

Keeyask Generation Project

Mercury and Human Health Risk Management Plan



KEEYASK GENERATION PROJECT MERCURY AND HUMAN HEALTH RISK MANAGEMENT PLAN

Prepared by

Keeyask Hydropower Limited Partnership

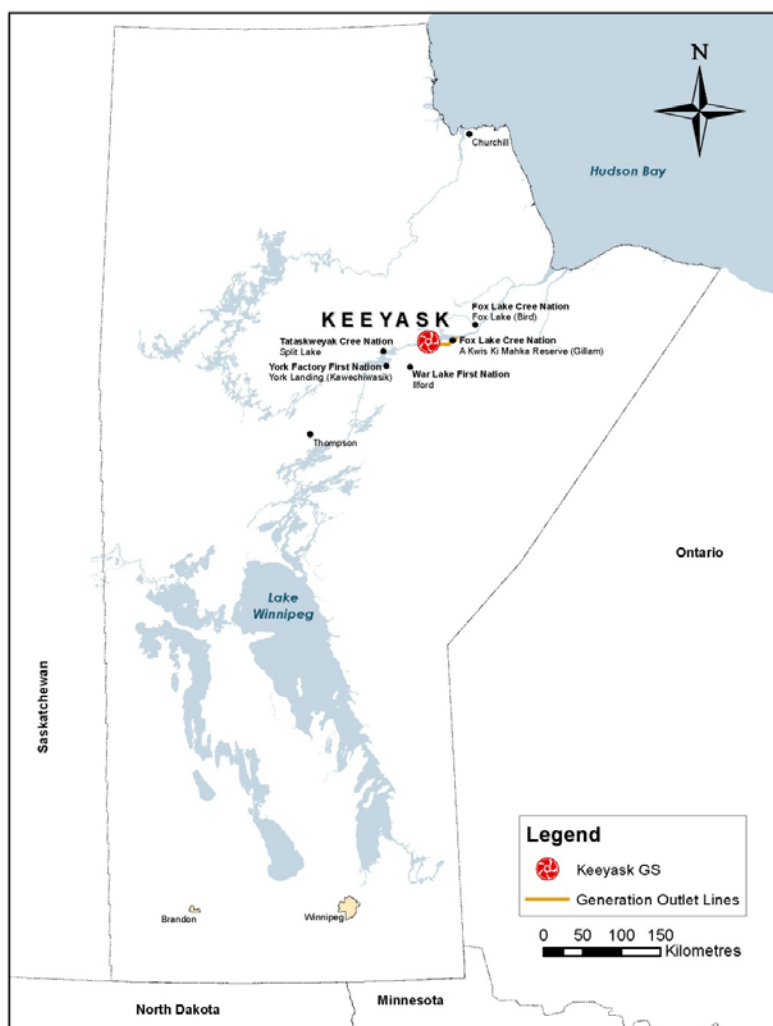
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PREFACE

KEEYASK ENVIRONMENTAL PROTECTION PROGRAM

An Environmental Protection Program (the Program) has been developed to mitigate, manage and monitor potential environmental effects described in the *Keeyask Generation Project: Response to EIS Guidelines* during the construction and operation phases of the Keeyask Generation Project (the Project) shown on Map 1. The Program includes a collection of plans grouped in the following categories: Environmental Protection Plans, Environmental Management Plans, and Environmental Monitoring Plans.



Map 1: Location of Keeyask Generation Project

Figure 1 lists all of the plans included in the Program. It also demonstrates how the Program will be managed. The Keeyask Hydropower Limited Partnership (the Partnership) has delegated authority to Manitoba Hydro to manage construction and operation of the Project including

implementation of the Program. The organizational structure of the Partnership for this aspect of the Project includes a Monitoring Advisory Committee (MAC), which includes participants from each of the Keeyask Cree Nations (KCNs) and Manitoba Hydro. Manitoba Hydro will be guided on the implementation of the Program by the MAC, the Partnership Board of Directors and ongoing discussion with Regulators.

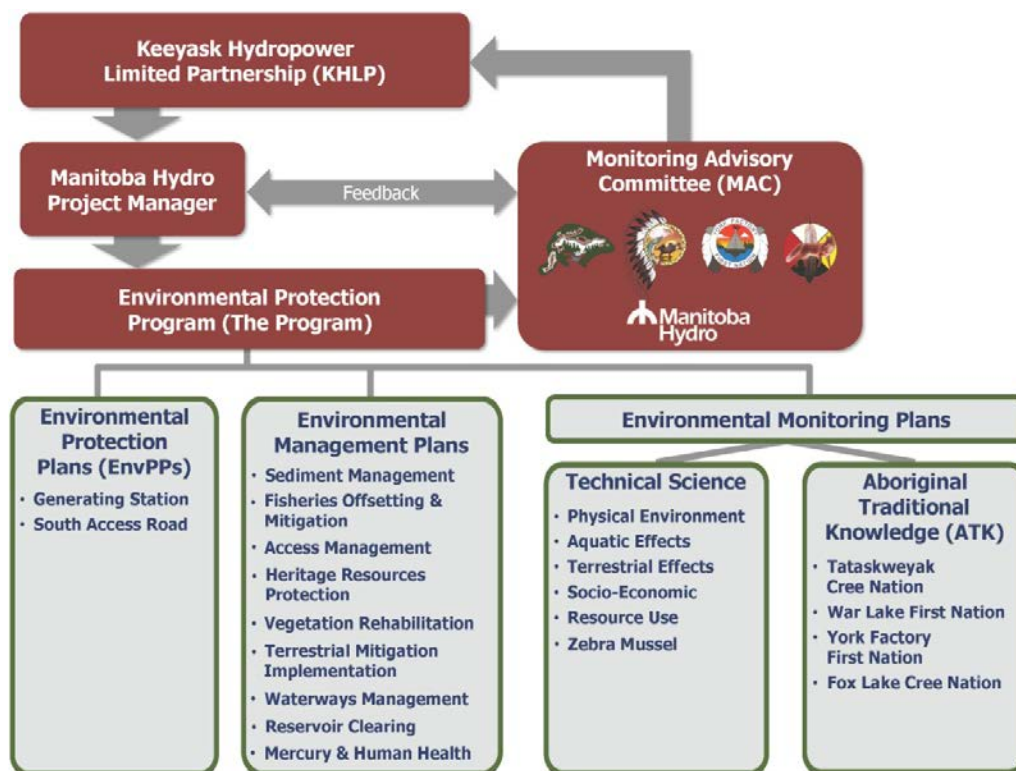


Figure 1: Environmental Protection Program

The Environmental Protection Plans (EnvPPs) provide detailed, site-specific environmental protection measures to be implemented by the contractors and construction staff to minimize environmental effects from construction of the generating station and south access road. They are designed for use as reference documents providing the best management practices to meet or exceed regulatory requirements. EnvPPs are organized by construction activity, highlighting measures to reduce the impact of a specific work activity (e.g., tree clearing or material placement in water). Contractors' compliance with the EnvPPs is a contractual obligation. Under Manitoba Hydro's construction site management, a Site Environmental Lead will be responsible for monitoring compliance and determining when corrective actions are required.

The Environmental Management Plans focus on minimizing effects on specific environmental parameters. They outline specific actions that must be taken during construction and in some cases into the operational phase to mitigate Project effects. The management plans include monitoring to determine success of the actions taken and to determine other actions that need to be undertaken (adaptive management). Implementation of these plans will involve Manitoba

Hydro's staff, the KCNs, specialized consultants and contractors under the direction of the Project Manager.

The Environmental Monitoring Plans are designed to measure the actual effects of the Project, test predictions or identify unanticipated effects. During the course of the environmental assessment, numerous requirements for monitoring were identified. There will be both technical science monitoring and Aboriginal Traditional Knowledge (ATK) monitoring undertaken. The technical science monitoring will be conducted by Manitoba Hydro and specialized consultants contracted by Manitoba Hydro, who will in turn hire members of the KCNs to work with them to fulfil the monitoring activities. Manitoba Hydro will also have contracts with each of the KCNs to undertake ATK monitoring of the project.

The activities that occur and the results generated from the Environmental Protection Program will be discussed at MAC meetings. The MAC is an advisory committee to the Partnership Board of Directors and will review outcomes of the programs and, if appropriate provide advice and recommendations to the Partnership on additional monitoring or alternative mitigation measures that may be required. The MAC will provide a forum for collaboration among all partners. On behalf of the Partnership, the MAC will also ensure that the outcomes of the Environmental Protection Program are communicated more broadly on an annual basis to Members of the KCNs, regulators and the general public.

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ABBREVIATIONS AND ACRONYMS

AEA – Adverse Effects Agreement

ATK – Aboriginal Traditional Knowledge

CAMP – Coordinated Aquatic Monitoring Program

CEAA – Canadian Environmental Assessment Act

CEC – Clean Environment Commission

DFO – Department of Fisheries and Oceans

EA – Environmental Assessment

EIS – Environmental Impact Statement

FEMP – Federal Ecological Monitoring Program

FLCN – Fox Lake Cree Nation

FNIHB – First Nations and Inuit Health Branch

HHRA – Human Health Risk Assessment

JKDA – Joint Keeyask Development Agreement

Kg -- kilogram

KHLP – Keeyask Hydropower Limited Partnership

KMHHPC – Keeyask Mercury and Human Health Planning Committee

Lb -- Pound

MAC -- Monitoring Advisory Committee

MB -- Manitoba

Mm -- millimeter

NRHA – Northern Regional Health Authority

Ppm – Parts per million

SE SV – Socio-Economic Supporting Volume

TCN – Tataskweyak Cree Nation

WLFN – War Lake First Nation

YFFN – York Factory First Nation

1.0 INTRODUCTION

This Mercury and Human Health Risk Management Plan (the Plan) is intended to identify, assess, respond to, communicate and monitor risks to human health estimated to result from increased methylmercury (mercury) in the environment as a result of the operation of the Keeyask Generation Project (the Project). The Plan was developed to fulfill the requirements of Clause 18 (n) of The Environment Act (Manitoba) Licence No. 3107, issued on July 2, 2014 by the Minister of Conservation and Water Stewardship. Note that all regulatory reporting requirements with regard to this plan will be fulfilled through the Socio-Economic Monitoring Plan reporting process.

This Plan reflects commitments and regulatory requirements identified through the course of the Keeyask environmental assessment and regulatory processes¹. The Keeyask Hydropower Limited Partnership (KHLP) has made extensive efforts to develop a plan that is practical, culturally relevant, rigorous and effective at the community level. Appendix A-1 presents commitments made in the Environmental Impact Statement (EIS) and in relevant responses through these processes.

This Plan is the product of a multi-year planning process, beginning in 2007 and extending to 2015, designed to intensively examine and address the mercury issue. The development of this Plan has involved representatives of the Partner First Nations, Manitoba Hydro and environmental assessment and toxicological experts, as well as government representatives from Manitoba Health, Manitoba Conservation and Water Stewardship, Health Canada, and the Department of Fisheries and Oceans. Two major reports have resulted from this process:

- The Final Report of the Mercury and Human Health Technical Working Group (Technical Working Group); and
- The Project's EIS and the Human Health Risk Assessment, submitted as part of the EIS.

In addition to these reports, the collaborative work both during and after the federal and provincial regulatory processes contributed to the preparation of this Plan. It is organized as follows:

- **Section 2: Goals** sets out the overall goals of the Plan. Goals relating to specific activities are included in relevant sections of the Plan.
- **Section 3: Engagement in Preparing the Risk Management Plan** describes the engagement of the Partner First Nations in joint planning processes with Manitoba Hydro to study, plan for and implement mitigation and monitoring of mercury effects on human health.

¹ The Project has been the subject of regulatory review both by the Government of Canada under the *Canadian Environmental Assessment Act* (and other federal legislation such as the *Fisheries Act*), and by the Province of Manitoba under *The Environment Act (Manitoba)*. The effects of the Project on human health resulting from elevated mercury levels, as well as measures to mitigate and monitor these effects were addressed throughout these processes. See www.Keeyask.com for further details.

It also describes public participation processes and the involvement of federal and provincial regulators and health care providers in developing the Plan.

- **Section 4: Risk Management Procedure** sets out the overall steps and schedule for the Plan, and the goals and approach for each of the following steps: **identification** (monitoring) of mercury risks, **assessment** of mercury risks, **response** to mercury risks, and **communication** of mercury risks and benefits of wild food.
- **Section 5: Roles and Responsibilities** to implement the plan.
- **Section 6: Adaptive Management** describes the KHLPP approach to respond to unanticipated or unforeseen effects, or adjust mitigation and monitoring activities, as necessary.
- **Section 7: References.**
- **Section 8: Acronyms and Glossary** and a series of appendices support the document.

1.1 THE MERCURY ISSUE

Mercury is a metal found naturally in small amounts in rock, soil, water, living organisms, as well as in synthetic products. Flooding of forested lands with soils with high organic content, or flooding of wetlands, commonly results in a temporary increase in mercury (in the form of methylmercury) in the water, and subsequently in the organisms that live and use those environments. Methylmercury is a potent neurotoxin that bio-accumulates through the aquatic food chain, placing people who consume fish with high mercury content at greater risk (Mergler et al. 2007). The term “mercury” is used throughout the Plan to represent “methylmercury”.

The vast majority of mercury exposure to people occurs through the consumption of fish. Fish with the highest mercury levels tend to be large and long-lived predatory fish; however, most fish contain some level of mercury. Various lakes across Canada, including some lakes in the Project’s Socio-Economic Local Study Area have some fish with naturally high levels of mercury – elevated fish mercury levels is not an issue that is restricted to hydroelectric reservoirs or to northern Manitoba. Freshwater fish that often contain elevated levels of mercury include lake trout, burbot, northern pike (jackfish) and walleye (pickerel), depending on the localized environment.

The health effects of mercury depend on the duration and quantity of exposure. Exposure at elevated levels for an extended period of time, may cause health effects to the nervous system (e.g., motor skills, irritability, tremors, changes in vision/hearing, memory loss, decreased IQ). Generally, young children and women of child-bearing age are of primary concern with respect to mercury exposure, although persons of any age or gender may experience health effects if the exposure is great enough. Consequently, recommendations to minimize risk of exposure to mercury vary by group within the population (Wilson Scientific 2012).

