake Resource Management Area (FLRMA) and the York Factory Resource Management Area (YFRMA) which includes the YFFN trapline 13
Heritage Resources Study Areas: Part 3 of SE-SV	
CSA	Includes the reach of the Nelson River between its outflow to Clark Lake and the inflow into Stephens Lake. Visually looks to include geographic study zones 1, 2 and 3, but no description provided in text of SE-SV
LSA	Includes the CSA and 7 additional geographic ranges; Clark, Carscadden, Moose Nose, Stephens, Fox, Kettle Lakes and Landing River
RSA	Includes the CSA, LSA and traditional lands of TCN, WLFN, FLCN and YFFN, and stays within the Swampy Cree region

Source: Socio-Economic, Resource Use and Heritage Resources - Part 1: Socio-Economic, section 1, page 1-20; Part 2: Resource Use, section 1, page 1-4; Part 3: Heritage Resources, section 1, page 1-6.

General Concerns

This is a list of general concerns gathered from each section of this report; (Please see the list of concerns at the base of each section of this report, specific to that section).

- 1) MBH did not provide a scientific rationale that explains why the study areas were selected for all environmental studies, and if those areas were appropriate. The rationale provided for selection of the geographic study zones was based on the MBH perspective of the Keeyask Project, rather than an objective perspective;
- 2) Study areas throughout the EIS materials are not consistently described and listed for each Supporting Volume. In some instances, the study area is only visually depicted;
- 3) The Response to EIS Guidelines, did not list the total amount of land to be directly and indirectly impacted by the Keeyask Project;
- 4) The Response to EIS Guidelines lists land impacted by the project in different areas throughout the materials, without providing an all-in table within all the values showing direct and indirect land use during the construction and operation phases of the Keeyask Project, that also accounts for mitigation efforts;
- 5) Different study areas are defined within the Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region and Responses of Terrestrial Habitats to Reservoir Flooding and Water Regulation in Northern Manitoba technical reports than used within the TE-SV and AE-SVs;
- 6) When presenting information during the CEC hearings, it has to be complete and match up with what is present within the EIS materials;
- 7) The LSAs selected for the SE-SV focused only on those communities that are involved with the Keeyask Cree Nation partnership with MBH;
- 8) The LSAs and RSAs utilized within the heritage resource portion of the SE-SV are limited, leaving out potentially important heritage sites, Cree Nation communities and description of how the LSAs and RSAs were determined;
- 9) MBH should not submit additional technical reports after the EIS materials have been submitted, reviewed, and subject to Information Requests that utilize different study areas and methodology to conduct the same types of studies as listed in the EIS materials: Assuming that what is presented in the

January 1, 2014

Summary

The purpose of conducting a large-scale environmental study to gain a cohesive understanding of the surrounding environment prior to development, using the same set of parameters, study areas and assumptions for comparability. MBH has simply conducted many small environmental studies, using independent methodology that under proper scientific scrutiny cannot be compared. However, MBH has lumped all the studies together for comparison, as if conducted using the same parameters, study areas and assumptions.

Recommendations

The overarching recommendations for the use of study areas while conducting an environmental assessment for the purpose of development are simple, and should be applied uniformly to all future projects.

- 1) Study areas need to have clear written and visual description that defines the amount of area used, land characteristics and current and past state.
- 2) A clear rationale needs to be presented for selection of the study area.
- 3) Control areas need to be defined at the outset of every study.
- 4) Baseline values for every study area need to be presented in the introductory portion of each study.
- 5) A consistent naming protocol for all study areas needs to be defined at the outset of all environmental assessments.
- 6) Study areas need to be consistent from one study to another. When comparing environmental studies between physically distinct ecosystems; terrestrial versus aquatic, study areas that allow for comparative studies should be utilized.
- 7) A complete listing of all study areas used throughout the environmental assessment should be provided.
- 8) A complete list of all the land impacted by a project should be provided and consistently referenced throughout the EIS materials.
- 9) Prior to defining study areas for any environmental study, First Nation communities should be consulted to ensure that the area selected is appropriate for the particular ecosystem component being investigated.
- 10) All of the above steps should be easily explained and justifiable, including in relation to best practices for EA, and CEA.

January 1, 2014

Conclusions

The purpose of a well-defined study area, is that it allows for proper scientific evaluation of an ecosystem or component of interest, that is reproducible and representative of the area being examined. Faulty selection of a study area promotes bias reporting, as it can lead to reporting of false positive or negative findings. In addition, the use of incompatible study areas between parallel studies prevents comparison for large-scale study analysis.

MWL have observed that MBH failed to utilize study areas in a manner that promotes verifiable reporting and reproducible scientific methodology. It cannot be over-stated enough, the importance of selecting appropriate study areas when conducting a large-scale environmental assessment. Prior to approval of any environmental license, a thorough review of the study areas and methodologies employed to carry out the environmental studies for the Keeyask Project should be conducted.