1.2 PAST EXPERIENCE WITH HYDROELECTRIC DEVELOPMENT IN NORTHERN MANITOBA

The Partner First Nations have been concerned about increasing mercury levels in fish since the 1970's when it became public that fish with high mercury concentrations from industrial sources were found in the South Saskatchewan and English-Wabigoon River systems. In northern Manitoba, the Churchill River Diversion, Lake Winnipeg Regulation and generating station projects along the Nelson River (e.g., Kettle Generating Station) in the 1970s led, unexpectedly, to increased levels of mercury in fish from affected waterways. At the time it was not fully understood that flooding caused an increase in mercury contamination. For example, Stephens Lake was flooded in 1970, creating a large reservoir for the Kettle Dam. Mercury levels in northern pike (jackfish) and walleye (pickerel) were first measured in 1982/1983, and concentrations in walleye (pickerel) were high (more than 1.7 ppm)¹. Since flooding occurred over 10 years earlier, even higher levels may have occurred.

Within 20 to 30 or more years after flooding, maximum concentrations then declined and most flooded lakes, including Stephens Lake, have returned to concentrations or levels that are similar to those found in fish from lakes in the areas that were not affected by flooding. It is noteworthy that industrial sources at Minamata Bay (Japan) and Grassy Narrows First Nation in north-eastern Ontario caused significantly higher fish mercury levels than those related to hydroelectric development in northern Manitoba.

Figure 1 provides the example of mercury concentrations after hydroelectric development in Stephens Lake.

¹ Health Canada (2010b) recommends a tolerable daily intake for sensitive members of the population is 0.2 ppm/kg body weight/day and .47ppm for non-sensitive members of the population.

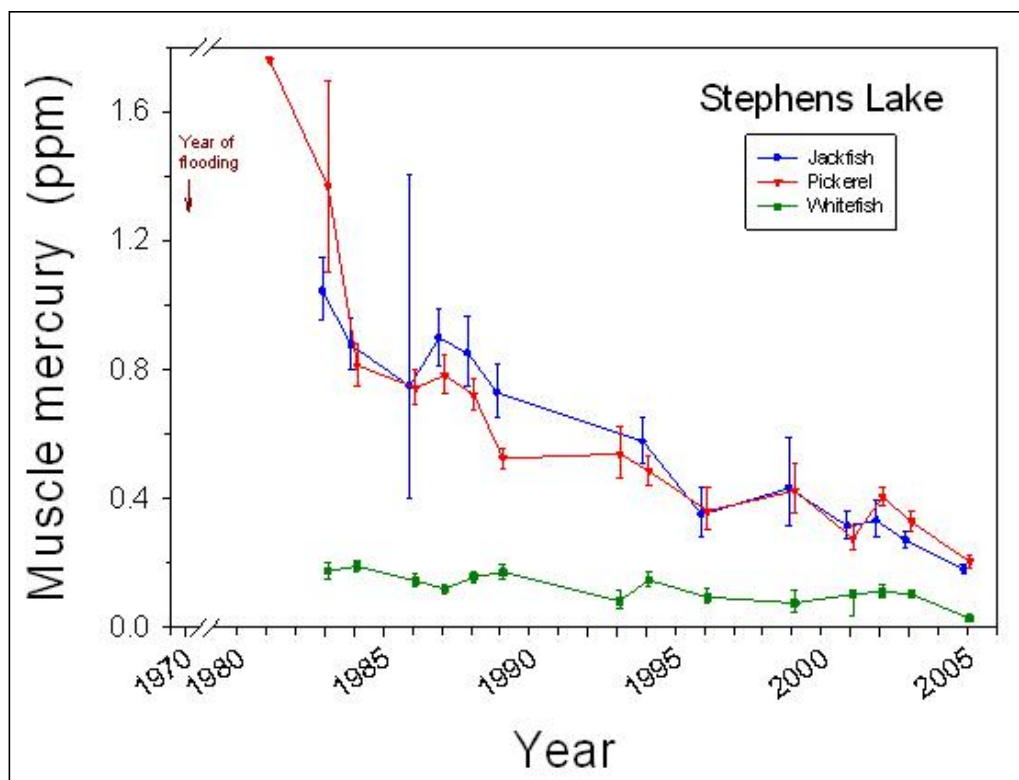


Figure 2: Muscle Mercury Concentrations in Fish Species in Stephens Lake

The effects of past hydroelectric projects prompted concerns about elevated mercury levels in fish, including the effect of mercury on human health. In 1986, the Department of the Environment and the Department of Fisheries and Oceans (DFO) began a joint five-year Federal Ecological Monitoring Program (FEMP) to conduct environmental research and monitoring in northern Manitoba. One of the research programs focused on mercury. FEMP was undertaken to study the environmental effects of hydroelectric projects in northern Manitoba (Lake Winnipeg Regulation, Churchill River Diversion and projects along the Nelson River) and included the examination of elevated mercury concentrations resulting from Manitoba Hydro projects. In terms of human health, Health Canada tested human mercury levels between 1976 and 1999 as part of a national program implemented in First Nation communities. Hair and blood testing performed by Health Canada in 1988/90 showed that 98% of those tested in Split Lake (Tataskweyak Cree Nation) and York Landing (York Factory First Nation) were within safe levels and the remaining 2% were considered to be 'at increasing risk'. In both Split Lake and York Landing (no women of child-bearing age or children between one and twelve years of age had values outside the normal range).

FEMP study results and summary data of human hair and blood monitoring (1976-1990) are available in the final FEMP report (Canada Dept. Of Fisheries and Oceans 1992). Additional information can also be found on this topic in the aforementioned Keeyask reports: the Mercury Human Health Technical Working Group Final Report, and Section 5.3.3.1 of the Socio-Economic Supporting Volume of the Keeyask Environmental Impact Statement.

1.3 MERCURY AND HUMAN HEALTH AND THE KEEYASK PROJECT

The KHLPP evaluated the anticipated environmental effects of the Keeyask Project by using a unique two-track approach that resulted in an Environmental Impact Statement (EIS) which gave equal weight to the process and results of each method of assessment. The first track resulted in Environmental Evaluation Reports produced by each Partner First Nation. These reports, founded in their Cree worldview, assessed the anticipated effects of the Project on themselves based on their Aboriginal Traditional Knowledge and previous experience with hydroelectric development. The second track responded directly to provincial and federal regulatory requirements, was based on a western science methodology, and resulted in the “Response to EIS Guidelines” (including extensive supporting volumes and supplemental filings).

Each Partner First Nation identified mercury as a key health concern in their evaluation of the effects of the Project. The Response to EIS Guidelines included “Mercury and Human Health” as a valued environmental component (VEC). As a result, Manitoba Hydro and the Partner First Nations worked collaboratively through a variety of processes to identify, understand, and respond to mercury concerns (See Section 3).

The key pathway of effect from the Project with respect to mercury and human health is flooding of land. The Project is expected to flood approximately 45 square kilometres of terrestrial soils and wetlands, including substantial amounts of peat. Bacterial breakdown of this peat and other organic materials will increase environmental concentrations of methylmercury primarily in the Keeyask forebay promoting the subsequent bio-accumulation in biota, particularly predatory fish. Map 2, a schedule to the JKDA, illustrates the flooding anticipated to occur once the Project is in operation.

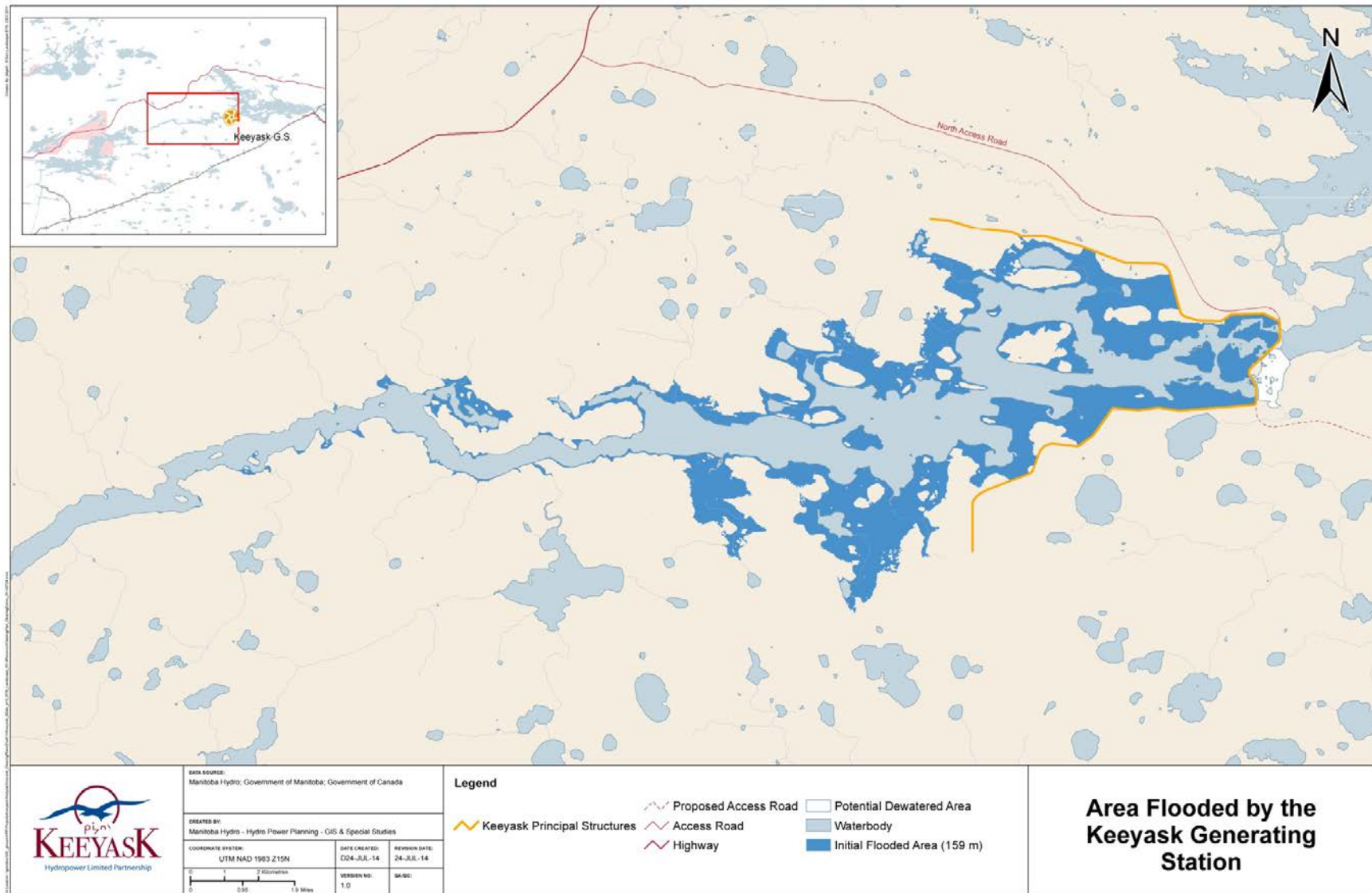
There is potential for a negative effect on human health if fish with high levels of mercury are eaten. There is also a potential for a negative effect on health and wellness if people substantively limit their harvesting and/or consumption of low-mercury fish. Indeed, Partner First Nations’ representatives indicated that the term ‘mercury’ translates into Cree as ‘poison’ and consequently, many people had stopped eating fish from the Nelson River system (including Gull Lake and Stephens Lake) or had reduced their domestic use of fish altogether because of high mercury concentrations as a result of past hydroelectric projects.

Key conclusions with regard to Project mercury effects include:

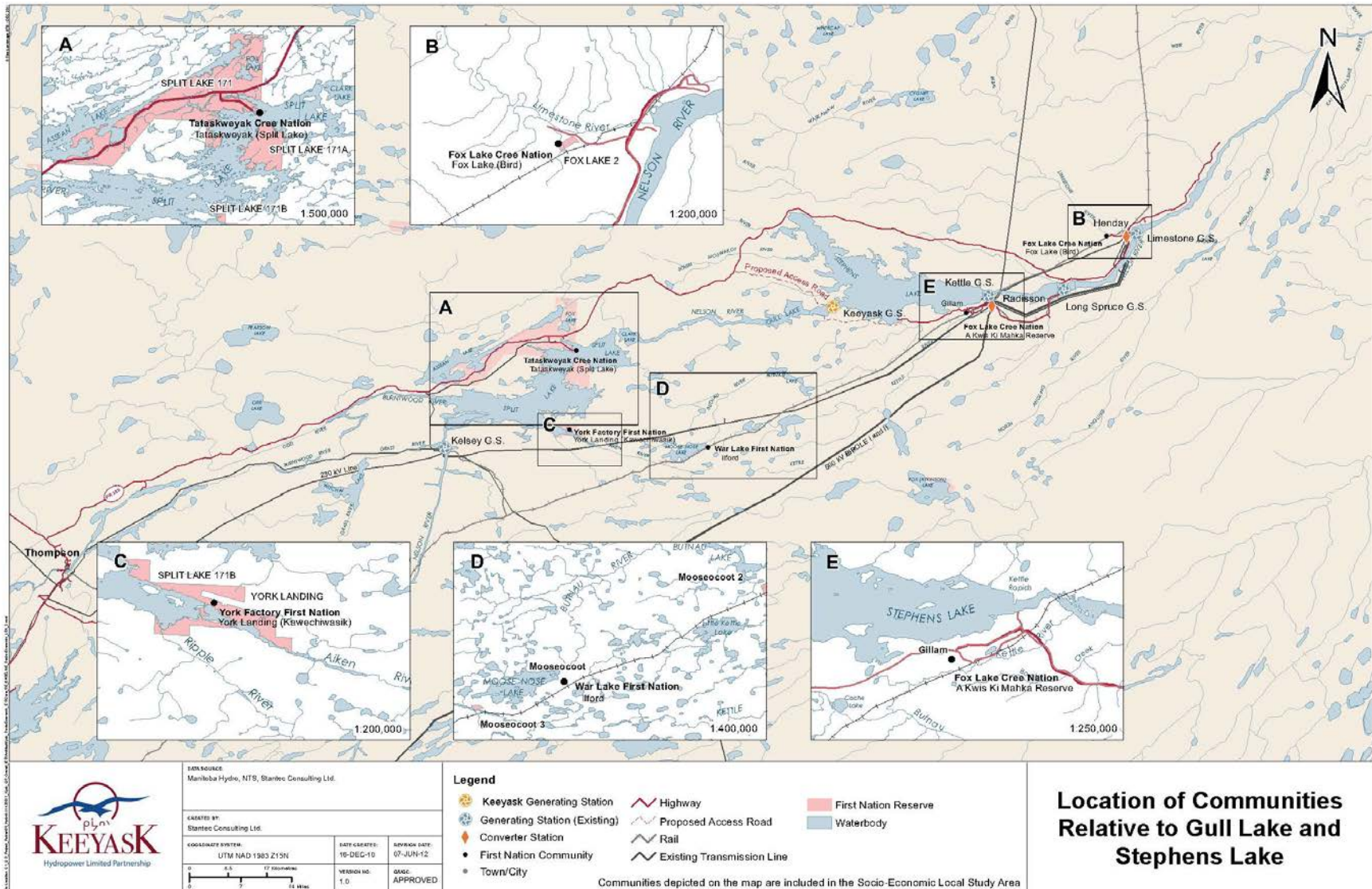
- Mercury levels in fish from Gull Lake are expected to peak three to seven years after impoundment in 2019 and then to decline gradually over the next 20 to 30 years until they reach pre-Project levels or stable concentrations. Mercury levels in fish also are anticipated to be elevated in Stephens Lake, immediately downstream of the Project, although to a lesser degree.

- The Human Health Risk Assessment (HHRA) showed that mercury in water is not of concern for drinking, bathing and swimming.
- Mercury in mammals, geese, ducks, and plants are not of concern.
- There is a risk to eating fish (especially northern pike/jackfish and walleye/pickereel) from Gull and Stephens Lakes while mercury levels are high.
- Women of child-bearing age and children are sensitive members of the population with regard to mercury. With fish being a source of traditional food and good nutrition, a balanced message is important to promote safe fish consumption and to encourage a healthy fish diet.

The locations of communities relative to the Project (and in particular, Gull Lake and Stephens Lake) are shown in Map 3.



Map 2: Area Flooded by the Keeyask Generating Station



Map 3: Location of Communities Relative to Gull Lake and Stephens Lake

2.0 GOALS

The KHLP recognizes the importance of wild foods to overall health. Partner First Nations representatives, in particular, viewed communication of mercury risk to be relevant to the physical health and cultural wellbeing of Members. Importantly, the Plan seeks to promote and implement a balanced message that encourages Members to include wild foods, including low-mercury fish, in their diet.

Traditional (wild) foods from the land and water, which have sustained communities for thousands of years, are acknowledged today as providing a better diet than typical store-bought foods and contribute to “strengthened cultural capacity and well-being” (CINE 2006). The ties between health and well-being and the land have been experienced firsthand by the Partner First Nations. Many factors affect traditional food patterns, including loss of traditional harvesting locations, concerns about water quality, changes to the taste and texture of fish, and concerns about mercury in fish. The Partner First Nations have noted a similar experience in which these factors resulted in changes to diet and increased reliance on store-bought food, in addition to a shift to a more sedentary lifestyle.

Concern for declining use of wild foods was also confirmed by the Manitoba portion of the national study, *First Nations Food, Nutrition and Environment Study*, led by Dr. Laurie Chan (Chan et al 2010).

A holistic view of the health of the local Aboriginal population, including the contribution of harvesting and consuming traditional foods to health and wellness informed the development of this Plan and associated communication products.

The KHLP has identified the following overall goals for the Plan:

- Mercury levels in individuals’ bodies are maintained at appropriate levels (within a range considered ‘safe’ by federal and provincial agencies and for those who wish to participate, verified through hair monitoring); and
- To support discussion and build understanding around mercury and fish that allows individuals and families to confidently assess and manage the benefits and risks associated with eating wild fish in the Project area. To support and enhance local practices of fishing for sharing, and eating wild-caught fish at levels that are healthy for all community members.

The RMP outlines key steps and approach to achieve these goals in Section 4. The detailed manner in which these goals are achieved will require thorough discussion with Partner First Nations’ community Members and leadership, as well as federal and provincial health care providers.

3.0 ENGAGEMENT IN PREPARING THE RISK MANAGEMENT PLAN

Several forms of engagement were undertaken to address the mercury issue. The first and most extensive was a collaborative joint education and planning process with the Partner First Nations – those most affected by the mercury issue in the vicinity of the Project. The second provided opportunities for public participation (beyond the Partner First Nations) through the Project's Public Involvement Plan and provincial regulatory process. The KHLPP also worked directly with government representatives involved in the federal and provincial regulatory processes with regard to Keeyask-related mercury issues.

3.1 ENGAGEMENT WITH PARTNER FIRST NATIONS

This section describes the joint process undertaken by the KHLPP to learn about mercury, assess its effects, develop the approach to monitor and manage the issue, and to communicate about it with Members. These planning processes and outcomes were particularly important to the Partner First Nations, whose Members regularly consume wild foods as part of their diets.

3.1.1 MERCURY AND HUMAN HEALTH TECHNICAL WORKING GROUP

Based on their past experience with hydroelectric development and related hair and blood monitoring undertaken through the Federal Ecological Monitoring Program (see Section 1), the issue of mercury and human health became a primary concern for the Partner First Nations and Manitoba Hydro in relation to the Keeyask Generation Project. The Mercury and Human Health Technical Working Group (Technical Working Group), comprised of representatives of the Partner First Nations, Manitoba Hydro, and members of the Environmental Assessment Study Team, was formed by the KHLPP in June 2007 to address concerns about Project effects related to mercury and human health. The group selected two mercury and human health experts to assist in its work – toxicologists Ross Wilson and Dr. Laurie Chan. In addition, there was periodic involvement of the Burntwood Regional Health Authority (now the Northern Regional Health Authority). The group held 14 workshops between 2007 and 2011 to undertake its work. Results were documented in Appendix 5B of the Socio-economic, Resource Use and Heritage Resources Supporting Volume (SE SV) of the Keeyask Environmental Impact Statement (Keeyask Hydropower Limited Partnership 2012). Appendix A-2 to this Plan includes a high level summary of each of the workshops.

The Technical Working Group had the following objectives:

- To answer the Partner First Nations communities' and Manitoba Hydro's questions about mercury and human health in today's environment (i.e., pre-impoundment of Keeyask);
- To answer the Partner First Nations communities' and Manitoba Hydro's questions about future mercury effects on human health if the Keeyask Generation Project were developed (i.e., post-impoundment), and ways to reduce those effects; and
- To develop ways to effectively communicate with communities about what has been learned.

In addition to presentations and discussions about a range of topics (see Appendix A-2), the Working Group commissioned the Human Health Risk Assessment (HHRA), undertaken by toxicologist Ross Wilson, with inputs from technical specialists working on the environmental assessment, when required. The HHRA examined ways in which mercury is anticipated and/or perceived to reach affected people in the Project area – through use of wild foods from the area, through drinking of surface water and from skin contact with surface water. The study examined both the present-day conditions without the Project and, based on an analysis of pathways of effect, future conditions with the Project (post-impoundment). The Working Group reviewed and discussed the HHRA results. The group identified recommendations to reduce the risk associated with mercury in wild food. They confirmed the importance of the programs included in each of the Partner First Nations' Adverse Effects Agreements to enable Members to harvest wild food in locations unaffected by the Project. The recommendations also recognized the health benefits of eating fish and encouraged Members of the Partner First Nations to focus on fish with low mercury content, especially for the vulnerable groups, i.e., women of childbearing age and children. Monitoring of mercury content in wild foods (primarily in fish, but also in mammals and plants to confirm their low mercury content) was also recommended. The Technical Working Group sought ongoing input and advice from Dr. Laurie Chan, which was incorporated into the HHRA and the approach developed to address mercury effects. The draft HHRA and Technical Working Group recommendations and communication products were peer reviewed favourably by Dr. Laurie Chan.

The Technical Working Group considered effective ways to communicate the results of this work to the Partner First Nations communities. Because of the importance of wild foods in a healthy diet and the technical and complex nature of the topic of mercury, the Technical Working Group wanted to ensure that communication was clear and well understood and that a balanced message was achieved.

Draft communication products were developed, informed by other hydroelectric development experience (e.g., northern Québec) as well as the knowledge, experience and review by Partner First Nations Working Group Members. Based on these inputs and fish mercury results for tested lakes, safe consumption recommendations with regard to present-day and future conditions were incorporated into a range of communication products. Placemats, maps, a poster, a fish "yardstick" for measuring fish length in the field and a short, plain language introductory video for local health care providers were prepared in anticipation of a two-phased

communication strategy to deliver these products: Phase One (pre-impoundment) to communicate pre-impoundment conditions; and Phase Two (post-impoundment) to be undertaken around 2019 to communicate the post-impoundment risks anticipated in Gull Lake and Stephens Lake.

3.1.2 KEYYASK MERCURY AND HUMAN HEALTH PLANNING COMMITTEE

The Keeyask Mercury and Human Health Planning Committee (Planning Committee) was formed near the conclusion of the licensing process to complete remaining work of the Technical Working Group and to respond to mercury issues that emerged during federal and provincial regulatory review of the Project. The Planning Committee's main task included finalizing this Plan.

The Planning Committee included representatives from the Partner First Nations, Manitoba Hydro, the environmental assessment study team (as required) and toxicologist Ross Wilson. Representatives from the provincial and federal health agencies, and Manitoba Conservation and Water Stewardship participated on an as-needed basis. The timeframe for work of the Planning Committee is June 2014 to June 2015 when its mandate is expected to be complete (see Section 5 for next steps).

To date, the KMHHP has held seven meetings between June 2014 and June 2015. See Appendix A-3, Table A-3-1 for details on each of the meetings.

In addition to developing the content of this Plan, the group worked with health regulators and providers and sought community-based feedback to finalize a suite of communication products that will be delivered as part of this Plan. In addition, opportunities for future cooperation with health service providers responsible for the regional population and First Nations health were explored and continue to be considered.

3.2 PUBLIC ENGAGEMENT

The subject of mercury and human health was also included in aspects of the Public Involvement Program undertaken for the Project which was intended to reach the public beyond the Partner First Nations communities. Three rounds of engagement were undertaken, as follows:

- Project description and issue identification;
- Preliminary environmental assessment results; and
- Environmental Impact Statement review.

A description of the PIP and outcomes are found in the EIS (Keeyask Hydropower Limited Partnership 2012a, b). In their final report, the Clean Environment Commission (CEC), mandated by the Government of Manitoba to hold public hearings and provide licensing recommendations, described the PIP process as “comprehensive, inclusive and more than met the requirements for consultation” (Clean Environment Commission 2014, p. 37).

Lastly, through the regulatory process (including the CEC process), the public and funded participants were invited to submit their concerns or questions about the Project, in which many of the questions raised were about mercury and human health. Responses to Information Requests and issues raised during the hearing process are available on the KHLPP website: www.keeyask.com.

3.3 GOVERNMENT ENGAGEMENT IN PREPARING THE PLAN

As noted, the Mercury and Human Health Technical Working Group invited the participation of the Medical Officer of Health for the Burntwood Regional Health Authority (now the Northern Regional Health Authority) who contributed to several of the workshops undertaken by the Technical Working Group. In November 2010, the Technical Working Group prepared a presentation for representatives of Health Canada’s First Nations Inuit Health Branch and the Burntwood Regional Health Authority to introduce the mercury work related to the Project and to present initial thoughts around risk communication.

The Keeyask Environmental Impact Statement was filed by the KHLPP in July 2012. As part of the federal and provincial environmental review processes, joint meetings between federal and provincial representatives and the KHLPP were held in October 2012 and March 2013 to review mercury effects, mitigation and monitoring and to discuss comments and questions from regulators. In response to comments about the HHRA, a modified report was filed as a supplementary filing in August 2013.

The KHLPP established the Keeyask Mercury and Human Health Planning Committee in June 2014 to prepare the Plan and to create an effective forum for discussion with government representatives about mercury issues that emerged during federal and provincial regulatory review of the Project (see Section 3.1.2 for further detail about the Planning Committee).

The Committee invited the participation of Health Canada, Department of Fisheries and Oceans, Manitoba Health and Manitoba Conservation and Water Stewardship in the meetings. Representatives attended meetings in November 2014 and January 2015. In April 2015, an exploratory meeting was held with representatives of the Northern Regional Health Authority to discuss the potential for their involvement in the implementation of mercury risk communication in communities in the local study area that are served by the Northern Health Region. A similar meeting with federal health care representatives will be pursued in the fall of 2015.

The regulators offered advice with respect to fish consumption guidance for the public, including vulnerable populations of women of child-bearing age and children as well as the draft communication products prepared by the KHLP. Health Canada and Manitoba Health indicated a willingness to note that communication products were developed with their input¹.

The KHLP will retain a process to continue discussions with federal and provincial regulators and health agencies after submission of this document. This engagement, along with that of the Partner First Nations, will be necessary to build an effective implementation plan, both pre- and post-impoundment and to ensure accurate, safe consumption guidance.

¹Pending final review of attached products in Appendix C.

4.0 RISK MANAGEMENT PROCEDURE

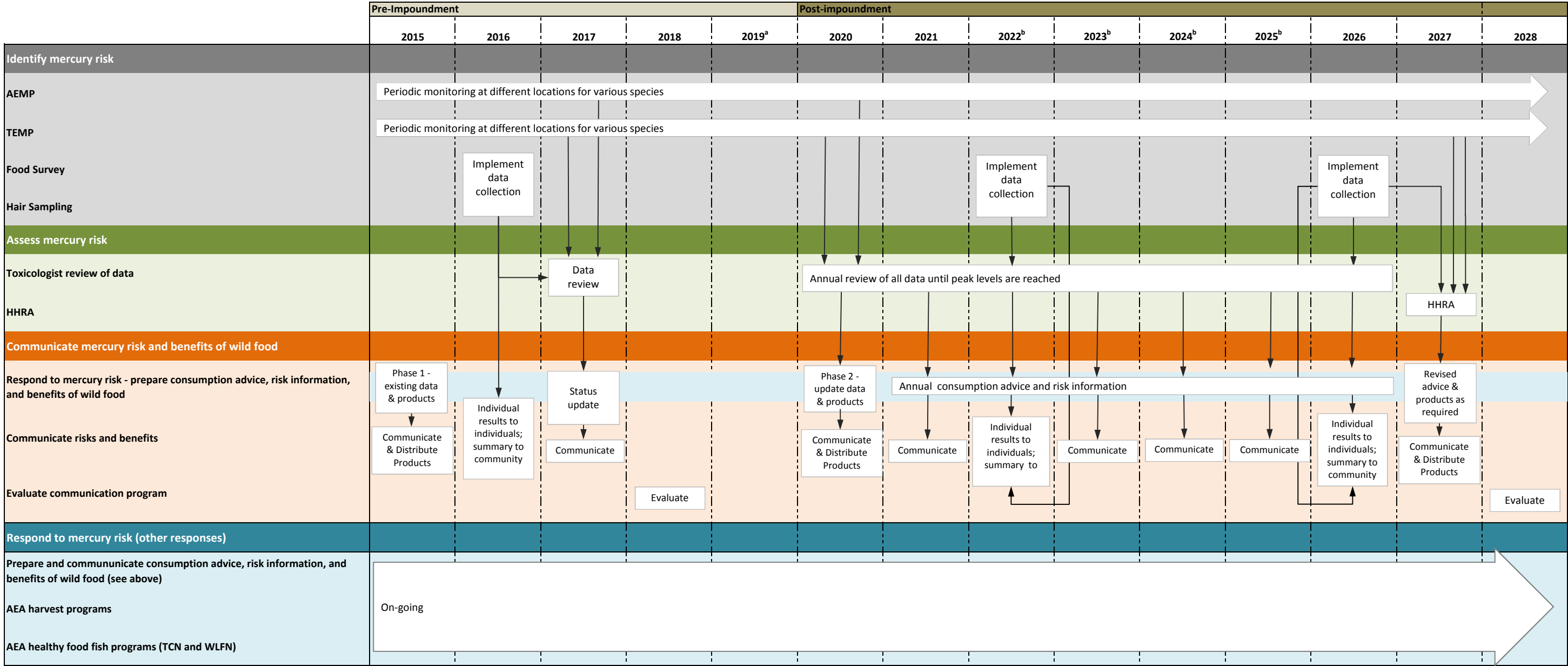
This section describes the steps that will be taken to identify (including monitoring), assess, respond to and communicate mercury risks.

Figure 2 Preliminary Implementation Schedule for the Keeyask Mercury and Human Health Risk Management Plan presents these strategic steps and shows possible timing and activities during the pre-impoundment period (2015 to 2019), as well as for the post-impoundment period (from 2020 onward) when mercury levels in Gull Lake and Stephens Lake are estimated to rise as a result of the Project¹.

Each of these steps are discussed in detail in Sections 4.1 to 4.4. Additional comments regarding implementation roles and responsibilities are noted in Section 5.

¹Changes to the timing and frequency of mercury monitoring in the TEMP and/ or AEMP may result in changes to the overall RMP schedule.

Figure 3: Preliminary Implementation Schedule



a) reservoir reaches full supply level
b) anticipated peak mercury levels sometime in this period

4.1 IDENTIFICATION OF MERCURY RISKS

The operation of the Project will result in increased mercury levels in various wild foods used by communities in the vicinity of the Project. This step includes actions to identify or verify mercury risk in wild foods consumed by people in both pre-and post-impoundment phases. Actions include:

- Continued monitoring of fish, mammals, waterfowl and plants;
- Tracking changes in Partner First Nations Member's diets (emphasis on wild foods) through baseline and post-impoundment food surveys; and
- Monitoring of mercury levels in people through voluntary baseline and post-impoundment hair monitoring in Partner First Nations communities.

An Aboriginal Traditional Knowledge (ATK) Monitoring program is currently under development by each of the Partner First Nations. While not specific to mercury, understanding from this program could inform the activities of this Plan. The ongoing evaluation of specific Partner First Nations' offsetting programs also has the potential to inform the Plan's implementation and associated products/activities.

4.1.1 MONITORING OF MERCURY IN WILD FOODS

Monitoring of mercury in wilds food includes monitoring of fish through the Aquatic Environment Monitoring Plan. Other wild foods are monitored through the Terrestrial Environment Monitoring Plan as well as through a voluntary sampling program.

The goal in monitoring mercury in wild foods is:

- To understand the level of mercury in wild foods consumed by people in the Gull Lake and Stephens Lake areas as well fish obtained from offset lakes. Each type of monitoring is discussed in detail below.

4.1.1.1 MONITORING OF MERCURY IN FISH

Monitoring of mercury levels in fish will be undertaken at regular intervals from now through to the time that mercury concentrations are at their peak in Gull Lake and Stephens Lake (expected to occur three to seven years after impoundment in 2019) and until mercury levels return to pre-project levels or are considered stable at a new background level (anticipated to be 20 to 30 years).

The large-bodied fish species that will be regularly sampled for muscle mercury are Lake Whitefish, Northern Pike (jackfish), and Walleye (pickerel). These species were selected for historic and economic importance; in the case of jackfish and pickerel, they are top aquatic

predators and will have the highest mercury concentrations of all species considered. In addition, muscle samples from incidental Lake Sturgeon mortalities will be collected and submitted for mercury analysis. To optimize securing these samples, a voluntary sampling protocol for local resource users was developed for sampling of Lake Sturgeon (see Section 4.1.1.2).

One-year old (1+) yellow perch will also be sampled. Yellow perch of age 1 do not undertake extensive movements, and thus are suitable indicators of “local” methylmercury (mercury) production and bioaccumulation. These young perch may also provide insights regarding annual changes in the supply of mercury to the ecosystem because their mercury body burden at the start of the 2nd growing season can be expected to be relatively small compared to any new mercury that has been accumulated during the summer prior to sampling.

Key questions that will be addressed through monitoring mercury in these fish are:

- What are the maximum mercury concentrations in the muscle of target fish species during operation of the Project in comparison to pre-project levels and in relation to fish from regional reference waterbodies?
- When (i.e., how many years post-impoundment) are the maxima reached?
- How long does it take for fish mercury concentrations to return to pre-project levels or stabilize at a new background level (considering potential temporal patterns in fish mercury in reference waterbodies)?
- Will the Project result in fish mercury concentrations that exceed acceptable human consumption standards and guidelines (e.g., Tolerable Daily Intake and Hazard Quotients¹) regarding human health or guidelines for the protection of wildlife consumers of aquatic life?

Monitoring of mercury (and of supporting biological parameters such as length, weight and age) in the above fish species will be conducted in the Keeyask reservoir, Stephens Lake, Split Lake, and the Aiken River (Northern Pike (jackfish) and Walleye (pickerel) only). Sampling may also extend downstream on the Nelson River, depending on the extent of observed increases in Stephens Lake; should predicted maximum mercury concentration be exceeded by more than 10%, monitoring would be extended into the Long Spruce forebay.

Monitoring is scheduled to start in the first year of operation of the Keeyask Generating Station and will continue yearly in the Keeyask forebay, in Stephens Lake, and in the Long Spruce forebay (if necessary)² until mercury concentrations for all tested species have reached a maximum. Thereafter, monitoring will continue every third year until pre-impoundment

¹ Tolerable Daily Intake (or TDI) refers to the maximum daily amount of a chemical that an individual may be exposed to daily over a lifetime without any expected deleterious effects. Hazard Quotient refers to the daily intake of a substance divided by the Tolerable Daily Intake (source: Health Canada, 2010).

² Monitoring of fish mercury concentrations in the Long Spruce Forebay will proceed only if fish mercury concentrations within Stephens Lake increase “substantially” (e.g., >0.5 ppm, the maximum post-Project concentrations predicted in the EIS for Pike and Walleye) during Project operations.

concentrations are reached or are considered stable at a new background level. Split Lake and the Aiken River will be sampled at 3-year intervals throughout the operation phase. Maximum post-Project mercury concentrations will be considered attained for a species if mean concentrations are not statistically different for three consecutive sampling periods or are significantly lower in the sampling period following two sampling periods of similar concentrations. Stable post-Project concentrations at the end of the declining phase will be considered attained for a species if means are not statistically different for three consecutive sampling periods.

In response to The Environment Act Licence condition 18(o) additional monitoring of fish mercury concentrations was completed in Stephens Lake and Gull Lake in 2012 and 2014, respectively. Future pre-impoundment monitoring of fish mercury in Stephens Lake is scheduled for 2015 and is anticipated to occur at Gull Lake in 2018.

In addition to monitoring under the AEMP, monitoring of fish from a range of lakes, including the offset lakes associated with the Partner First Nations' Adverse Effects Agreements will also take place (see Section 4.3 for description of Adverse Effects Agreements). To assist communities in identifying off-system lakes with fish low in mercury, the KHLP has undertaken mercury sampling of fish in offset lakes already identified by TCN and WLFN - the only communities thus far to identify offset lakes for this purpose. These results will be used by TCN and WLFN to manage appropriate domestic food fish off-setting programs for their communities. As new or different lakes are identified by the Partner First Nations for the purposes of these programs for which no mercury data are available, additional mercury sampling and analysis may be undertaken by the KHLP at that time. As well, monitoring of mercury levels in the catch associated with these programs may be undertaken by the KHLP on an as needed basis so that the programs can be adjusted if required.

It should be noted that offset lakes are not formally included in the Aquatic Effects Monitoring Plan for Keeyask because there are no effects to these lakes as a result of developing the Project.

4.1.1.2 MONITORING FOR MERCURY IN OTHER WILD FOODS

Monitoring for increases in mercury concentrations in terrestrial ecosystems will focus on the plant and wildlife species of concern to the Partner First Nations. Given expected exposure pathways, as well as the importance of plants, waterfowl, aquatic furbearers, caribou and moose to the Partner First Nations, mercury monitoring will also address these species under the Terrestrial Effects Monitoring Plan (TEMP). In addition to the voluntary collection of samples of these species by the Partner First Nations, there will be a collection of plant and aquatic furbearer samples for mercury analysis done under the TEMP. Sampling will be undertaken at regular intervals during the construction phase through to the time that mercury concentrations are at their peak (three to seven years after impoundment) and until mercury levels return to pre-project levels or are considered stable at a new background level. Samples will be collected during the first 10-15 years of operation, at which time the need to continue sampling for each component will be assessed.

In addition to lake sturgeon (see Section 4.1.1.1), the KHLP will undertake the voluntary collection of samples of wild game, waterfowl, and plants for mercury testing to confirm that mercury concentrations remain acceptable for domestic consumption. These monitoring results will provide important indicators to inform the KHLP's actions with respect to consumption advice (in consultation with federal and provincial health agencies) and the risk communication strategy.

Voluntary sampling protocols (see Appendix D) were developed through the Technical Working Group for sampling of lake sturgeon, mammals (including moose, caribou, beaver, and muskrat), waterfowl (ducks and geese) and plants (including Labrador and northern Labrador tea, blueberries and Seneca root). The program for mercury testing is an important part of verifying that these foods and medicines consumed by the Partner First Nations do not have an adverse impact on human health.

Resource harvesters fishing for sturgeon or hunting or trapping wild game may collect samples for analysis of mercury levels. The sampling protocol articulates that the program has been designed to secure tissue samples from fish and wild game that are harvested for domestic consumption purposes. Persons are not encouraged to fish or hunt solely for the purpose of obtaining tissue samples for this program.

Designated Partner First Nations Members will assist Members interested in submitting samples and will coordinate with aquatic, terrestrial and wildlife biologists to ensure quality control for collection and submission of samples. Consistent with the TEMP activities, voluntary monitoring will be continued on an annual basis until maximum levels are reached and then periodically until mercury concentrations are considered stable at a new background or reach pre-impoundment levels (see AEMP and TEMP for more details).

4.1.2 FOOD SURVEYS

The KHLP will implement a baseline food survey, with emphasis on wild foods, prior to impoundment and every five years in the post-impoundment period.

The goals of these food surveys are:

- To understand current consumption of wild foods by the Partner First Nations, to be used in the following ways:
 - To provide a baseline for comparison to wild food use after impoundment;
 - To complement baseline mercury hair monitoring, if it occurs; and
 - To meet the information needs of a Human Health Risk Assessment (to be undertaken after impoundment).
- To contribute to the planning of communication that encourages the harvesting and use of wild foods, which in turn strengthens health and culture (part of living mino pimatisiwin).

The food survey may potentially contribute to evaluations of Adverse Effects Agreements offsetting programs that assist members to obtain wild foods from locations unaffected by the Project.

4.1.1.3 BASELINE FOOD SURVEY

Information about consumption of wild foods is required as an input to the HHRA methodology. During the course of the Environmental Assessment, the Partner First Nations chose not to undertake a full-scale consumption survey. An alternative approach was used to obtain relevant information for the HHRA. Each of the Partner First Nations identified Members who participated in a workshop to provide information about the types of wild foods used by people in their communities in the local area (Split Lake, Gull Lake and Stephens Lake). They were asked which wild foods were eaten, how often, and in which season(s). Realistic estimates of wild foods eaten were required and the Partner First Nations community Members assisted in providing this information as well as ensuring that all major food groups of wild food were represented. The Partner First Nations community Members were also asked to advise if anything was missed. The results of this workshop are included in Appendix B.

The KHLPP recognises a more detailed understanding of current patterns in the consumption of wild foods may contribute to a more accurate analysis of changes in wild food diet as a result of the Project. Provincial and federal health regulators have also indicated a desire for a more detailed baseline survey to be undertaken in each community, pending community consent. For these reasons, the merits and challenges of conducting a baseline food survey were researched and discussed at several of the Planning Committee meetings in 2014/15 (see Appendix A-3 for details about the meetings). Partner First Nations have identified a need for additional engagement with their members and leadership to better ascertain and/or ensure how participation in food surveys would benefit individuals and their community as a whole. For those communities that wish to participate, a baseline food survey, with an emphasis on wild food consumption, will be designed and undertaken in a way that can be replicated in the post-impoundment period. The survey scope and design will be guided by articulated goals, and serve as a basis to monitor changes over time.

Future discussion among the Partner First Nation communities and Manitoba Hydro will also contribute to developing a process to determine level of participation, to define scope and to execute the food survey in participating Partner First Nation communities.

4.1.1.4 POST-IMPOUNDMENT FOOD SURVEY

Post-impoundment food surveys in the Partner First Nation communities will be undertaken in participating Partner First Nation communities approximately every five years, starting at peak mercury levels (three to seven years post-impoundment, between 2022-2026), until mercury levels return to pre-impoundment or stable conditions. Periodic monitoring of consumption of wild foods from the Gull Lake and Stephens Lake area will also inform the analysis of mercury risk (i.e., future planned HHRAs), contribute to the adaptation of the risk communication strategy, and serve to tailor a health promotion approach that encourages the safe consumption

of wild foods. The food surveys, focused primarily on wild food consumption, will, in conjunction with hair monitoring results contribute to the evaluation of the effectiveness of KHLP mercury communication products.

4.1.3 MERCURY HAIR MONITORING

The KHLP will make available voluntary mercury hair sampling in Partner First Nation communities during pre-and post-impoundment periods.

The goals of hair monitoring are:

- **For individuals who wish to participate**, to understand, and be able to confidently respond to mercury levels in their bodies (through hair sampling), now and after impoundment.
- **For the community as a whole**, to understand mercury levels in participating community Members (through representative hair sampling), pre- and post-impoundment.
- To have **confidential hair monitoring results** provided to individuals in a **reasonable timeframe**, in conjunction with education and nutrition counselling regarding what the results mean, and what to do if they are above safe levels (particularly for women of child-bearing age).
- To act as one tool in the mercury and health “tool kit” to provide greater understanding of mercury in people today and after impoundment.

The benefits and challenges of mercury hair monitoring were researched and discussed at several of the Planning Committee meetings in 2014/15 (see Appendix A-3 for details about the meetings). Acknowledging that hair monitoring may assist individuals and communities to more confidently manage the benefits and risks of eating fish in the Project area, the KHLP will make available hair monitoring to those who wish to participate.

The approach to implement this initiative will consider concerns about past experience with hair monitoring; the Planning Committee representatives expressed that an effective implementation plan would need to provide opportunities where community members may continue this discussion to build understanding about the merits and limitations in participating in such a program. As such, the KHLP anticipates incorporating individual and group mercury education sessions into the larger implementation plan which will inform the scope of the mercury hair monitoring (e.g., individual and possibly representative sampling) and methodology options. Discussions with local, regional and federal health agencies will be undertaken to review same, including coordination with prerequisite education about mercury which should occur prior to a hair monitoring program. It is anticipated that federal and provincial agencies will be involved to some degree in education and communication about mercury and human health, particularly in the pre-impoundment period.

Overall, hair monitoring has the potential to provide definitive information to individuals regarding their own levels of mercury. Return of confidential results to individuals will also provide an opportunity for individual counselling with respect to mercury risk and wild food use. A representative survey presenting aggregated community results will be pursued, if desired by Partner First Nations.

4.2 ASSESSMENT OF MERCURY RISKS

Information obtained in the first step (Identification of Mercury Risk) will be reviewed by the toxicologist to re-assess risk to human health. Periodic Human Health Risk Assessments, beginning 5 years after peak mercury levels have been reached, will be undertaken to determine when mercury levels change enough to warrant change in guidance regarding fish consumption by people.

The following goals are identified for assessment of mercury risks:

- Based on information obtained through monitoring (noted above), to identify the risk to human health of consuming wild foods from areas affected by the Project.
- To provide the basis for developing consumption guidelines regarding these wild foods, with the involvement of relevant federal and provincial health authorities.
- To provide the basis for determining if and when communication products about mercury risk should be altered.

Risks to human health resulting from mercury in wild foods are assessed using a Human Health Risk Assessment methodology. Appendix B provides a summary description of this methodology. The HHRA of pre-impoundment conditions is used as a basis for further steps in this Plan along with input from federal and provincial health agencies and Partner First Nations. Collectively, this information is used to assess risk and develop appropriate risk communication guidance and products for the pre- and post-impoundment environment related to the Project.

4.2.1 PRE-IMPOUNDMENT CONDITIONS

For pre-impoundment conditions, the HHRA undertaken during the environmental planning process found that mercury in water was not of concern in terms of drinking, or bathing and swimming in water from Gull Lake or Stephens Lake. It also found that, with the exception of fish, the consumption of wild foods (moose, beaver, muskrat, snowshoe hare, and ducks) were not of concern. Appendix B includes preliminary consumption recommendations prepared for wildlife and waterfowl under pre- and post-impoundment conditions.

The HHRA also estimated the amount of fish that can be consumed on a weekly basis from Gull Lake and Stephens Lake (see Appendix B). The recommended amounts resulted in an exposure equal to the Tolerable Daily Intake guideline used by Health Canada and the World

Health Organization. Using the mean mercury concentrations for each of the three size classes for the three main fish species (North/South Consultants Inc., unpubl. data), recommendations for consumption of various fish sizes were developed. These recommendations are based on the size distribution of fish actually sampled for mercury analysis to establish present-day concentrations. The analysis also provides separate recommendations for toddlers, for women of child-bearing age and for adult males/all seniors.

In summary:

- The greatest risks were estimated from eating northern pike (jackfish) and walleye (pickerel) due to their higher tissue mercury concentrations as compared to other fish species. These species often have mercury concentrations between 0.2ppm and 0.5 ppm; health agencies have recommended that young children and women of childbearing age may choose to restrict their consumption of these fish to avoid exceeding acceptable Hazard Quotient values.
- Risks from lake whitefish were the lowest due to their low mercury concentrations; however, eating three large meals per week could still result in Hazard Quotient values exceeding the acceptable level.
- For lake sturgeon from Gull Lake (only lake with data), mean mercury concentrations are at 0.2ppm. Eating three large meals per week could result in Hazard Quotient values exceeding the acceptable level.

4.2.2 POST-IMPOUNDMENT CONDITIONS

Risk analyses for post-impoundment conditions were estimated as part of the HHRA included in the EIS, based on estimated peak mercury concentrations in fish following impoundment and assuming consumption of standard-sized fish. As reported in the HHRA, some fish, such as lake whitefish from Gull and Stephens lakes would still be acceptable to consume at current frequencies for adult men and women past childbearing age; for other fish it is anticipated that in order to maintain recommended Tolerable Daily Intake levels, consumption should be restricted and, in some cases, avoided. The HHRA describes the estimated risks associated with the post-impoundment consumption of different sizes and species of fish and provides the following key recommendations:

- Standard-sized northern pike (jackfish) and walleye (pickerel) from Gull Lake should be avoided by all ages under post-impoundment conditions due to predicted mercury levels that would exceed Hazard Quotient levels greater than one (based on consumption of three large meals per week).
- All fish larger than the standard lengths identified above should be avoided by everyone under post-impoundment conditions.

- The risk estimated from consumption of standard length lake whitefish from Gull and Stephens lakes were the lowest of the fish evaluated (with Stephens Lake whitefish being lower than Gull Lake whitefish). However, consumption of three large meals per week could still result in Hazard Quotient values greater than 1 for women of childbearing age and young children.

Appendix B provides the post-impoundment Recommended Maximum Weekly Intakes for the average-sized fish that would result in a Hazard Quotient value of 1.

Five years after peak mercury levels are reached, the HHRA will be repeated to determine if actual mercury levels have declined enough to safely consume fish in Gull Lake and Stephens Lake. HHRAs will occur every five years after that until actual mercury levels reach pre-Project or stable background levels. In conjunction with input from health agencies, information from these analyses will inform necessary adjustments to consumption guidelines for fish from Gull Lake and Stephens Lake.

In summary, it is anticipated that:

- At peak mercury levels, consumption of certain fish from Gull Lake and Stephens Lake will be discouraged to reduce the potential for fish consumers exceeding safe mercury intake levels.
- Although occasional consumption of certain smaller fish (e.g., lake whitefish) has been predicted to be acceptable at peak levels, consumption of other fish should be discouraged particularly by women of childbearing age and children.
- The updated consumption recommendations will be messaged to the public via Phase Two of the risk communication strategy (see Section 4.3). In addition to the fish evaluated in the risk assessment (i.e., lake whitefish, northern pike (jackfish) and walleye (pickerel), other fish may be considered in the communication plan.

4.3 RESPONSE TO MERCURY RISKS

Communication of mercury risk to potentially affected people, along with promotion of safe consumption of wild food, is one key response to protect the health of people. Another is the implementation of Adverse Effects Agreements programming for each Partner First Nation (designed to allow communities to obtain wild foods in locations within their traditional territories that are unaffected by hydroelectric development). The section below describes these two key responses—the implementation of Adverse Effects Agreements and preparation of risk communication strategy and materials—in more detail.

The following goals govern the KHLP's response to mercury risk:

- To mitigate risks to human health resulting from Project-related mercury effects in Gull Lake and Stephens Lake.

- To protect the health of people living in Partner First Nation communities and the Town of Gillam who may harvest or consume wild foods from the Gull Lake and Stephens Lake area. To protect the health of non-residents who may use wild foods from the Gull Lake and Stephens Lake area.

4.3.1 ADVERSE EFFECTS AGREEMENTS

Manitoba Hydro has entered into separate Adverse Effects Agreements (AEAs) with each Partner First Nations. These agreements, signed in 2009, describe a range of Offsetting Programs which were negotiated based on each community's perspectives about the types of programming required to address anticipated Project effects, including anticipated mercury risks. By participating in the various technical working groups and planning committees related to mercury, the Partner First Nations learned from and contributed to the scientific assessment of potential mercury effects resulting from the Project.

Each of the Partner First Nations' Adverse Effects Agreements include offsetting programs focused on providing opportunities to continue their customs, practices and traditions including hunting, fishing and trapping for food in areas unaffected by the Project. Each program differs based on the needs of the respective community:

- TCN's Access Program is focused on substitute opportunities to hunt, fish and trap for food within the Split Lake Resource Management Area. The Health Food Fish Program is intended to provide a wholesome supply of fish from community selected lakes in the SLRMA, which are not affected by the Project, replacing fish from the Nelson River whose mercury levels will be affected by the Project.
- WLFN's Improved Access Program is focused on improving road and winter trail access to War and Atkinson lakes to enable ongoing fishing and other cultural practices. The Community Fish Program is intended to provide a supply of wholesome food fish to the community as a replacement for fish from Project-affected areas due to increased mercury risk.
- FLCN's Alternative Resource Use Program is to provide opportunities to community resource users to access alternate areas within the Fox Lake Resource Management Area unaffected by Keeyask to pursue traditional activities.
- YFFN's Resource Access and Use Program is focused on enabling access to areas within the York Factory Resource Management Area for resource harvesting, traditional activities and cultural renewal, storing and distributing country foods and access to off-system lakes for fishing to replace fish potentially affected by the Project (i.e., increased mercury risk).

As per the provisions of these agreements, each of the Partner First Nations will take responsibility for the management, implementation, operation and evaluation of their community's Offsetting Programs. If required, provisions in the AEAs allow communities the

opportunity to modify offsetting programs or to reallocate annual program funding to more appropriately address Project effects as they are experienced.

4.3.2 PREPARATION OF CONSUMPTION ADVICE, RISK INFORMATION AND INFORMATION ABOUT BENEFITS OF WILD FOOD

The KHLP is committed to communicating mercury risk to potentially affected people, and developing effective communication strategy and products that promote the safe consumption of wild food.

This strategy will take into account that understandings about mercury are informed by a variety of information sources, as well as personal and cultural attitudes and experiences. As noted earlier, due to fears and lack of/conflicting information from trusted sources, many Partner First Nations Members have indicated that they have either stopped or decreased consumption of fish or other wild foods. Because fish, in the right quantity, are very healthy components of a diet, it is important to build effective communication mechanisms and products to allow individuals and families to safely and confidently consume these nutritionally and culturally important foods.

Based on identified risks to human health from mercury in fish and other wild foods, the following responses to manage pre- and post-impoundment mercury risk have been developed:

- Providing consumption advice and risk information regarding fish, developed in conjunction with health authorities and informed by WHO 2008 guidelines, to Members of the Partner First Nations (domestic use), other Aboriginal people (domestic use) and other local residents (recreational use).
- Developing a risk communication strategy that encourages the safe consumption of wild foods. In the case of domestic use, efforts will be coordinated with and cognizant that the consumption of safe wild food is an important aspect to overall health promotion and achieving wellness.

4.4 COMMUNICATION OF MERCURY RISKS AND BENEFITS OF WILD FOOD

A key response to mercury risk includes the preparation of a risk community strategy and associated materials. This section builds on the information presented in Section 4.3.2.

Balanced messaging will be prepared to provide guidance with respect to consumption of fish and other wild foods, including risks and benefits. Preparation and evaluation of the

effectiveness of communication products, their distribution process and associated educational activities are included in this section.

Communication goals of the KHLP are as follows:

- To provide timely guidance to target audiences regarding safe consumption of fish, including information about risks of consuming fish with elevated mercury levels, from Gull Lake and Stephens Lake.
- To consult with provincial and federal health agencies to develop or update consumption guidance.
- To encourage use of wild foods, especially fish, as part of a healthy diet and healthy lifestyle; in particular, wild foods that are low in mercury and will continue to have low mercury levels after impoundment (mammals, ducks, geese, plants).
- To increase awareness of the facts about mercury in wild foods in the Gull Lake and Stephens Lake areas and in alternative resource harvesting areas unaffected by hydroelectric development.
- To deliver communication to Aboriginal target audiences in culturally appropriate ways.

4.4.1 TARGET AUDIENCES

The following provides a list of groups in the vicinity of the Project targeted for consumption advice:

- The Partner First Nations– including leadership, their Project Implementation teams, health care providers in the communities, resource harvesters, Members who prepare meals, women of childbearing age, Elders, educators and general Membership;
- Residents of Gillam – including leadership, health care providers and the general public who may prepare and use local fish (including Metis and other Aboriginal people beyond the Partner First Nations); and
- Sport fishers who may make use of Gull Lake and Stephens Lake and Manitoba Conservation and Water Stewardship, which prepares the sport fishing guide.

4.4.2 RISK COMMUNICATION STRATEGY

A key element of this Plan is to implement a risk communication strategy which is rigorous and meaningful and that supports and enhances local practices of fishing for sharing, and eating wild-caught fish at levels and in amounts that are healthy for all community members. It aims to effectively inform local domestic and recreational users of wild food to understand mercury risks in areas affected by the Project, and to undertake that communication in a way that is culturally appropriate. As noted above, risk communication for domestic users of wild food, particularly for

the local Partner First Nations needs to be designed and delivered in coordination with broader health promotion, in order to encourage use of safe wild foods.

The key elements of the risk communication strategy include:

- **Balanced Message:** Recognizing the role of harvesting and consuming wild foods as central to health and cultural wellness messaging balances the risks and benefits of wild food use and encourages safe consumption of wild foods. The consumption advice is based on technical human health risk analyses and input from federal and provincial health agencies and Partner First Nations to achieve culturally and scientifically relevant messaging and materials.
- **Two Phases of Communication:** Communication will take place in both pre-and post-impoundment phases. For both phases, consumption guidelines will be tailored to specific lakes, species and sizes of fish and key population groups of people (toddlers, women of childbearing age and all other adults). General messaging will be consistent with the EIS (and HHRA) findings noted above.
 - **Phase One** focuses on the existing (pre-impoundment) environment – consumption advice based on pre-impoundment mercury risks. Phase One is anticipated to be underway in 2015 with the distribution of communication products identified in Appendix C and will extend until just prior to reservoir impoundment.
 - **Phase Two** focuses on the post-impoundment environment. Just prior to impoundment, communication products will introduce the upcoming changes in mercury levels that are predicted to come within three to seven years after impoundment of the reservoir in 2019. Actual mercury levels and associated consumption advice will be provided on an ongoing basis from that point forward.
- **Mercury Information on Keeyask Website:** The Keeyask Project has established a dedicated Mercury and Human Health folder on its website: <http://keeyask.com/wp/the-project/environment-and-monitoring/mercury-and-human-health>. While still in development, it will include information from the environmental assessment and regulatory process as well as up to date information with regard to mercury and human health (e.g. communication products, updated HHRA, mercury information session schedules) and a link to relevant federal and provincial health agencies' sites.
- **Cree Translation:** Select communication materials will be translated into Cree (roman orthography). The process to do so is outlined in the Project's Cree Language Plan (available on www.keeyask.com).
- **Monitoring Advisory Committee:** The consumption guidance is based on monitoring and subsequent assessment outcomes. Results of all monitoring will be communicated to communities through the Monitoring Advisory Committee, and to the Project Toxicologist for inputs into updated HHRAs. The HHRA outcomes will also be communicated to the communities through the Monitoring Advisory Committee (see Section 5).

4.4.3 COMMUNICATION PRODUCTS

The KHLP, through the work of the Technical Working Group and Planning Committee, developed communication products as tools to communicate Project-related risks associated with mercury and human health. The products make use of information about present-day mercury risk drawn from the HHRA. These communication products and associated recommendations were reviewed, discussed and refined through input from the Partner First Nations, as well as Health Canada and Manitoba Health.

Products that have been developed relevant to pre-impoundment conditions include the following (see Appendix C):

- Mercury placemats for Split, Gull and Stephens lakes to replace original placemats prepared by TCN over 20 years ago and still in use in the community today;
- Mercury posters (tailored for Split, Gull and Stephens lakes) for use in public locations such as schools, health care stations, fish plants, and administration offices;
- Mercury 'fish tape' for use by resource harvesters when harvesting (Gull and Stephens lakes) (meant to be a vinyl sticker for adhering to the sides of fishing boats for measuring the size of fish). It will be accompanied by a mercury fish chart graphically illustrating mercury levels in fish in Split, Gull and Stephens lakes;
- A poster-map identifying mercury levels in fish in Split, Gull and Stephens lakes;
- A Question and Answer product for easy reference by community health care providers to enable them to answer basic questions about mercury effects on people, and where to seek information;
- Mercury and health video (in production); and
- The development of signage placed at Gull and Stephens Lakes to warn the general public of mercury risk (Phase Two only).

These communication products will be updated for post-impoundment conditions. There will be an opportunity for adjustments to the products and distribution process after evaluation of Phase One. A plan will be developed to retrieve outdated communication materials and replace them with up-to-date materials in order to avoid confusion in the post impoundment period.

5.0 ROLES AND RESPONSIBILITIES

The KHLP takes overall responsibility for funding the implementation of the Plan. The KHLP will establish a process in which Manitoba Hydro and the Partner First Nations continue to work together, with involvement from federal and provincial health representatives, to develop an implementation plan for both pre- and post-impoundment conditions. Planning efforts will also include identifying the resources required to coordinate community based implementation efforts on behalf of the Monitoring Advisory Committee (MAC). The KHLP envisions that Partner First Nations will play a strong role in developing an implementation plan, its coordination and the evaluation of activities.

The MAC, as an advisory committee to the KHLP Board of Directors, will review the programs outlined in the Environmental Protection Program (including monitoring activities and outcomes associated with this Plan) and, if appropriate, may provide advice and recommendations to the KHLP on additional or alternative mitigation measures that may be required.

On behalf of the KHLP, the MAC will also ensure that the outcomes of the Environmental Protection Program are communicated more broadly on an annual basis to Members of the Partner First Nations communities, regulators and the general public (Keeyask Hydropower Limited Partnership 2012a). Any Plan activities currently identified as having regulatory reporting requirements (e.g., HHRA outcomes) will be fulfilled through the Socio-Economic Monitoring Plan reporting process.

5.1 PRE-IMPOUNDMENT CONDITIONS (PHASE ONE)

For primary users of the Project area, an implementation group, involving community based coordination teams, will oversee the preparation of communication materials and a risk communication strategy based on pre-impoundment conditions. Information will be consistent with federal and provincial guidance and is being undertaken to help target audiences build awareness and gain comfort with the communication materials (outlined in Section 4.4) prior to impoundment.

Throughout the planning process, the Partner First Nations have articulated an expectation that federal and provincial health agencies be central in communicating mercury risk under current conditions¹. They have stated that, in terms of delivering important health related information, a

¹ Health care is a joint responsibility between the province and the federal government. The province, through regional health authorities, is responsible for the operation and administration of facility and community based health programs and services such as hospitals, health clinics and primary health care. The Northern Regional Health Authority is unique in Manitoba in that 72% of its population is of Aboriginal descent and it is the largest geographic health region in the province. The federal government, through the First Nations and Inuit Health Branch (FNIHB) funds or delivers community-based health promotion and disease prevention programs; primary, home and community care services; programs to control communicable diseases and address environmental health issues; and non-insured health benefits (Health Canada 2012). First Nation Members residing in the region who live on-reserve, receive health care services on-reserve through FNIHB; and access services off-reserve through the provincial regional

strong health care provider role is important in order for their Members to build trust and gain comfort with discussions about mercury levels in fish and other traditional foods, especially in the context of promoting traditional foods as an important part of a healthy diet. The KHLP will continue to work collaboratively with health agencies to maximize the potential for mutual benefit in terms of mercury-related harm reduction and health promotion initiatives related to this Plan.

Provincial health care representatives have indicated a willingness to incorporate local and regional health promotion initiatives with the KHLP's risk communication efforts. Similarly, Health Canada has also indicated a willingness to have a role in supporting the delivery of public health and health promotion services on-reserve¹.

5.2 POST-IMPOUNDMENT EFFECTS OF THE KEEYASK PROJECT (PHASE TWO)

It is anticipated the mechanisms established to coordinate Phase One implementation will be applicable to Phase Two; a Phase One evaluation will determine whether there is need to adjust resources required to maintain or improve implementation processes. Similar to Phase One, an implementation group, involving a community based coordination team, will oversee the preparation of communication materials and a risk communication strategy based on post-impoundment conditions. Program delivery will attempt to optimize existing services and updates or revisions to materials will be in consultation with federal, provincial, and local service providers to ensure effective and accurate information provision to Phase Two target audiences. Other government agencies, such as Manitoba Conservation and Water Stewardship will be involved, as required.

The implementation group may also coordinate risk communication activities with staff in each of the Partner First Nations that are responsible for implementing relevant domestic resource harvesting programs and fish replacement programs within their individual Adverse Effects Agreements (e.g., provision of communication products to participants in relevant programs).

health authority as necessary (e.g., physician services as required, screening services and hospitalization). Through a 1964 federal-provincial agreement, health services in War Lake First Nation at Ilford are provided by the Province of Manitoba.

¹ For example, Health Canada's First Nation Inuit Health Branch can provide advice about food safety issues in traditional foods (as well as conventional [store-bought] food) and potential exposure to environmental contaminants. Upon request, Environmental Health Officers provide awareness materials and information sessions about food safety to First Nation community members (Email, dated January 8th, 2015. Sandra Slogan, Regional Environmental Assessment Coordinator, Environmental Health Program, Health Canada).

6.0 ADAPTIVE MANAGEMENT

The effects of mercury on human health as a result of the Project have been carefully assessed through an extensive two-track environmental assessment process as well as a rigorous environmental licensing process. Mitigation measures and monitoring activities have been carefully planned and designed to prevent or reduce, to the extent practical, adverse Project effects on human health. The KHLP has adopted an adaptive management approach in the event of unanticipated or underestimated Project effects, and/or to consider alternative mitigation measures when necessary (see KGP EIS, Chapter 8, Response to Guidelines). Where appropriate, potential adaptive management activities are included in the monitoring and management plans developed as a part of the Environmental Protection Program or through an on-going process during monitoring in consultation with regulators.

More specifically, this Plan includes mitigation and monitoring activities in both pre-and post-impoundment conditions. Those outlined in the pre-impoundment phase are intended to lay the groundwork and serve as a 'pilot' for the post-impoundment period. An evaluation of the risk communication strategy, including communication products, information provision processes as well as other identified activities may identify alternatives or necessary changes for the post-impoundment period.

The risk communication strategy and materials outlined in this Plan have been and will continue to be shaped by the input and advice from Partner First Nations as well as health agencies. The KHLP will maintain a process to continue dialogue amongst stakeholders. As noted above, MAC is a forum in which Partners will discuss existing and emerging mitigation and monitoring issues and, if required, advise the KHLP to provide additional or consider alternative mitigation or monitoring activities. In this way, feedback from KHLP and government stakeholders will be considered in this process of adaptive management.

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8.0 GLOSSARY

Bioaccumulation (re: mercury) - the buildup of mercury and mercury compounds in living organisms such as insects and small fish.

Biomagnification (re: mercury) - the process whereby the tissue concentrations of a contaminant such as mercury increase as it passes up the food chain through two or more levels of the food chain (e.g., from insects to small fish; from small fish to large predatory fish; from predatory fish to people).

Hazard Quotient - a scientific formula for undertaking human health risk analysis; it is the estimated daily exposure divided by the Tolerable Daily Intake. If the Hazard Quotient is less than 1, adverse health effects are unlikely; if the Hazard Quotient is greater than 1, chemical exposure rates may exceed acceptable rates and cautionary advice is needed (Wilson 2012).

Human Health Risk Assessment (HHRA) - a process that is accepted by Canadian and international health agencies for evaluating the potential for chemical, biological and physical agents to cause adverse health effects in people (Wilson 2012).

Impoundment - a reservoir formed by a dam.

Methylmercury - an organic form of mercury that bioaccumulates through the aquatic food chain.

Recommended Maximum Weekly Intake - represents the amount of food that, if consumed on a weekly basis, would result in an exposure that is equal to the Tolerable Daily Intake (and thus result in a Hazard Quotient value equal to 1 (Wilson 2012).

Tolerable Daily Intake - The daily amount of exposure that is considered unlikely to cause adverse health effects in the general population (including sensitive individuals) (Wilson 2012).

Toxicologist - a scientist who studies the adverse effects of chemical, physical, or biological agents on people, animals, and the environment.

APPENDIX A

PARTNERSHIP ENGAGEMENT

APPENDIX A-1:

**COMMITMENTS IN EIS AND RESPONSES
TO INFORMATION REQUESTS
RELATED TO MERCURY
AND HUMAN HEALTH**

Commitments in EIS and Responses to Information Requests Related to Mercury and Health

The work of the MHHTWG was incorporated in the Environmental Impact Statement and in responses to Information Requests during the environmental review process. Table A-1-1 provides a summary of where mercury and human health is included in the EIS documents. This table indicates KHLP commitments with respect to actions to address mercury and human health and are incorporated into this Mercury and Human Risk Management Plan.

Table A-1-1: Location of Mercury Topic in the Environmental Impact Statement Filing

Mercury Topic	Location in the EIS Filing
Mercury and Human Health – approach and methodology	Socio-Economic Supporting Volume, Sec. 5.2.3 (p. 5-11 to 5-13)
Mercury and Human Health – existing environment	Response to EIS Guidelines, Sec. 6.2.3.5.4 (p. 6-160 to 6-162) Socio-Economic Supporting Volume, Sec. 5.3.3 (p. 5-103 to 5-118)
Mercury and Human Health – effects assessment (including mitigation)	Response to EIS Guidelines, Sec. 6.6.5.3 (p. 6-471 to 6-476) Socio-Economic Supporting Volume, Sec. 5.4.1.3 (construction phase – no effect) (p. 5-181); Sec. 5.4.2.3 (operation phase – effect) (p. 5-214 to 5-224)
Mercury and Human Health - monitoring	Response to EIS Guidelines, Sec. 8; Table 8-3 (p. 8-17) for fish; Table 8-4 (p. 8-26) for wild game; Table 8-5 (p. 8-33) for socio-economics Preliminary Socio-Economic Monitoring Plan, Preliminary Terrestrial Effects Monitoring Plan [Filed April 2013] Preliminary Aquatic Effects Monitoring Plan [Filed August 2013]
Human Health Risk Assessment	SE SV Appendix 5C; updated in Supplemental Filing # 1, April 2013
Mercury and Human Health ¹ – Information Requests through Technical Advisory Committee (TAC) regulatory review process	<u>TAC Public Rd 1</u> <ul style="list-style-type: none"> Health Canada – 0001, 0002, 0003, 0004, 0005, 0006, 0007, 0008, 0009 <u>TAC Public Rd 2</u> <ul style="list-style-type: none"> Health Canada – 0002, 0003, 0007 MCWS – Fisheries – 0002 (monitoring) MB Health - 0001 <u>TAC Public Rd 3</u> Health Canada – 0007

Mercury Topic	Location in the EIS Filing
Mercury and Human Health ¹ – Information Requests through the Clean Environment Commission (CEC) review process	<u>CEC Rd 1</u> <ul style="list-style-type: none">• CAC-0016, 0017, 0018, 0019, 0020a/b, 0021,0024a/b, 0028, 0029, 0030, 0031, 0032, 0035• MMF-0037 <u>CEC Rd 2</u> <ul style="list-style-type: none">• CAC-0157, 0158, 0160, 0161 PFN-0069b

¹ Note: This table focuses on human health. There were many other mercury-related IRs through both the TAC and CEC processes that focused on more technical issues addressed by the aquatic and terrestrial specialists that were not specific to human health. These have not been included in this table which focuses on human health.

APPENDIX A-2:
MERCURY AND HEALTH
TECHNICAL WORKING GROUP

1.0 PURPOSE

The Keeyask Mercury and Human Health Technical Working Group (the Working Group) was formed in June 2007 to address concerns expressed by the Partner First Nations respecting an increase in methylmercury (mercury) resulting from the flooding of land in the forebay of the proposed Keeyask Generation Project. Two key questions were raised:

- Would flooding increase mercury levels in fish and other animals eaten by people so that mercury levels in people would also increase?
- If there was an increase, would this pose a health risk to people?

The Working Group was struck by the EIS Coordination Team, which recognized that the topic of mercury and human health is highly complex in both technical analysis and language. The level of technical complexity presents a challenge when trying to discuss study results with communities in ways that are clear and helpful. As discussed at the first workshop in June 2007, the purposes of the Working Group were as follows:

- To answer the Partner First Nations communities' and Manitoba Hydro's questions about mercury and human health today;
- To answer the Partner First Nations communities' and Manitoba Hydro's questions about future mercury effects on human health if the Keeyask Generation Project is developed and ways to reduce those effects; and
- To develop ways to effectively communicate with communities about what has been learned.

The Working Group undertook its work between June 2007 and June 2011. A record of all meetings and presentations has been maintained.

2.0 PARTICIPANTS

The Working Group included representatives from each of the Partner First Nations, Manitoba Hydro and the environmental assessment study team (EA Study Team). An independent toxicologist, Mr. Ross Wilson of Vancouver, BC was hired to do the human health risk assessment (HHRA). An independent specialist, Dr. Laurie Chan of the University of Ottawa (formerly of the University of Northern BC), was hired to assist the Working Group; he provided information about mercury and human health at the outset of the process, undertook the peer review of the HHRA results and reviewed the draft communication products. In addition, for a portion of the process, the Medical Health Officer of the Burntwood Regional Health Authority participated in the process (Dr. Lisa Richards and Dr. Randy Gesell each participated).

3.0 ACTIVITIES OF THE WORKING GROUP

The Working Group held 14 workshops between June 2007 and June 2011. See Table A-2-1 for details on the workshops.

At the initial workshops, the Working Group gathered facts about mercury to enable everyone to gain a better understanding of the concern and to answer the Partner First Nations communities' and Manitoba Hydro's questions about mercury.

Through presentations and discussion, the Working Group covered topics such as the following:

- What is methylmercury and where does it come from;
- Mercury in freshwater environments in northern Manitoba (including lakes unaffected by hydroelectric projects);
- Mercury in fish;
- Mercury in furbearers;
- Mercury in birds;
- Mercury and people;
- Guidelines for mercury in fish and for people eating the fish; and
- Changes in mercury levels at previously constructed generation stations in northern Manitoba.

Secondly, the Working Group commissioned the HHRA that was undertaken by Ross Wilson. The study examined ways in which mercury could reach human receptors in the areas that will be affected by the Project – through use of country foods from the area, through drinking of surface water and from skin contact with surface water. The study examined both the present-day conditions without the Project and future conditions with the Project. The Working Group reviewed and discussed interim and then final results of the HHRA. In addition, the details of interim pathways from the environment to country foods – through mercury in fish, mammals, plants and water – were discussed with specialists from the EA Study Team who prepared these analyses. The HHRA included recommendations to reduce the risk associated with mercury in country food. The HHRA confirmed the importance of the programs included in each of the Partner First Nations' Adverse Effects Agreement to enable Members to harvest country food in locations unaffected by the Project. The recommendations also recognized the health benefits of eating fish and encouraged the Partner First Nations to focus on fish with low mercury content, especially for the vulnerable groups, such as women of child-bearing age and children. Monitoring of mercury content in country foods (primarily in fish, but also in mammals and plants to confirm their low mercury content) was included.

The draft HHRA was peer reviewed by Dr. Laurie Chan.

The third major focus of the Working Group was to consider effective ways to communicate the results of this work to the Partner First Nations communities. The topic of mercury is highly technical and very complex, in particular because the health benefits of fish are important to confirm as well as the risks of mercury. The Working Group wanted to ensure that communication was clear and well understood.

Communication products were developed, based on experience elsewhere (*e.g.*, northern Québec), the knowledge of Working Group Members from the Partner First Nations and the specific results to be communicated about the present-day and future conditions. Draft products included placemats, maps, a poster, a fish “yardstick” for measuring fish length in the field and a PowerPoint presentation for local health care providers. A two-phased communication strategy was developed for delivery of the products, including an initial phase to communicate present-day conditions and a second phase that would be undertaken prior to impoundment to communicate the risks that are expected in the period three to seven years after impoundment in Gull Lake and Stephens Lake. The communication products were tested by some of the Partner First Nations communities for effectiveness. In addition, the HHRA background, results and communication products were presented to federal and provincial health staff.

Table A-2-1: Technical Working Group Workshops

Workshop One	
Date:	June 13, 2007
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda Working Group Members Identified So Far Memo on candidate profiles of technical experts
Summary:	This workshop discussed the purpose of the Mercury and Human Health Technical Working Group, goals, schedule, hiring a health expert and next steps.
Workshop Two	
Date:	July 30, 2007
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda Working Group Members Background and Guidelines for Consumption (J. Whitaker) Mercury in Freshwater Environments in Northern Manitoba (F. Schneider-Vieira) Memo on Effects of Mercury Loading on Piscivorous Birds; Memo on Effects of Mercury on Bald Eagles; Article – Effects of Environmental Methylmercury on the Health of Wild Birds, Mammals, and Fish (L. Wyenberg) Mercury in Furbearers (R. Berger) Mercury and Human Health in Northern Manitoba – Initial Comments (J. Kinley)

Summary:	This workshop focused on gathering facts about mercury – the big picture, mercury in the environment in northern Manitoba, mercury in water and fish, mercury in birds, mercury in furbearers, mercury and human health in northern Manitoba – mercury and health in KCNs communities, questions about mercury and health that remain to be answered and next steps.
Workshop Three	
Date:	September 27, 2007
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members Specialist Presentation -- Dr. Laurie Chan
Handouts:	Draft Meeting Agenda Members @ 31 August 2007 A Brief Introduction to Mercury Toxicology (presentation slides prepared by Dr. Laurie Chan)
Summary:	This workshop included a presentation by Dr. Laurie Chan on mercury and human health followed by discussion of specific questions and answers, outstanding questions yet to be answered and next steps.
Workshop Four	
Date:	November, 23, 2007
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda What We've Covered to Date Additional Questions from the Last Meeting Predicting Fish Mercury Concentrations for the Keeyask Project – Approach and Preliminary Results (presentation) Estimating Effects of Mercury on People

Summary:	This workshop addressed what was learned at the last meeting, the status of predictive modeling to estimate effects of the Keeyask Generation Project on mercury, communicating with the communities about what we've learned and next steps.
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Workshop Five

Date:	January 31, 2008
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members Specialist Dr. Laurie Chan (via speaker phone)
Handouts:	Draft Meeting Agenda Fish Mercury Concentrations for the Keeyask Project – Projects Lakes and Offset Lakes (presentation) Approach to Assessing the Effects of Mercury on Birds (presentation) Predicting Furbearer Mercury concentrations for the Keeyask Project – Preliminary Approach (presentation) Health Risk Assessment – correspondence, CVs and Comparison of Specialists and Approaches table Updated draft "Good for You and Good to Eat" placemat DVD of videotapes explaining the Federal Ecological Monitoring Plan (FEMP) mercury testing from Member E. Morris of Tataskweyak Cree Nation
Summary:	This workshop included clarity on guidelines (Dr. Chan on speaker phone), reporting on action items from the last meeting, mercury levels in other lakes being fished, status of predictive modeling for birds, communication results with the communities and next steps.

Workshop Six

Date:	March 27, 2008
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members

Handouts:	<p>Draft Meeting Agenda</p> <p>Mercury in Fish and Guidelines for the Consumption of Recreationally Angled fish in Manitoba (Manitoba Water Stewardship)</p> <p>Article: Mercury Connections: The extent and effects of mercury pollution in northeastern North America</p> <p>Article: Maternal Fish Intake during Pregnancy, Blood Mercury Levels, and Child Cognition at Age 3 Years in a US Cohort</p> <p>October 2006 Fact Sheet: Balancing Choices: Supporting Consumer Seafood Consumption Decisions (Institute of Medicine of the National Academies)</p> <p>Initial Draft Mercury and Health Question and Answer Summary for Input to Communication Products for Communities</p> <p>Graph of mercury levels in fish in Sipiwesk Lake</p> <p>Updated draft "Good for You and Good to Eat" placemat</p>
Summary:	This workshop included reporting on selected items, factual questions, communication results regarding current mercury levels with communities, and next steps.
Workshop Seven	
Date:	May 22, 2008
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Manitoba Hydro</p> <p>EA Study Team Members</p>
Handouts:	<p>Draft Meeting Agenda</p> <p>Keeyask Mercury and Human Health Technical Working Group Interim Summary Report (draft May 14, 2008)</p> <p>Summary PowerPoint Presentations for communities to use (long and short version)</p> <p>Hydro Quebec's Nutrition Guide and Map</p>
Summary:	This workshop included reporting on selected action items, a review of interim summary report and PowerPoint presentations, communication of results regarding current mercury levels with communities, health risk assessment (Ross Wilson) and next steps.

Consumption Workshop

Purpose:	Workshop to set assumptions about country food use for the HHRA.
Date:	October 7, 2009
In attendance:	Each of the KCNs was asked to bring community representatives who were familiar with country food use in their community; representatives were from: Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Also attending: Wilson Scientific Manitoba Hydro InterGroup Consultants
Handouts:	Draft Meeting Agenda
Summary:	This workshop included a review of the agenda and background on the Mercury and Human Health Technical Working Group. Questions were posed to participants regarding the types of country foods eaten by communities and the quantities eaten by adults and children. The intent was to establish assumptions for the HHRA.

Workshop Eight

Date:	November 24, 2009
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda Members of the Mercury and Health TWG as of November 24, 2009 Mercury and Human Health in Northern Manitoba – A Status Report Predicting Fish Mercury concentrations for the Keeyask Project – Update of Estimates (November 2009) Birds: Estimated Levels of Mercury in Water Birds – Pre and Post Impoundment Human Health Risk Assessment of Country Foods: Update Keeyask Country Foods consumption Assumptions

Summary:	This workshop included an updated status report, a review of the HHRA and an update on some preliminary draft results and next steps.
Workshop Nine	
Date:	March 23, 2010
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda November 24, 2009 Draft Meeting notes of the Mercury and Health TWG PowerPoint Presentation: Estimated Levels of Mercury in Mammals Pre and Post Impoundment (R. Berger) PowerPoint Presentation: Human Health Risk Assessment of Country Foods: March 2010 Update (R. Wilson)
Summary:	This workshop included presentations about mercury in mammals as well as the health assessment of country foods. In addition, a communications strategy was discussed along with next steps.
Workshop Ten	
Date:	May 20, 2010
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members Dr. Lisa Richards, Medical Officer of Health
Handouts:	Draft Meeting Agenda March 23, 2010 Draft Meeting notes of the Mercury and Health TWG PowerPoint Presentation: Estimated Levels of Mercury in Mammals Pre and Post Impoundment (R. Berger) PowerPoint Presentation: Human Health Risk Assessment of Country Foods: May 2010 Update (R. Wilson) Communication Strategy – Methylmercury and Human Health Today and After the Keeyask Generation Project

Summary:	This workshop included a review of the agenda, the moose and caribou monitoring program, HHRA, communications strategy and next steps.
Workshop Eleven	
Date:	September 9, 2010
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members Dr. Lisa Richards, Medical Officer of Health Dr. Susan Roberecki, Environmental Health Lead (via teleconference)
Handouts:	Draft Meeting Agenda May 20, 2010 Draft Meeting notes of the Mercury and Health TWG PowerPoint Presentation: Human Health Risk Assessment: September 2010 Update (R. Wilson) PowerPoint Presentation: Communicating Mercury and Human Health (J. Kinley) Revised draft placemat Draft "Yardstick": Mercury in Fish: Guide to Fish Size for Healthy Eating in Gull Lake and Stephens Lake (for use by resource harvesters in boats) Draft Map: Fish Consumption Guide for Keeyask Project Waterbodies Draft Wild Game Monitoring Program: Recommended Procedures for Obtaining and Submitting Tissue Samples Draft Lake Sturgeon Mercury Monitoring Program and Sample Collection Protocol
Summary:	This workshop included a review of the agenda, a presentation concerning HHRA (updated from the May 20 th presentation), a presentation concerning communicating mercury and human health (including a discussion of the placemat update, sample map with consumption guidelines, and fish "yardstick"), a plan for discussion with health representatives in communities about mercury, the country food monitoring programs and next steps.

Workshop Twelve

Date:	November 3, 2010
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Wilson Scientific</p> <p>Manitoba Hydro</p> <p>EA Study Team Members</p> <p>Dr. Randy Gesell, Medical Officer of Health</p>
Handouts:	<p>Draft Meeting Agenda</p> <p>September 9, 2010 Draft Meeting notes of the Mercury and Health TWG</p> <p>PowerPoint Presentation: Human Health Risk Assessment: November 2010 Update (R. Wilson)</p> <p>PowerPoint Presentation: Communicating Mercury and Human Health (J. Kinley)</p> <p>Revised draft Placemats</p> <p>Revised draft "Yardstick"</p> <p>Revised draft Maps: Fish Consumption Guide for Split, Gull and Stephens Lakes, and for Keeyask Project Offset Lakes</p> <p>Draft Poster: Mercury, Fish and People</p>
Summary:	<p>This workshop included a review of the agenda, a presentation concerning the HHRA (updated from September 9, 2010 workshop), a presentation concerning communicating mercury and human health (including a discussion of revised placemat, maps, yardstick and the poster), discussion with health representatives in communities, a presentation on the environmental contaminant monitoring program organized and managed by the First Nations University of Canada, AFM and Health Canada, a discussion of the country food monitoring program and next steps.</p>

Workshop Thirteen

Date:	February 2, 2011
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Wilson Scientific</p> <p>Manitoba Hydro</p> <p>EA Study Team Members</p> <p>Dr. Randy Gesell, Medical Officer of Health</p>
Handouts:	<p>Draft Meeting Agenda</p> <p>November 3, 2010 draft meeting notes of the Mercury and Health TWG</p> <p>Finalizing the Work of the Mercury and Human Health TWG, Draft @ January 27, 2011</p> <p>PowerPoint Presentation: Status and Draft Plan to Complete the Original Tasks (Draft @ February 2, 2011; J. Kinley)</p> <p>PowerPoint Presentation: Mercury and Human Health: Presentation to Health Care Providers – revised with TWG suggestions</p> <p>Revised draft placemats</p> <p>Revised draft yardstick</p> <p>Revised draft maps: Fish Consumption Guide for Split, Gull and Stephens Lakes, and for Keeyask Project Offset Lakes</p> <p>Draft poster: Mercury, Fish and People</p>
Summary:	<p>This workshop included a review of the agenda, the status and plan for completion of the work of the Mercury and Human Health Technical Working Group, discussion of the plain language version of the HHRA for communities, finalizing the communications strategy, discussion of communication strategy products (placemat, maps, yardstick, poster, report with health care professionals), discussion of country food monitoring programs and next steps.</p>

Workshop Fourteen

Date:	June 15, 2011
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members Dr. Randy Gesell, Medical Officer of Health
Handouts:	Draft Meeting Agenda PowerPoint Presentation: Finalizing The Work Of the Mercury and Human Health Technical Working Group (J. Kinley) Memo on Plant Sampling Protocol – Draft @ June 7, 2011 Communication Products
Summary:	This workshop included a review of the agenda, a review of the summary of the Mercury and Human Health Technical Working Group work, finalizing the communications products, finalizing the HHRA, including the full technical report and plain language summary, and review of country food monitoring programs.

Technical Session with Regulators

Date:	October 31, 2012
In Attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Wilson Scientific</p> <p>Manitoba Hydro</p> <p>EA Study Team Members</p> <p>Federal representatives from CEAA, Health Canada, DFO, Environment Canada, and Natural Resources Canada</p> <p>Provincial representatives from MB Aboriginal and Northern Affairs, MB Health, and MB Conservation and Water Stewardship</p>
Handouts:	<p>Draft Meeting Agenda</p> <p>PowerPoint Presentations: Mercury and Human Health: Background; Overview of Mercury in Water; Mercury in Fish: Overview and Results from the Keeyask EIS; Methylmercury in the Keeyask Terrestrial Environment; Overview of Human Health Risk Assessment: Proposed Keeyask Generation Project; Mercury Concentrations in Fish from Keeyask Project Waterbodies – Existing Environment; Overview of Human Health Risk Assessment – Existing Environment; Mercury in the Existing Environment – Risk Communication</p>
Summary:	<p>This technical session included a review of the agenda and purpose of the meeting. The majority of the day was focused on presentations related to potential mercury pathways of effect of the Keeyask Generation Project (on water, fish, the terrestrial environment and human health). The rest of the day focused on risk communication in the existing environment.</p>

Post-Filing TWG Meeting

Date:	February 21, 2013
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members
Handouts:	Draft Meeting Agenda PowerPoint Presentation: Mercury and Human Health: Activities since last MHHTWG Workshop Keeyask Generation Project – Mercury and Human Health Change in Fish Consumption Recommendations, Draft @ 2013 02 15 Revised Sample Placemat (Gull Lake), Draft @ February 2013 Summary Table of Health Canada comments on Risk Communication Products @ November 2, 2012
Summary:	This meeting included a review of activities since the MHHTWG last met in 2011, including a brief summary of activities up to June 2011, the filing of the EIS, visits to communities, work on a video product, and the adequacy review by regulators (key Information Requests were noted). The group discussed the key change in fish consumption recommendations being requested by Health Canada and the resulting implications for all communication products.

Technical Session with Regulators

Date:	March 12, 2013
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific Manitoba Hydro EA Study Team Members Federal representatives from Health Canada and DFO Provincial representatives from MB Health and MB Conservation and Water Stewardship
Handouts:	Draft Meeting Agenda PowerPoint Presentations: Mercury and Human Health Information Requests – Status to Date, HC 0002 Fish Consumption, HC 0003 Communication Products
Summary:	The technical session included a review of the draft meeting agenda and main purposes of the session. The first half of the meeting focused on review and discussion on three PowerPoint presentations focused on (a) Health Canada's concerns with the 'unrestricted eating' category and (b) revising the HHRA to remove consumption recommendations, mitigation and communication as those items should be included in a Risk Management Plan. The remainder of the session focused on requested suggestions and changes to the Partnership's risk communication products.

Post-Filing TWG Meeting

Date:	April 8, 2014
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Wilson Scientific (phone) Manitoba Hydro EA Study Team Members

Handouts:	<p>Draft Meeting Agenda</p> <p>PowerPoint Presentation: Mercury and Human Health: Where We've Been</p> <p>Keeyask Generation Project – Mercury and Human Health Commitments Table</p> <p>Keeyask Generation Project: Mercury and Human Health Risk Management Plan Purpose and Draft Outline</p>
Summary:	<p>This final meeting of the TWG included a review of the draft agenda, review and discussion of the PowerPoint presentation Where We've Been and the commitment table, and discussion related to feedback from health regulators and CEAA related to the Risk Management Plan (RMP) and Risk Communication Strategy. The group discussed the need for the formation of a transition 'planning' group to continue the work on the RMP for filing with regulators by June 2015, and the revised communication products.</p>

APPENDIX A-3:
KEEYASK MERCURY AND HUMAN HEALTH
PLANNING COMMITTEE

1.0 PURPOSE

The Keeyask Mercury and Human Health Planning Committee (KMHHPC) was struck to complete the remaining work of the MHH Technical Working Group as well as respond to mercury issues that emerged during federal and provincial regulatory review of the Project. The KMHHPC will have the following responsibilities:

- To finalize the Mercury and Human Health Risk Management Plan;
- To provide advice and recommendations to the Partnership (through the Monitoring Advisory Committee) for Phase 1 implementation (present day conditions); and
- To develop advice for the Partnership for Phase 2 implementation (post-impoundment conditions).

The timeframe for the MHH Planning Committee was between June 2014 and June 2015 when the mandate of the MHH Planning Committee will be completed.

2.0 ACTIVITIES OF THE PLANNING COMMITTEE

The Keeyask Mercury and Human Health Planning Committee held seven meetings between June 2014 and June 2015. See Table A-3-1 for details on each of the meetings.

Table A-3-1: Planning Committee Meetings

Meeting One	
Date:	June 10, 2014
In attendance:	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives York Factory First Nation Representatives Fox Lake Cree Nation Representatives Manitoba Hydro EA Study Team Members Representative of Health Canada (FNIHB) for brief portion at the end
Handouts:	Proposed Mercury and Human Health Risk Management Planning Group Proposed Terms of Reference (and associated work plan and schedule) - Draft @ 2014 06 03 MHH Risk Management Plan Actions Required to Complete the Plan - Draft @ 2014 06 03 Change in Fish Consumption Recommendations - Draft @ 2014 06 10 Placemat Insert Options – Servings and Weight/Month vs. Servings/Month – Draft February 2013
Summary:	The group discussed the Terms of Reference for the committee and associated work plan and schedule. It was agreed that representatives from the health agencies should be invited to participate when needed. Additional testing of Gull Lake and offset lakes was discussed. The main focus of the meeting was discussion associated with replacing the “unrestricted eating” category on all communication products; and preparing for a September meeting with health agencies attending. The responsibilities of FNIHB in the Planning Committee’s risk management planning was explored.
Meeting Two – Planning Meeting with Health Agencies	
Date:	July 4, 2014
In attendance:	Manitoba Hydro EA Study Team Members Representatives from Manitoba Health, Health Canada and Manitoba Conservation and Water Stewardship

Handouts:	<p>PowerPoint Presentation: Mercury and Health Status Update – July 4, 2014</p> <p>MB Health: Mercury and Human Health Risk Communication Planning Committee (distributed July 3, 2014)</p> <p>Placemat Insert Options – Servings and Weight/Month vs. Servings/Month – Draft February 2013</p> <p>Keeyask Generation Project – Mercury and Human Health Commitments Table – Draft @ 2014 04 09</p> <p>Proposed Mercury and Human Health Planning Committee Draft Terms of Reference Outline</p>
Summary:	<p>The Terms of Reference for the Keeyask MHH Planning Committee and the MB Health technical committee were reviewed and discussed, including respective roles and responsibilities. The group discussed preparation for a fall 2014 meeting with the Partnership. MB Health and Health Canada agreed to participate on the Keeyask MHH Planning Committee on an “as needed basis”. A Keeyask Mercury and Human Health Risk Management Plan, including communication products, was a commitment made by the Partnership – this was reiterated as the key focus for the Keeyask MHH Planning Committee.</p>
Meeting Three – Prep Meeting	
Date:	November 12, 2014
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Manitoba Hydro</p>
Handouts:	<p>Draft Agenda</p> <p>Proposed Keeyask Mercury and Human Health Planning Committee Proposed Terms of Reference – Revised Draft @ 2014 09 05</p> <p>Provincial and Federal Health and Conservation Agencies’ Comments and Initial Proposed Responses for Discussion – Draft @ September 29, 2014</p> <p>Revised Placemats (Split, Gull and Stephens Lakes) – Draft @ November 2014</p>
Summary:	<p>The Planning Committee discussed preparation for November 20th meeting with health agencies. Additional discussion revolved around concerns about mercury in the environment today, rationale for revised consumption recommendation categories on the communication products, issues relating to implementation of communication products/program, including the involvement of provincial and federal health agencies in the KMHHP’s implementation planning.</p>

Meeting Four

Date:	November 20, 2014
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Manitoba Hydro</p> <p>EA Study Team</p> <p>Mr. Ross Wilson</p> <p>Representatives from Manitoba Health, Health Canada, DFO and Manitoba Conservation and Water Stewardship</p>
Handouts:	<p>Draft Agenda</p> <p>PowerPoint Presentation: Mercury and Human Health: Where We've Been, November 20, 2014</p> <p>Keeyask MHH Planning Committee: Proposed Terms of Reference and Work Plan – Draft @ 2014 09 05</p> <p>PowerPoint Presentation: Role of Government Representatives</p> <p>Draft Placemats with fish consumption guidance for Split, Gull and Stephens lakes</p> <p>Comparison of Community Diet Survey and Country (Wild) Food Survey (<i>Distributed; discussion deferred to next meeting</i>)</p> <p>PowerPoint Presentation: Baseline Diet Survey (<i>Distributed; discussion deferred to next meeting</i>)</p>
Summary:	<p>The meeting discussed Partner First Nation concerns about changing messages related to mercury and what fish are safe to eat. The PPT on Where We've Been was provided as an overview/context for discussion. Representatives from the provincial and federal health agencies participated in a joint presentation on the role of their departments and agencies in providing health services to the Partner First Nations and in relation to the mercury issue. The suite of communication products was reviewed, with focus on changes to the placemat insert handed out. Comments received from provincial and federal agencies on the communication products were reviewed, focusing on where the Partnership had a concern.</p>

Meeting Five

Date:	January 22, 2015
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Manitoba Hydro</p> <p>EA Study Team</p> <p>Mr. Ross Wilson</p> <p>Representatives from Manitoba Health, Health Canada and Manitoba Conservation and Water Stewardship</p>
Handouts:	<p>Draft Agenda</p> <p>Keeyask MHH Planning Committee November 20, 2014 Meeting Record</p> <p>Keeyask MHH Planning Committee Complete Action Items re: placemat</p> <p>Draft placemats with fish consumption guidance for Split, Gull and Stephens lakes</p> <p>Keeyask MHH Planning Committee Background Research on Hair Monitoring – Draft @ January 9, 2015</p> <p>Keeyask MHH Planning Committee Comparison of Community Dietary Survey and Country (Wild) Food Survey – Draft @ August 19, 2014</p> <p>PowerPoint Presentation: Food Survey – January 22, 2015</p> <p>PowerPoint Presentation: Baseline Survey, by the Mercury and Fish Technical Advisory Committee, November 20, 2014</p> <p>Keeyask MHH Planning Committee Work Plan and Schedule – Revised Draft @ 2014 01 20</p>
Summary:	<p>The group reviewed the regulatory requirement for submitting the Risk Management Plan (RMP) by June 2015, the cultural importance of the use of wild food and the importance of promoting an understanding of mercury effects. The group reviewed the revised draft placemat, noting that a decision had been made by the Partners to show monthly intake guidelines. Manitoba Health presented an informal review of potential goals for the RMP, noting that Project goals need to be explicit in the RMP. Both the concept of undertaking hair monitoring and a baseline food survey, requesting feedback from the Partner First Nation on both possible initiatives.</p>

Meeting Six

Date:	March 17, 2015
In attendance:	<p>Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) Representatives</p> <p>York Factory First Nation Representatives</p> <p>Fox Lake Cree Nation Representatives</p> <p>Manitoba Hydro</p> <p>EA Study Team</p> <p>Mr. Ross Wilson</p>
Handouts:	<p>Draft Agenda</p> <p>Keeyask MHH Planning Committee Meeting Record of January 22, 2015</p> <p>PowerPoint Presentations:</p> <ul style="list-style-type: none"> • MHH Risk Management Plan: The Big Picture • Mercury Hair Monitoring • Baseline Food Survey • Target Audiences <p>Implementation Schedule for the Keeyask MHH Risk Management Plan – Draft @ March 17, 2015</p> <p>Draft Communication Products:</p> <ul style="list-style-type: none"> • Placemats with fish consumption guidance for Split, Gull and Stephens lakes • Poster with fish consumption guidance for Split, Gull and Stephens lakes • Map for Current Conditions for Split, Gull and Stephens lakes • Fish tape “Guide to Fish Size for Healthy Eating” (current conditions) • Chart “Maximum Safe Monthly Fish Consumption – Gull Lake” • Questions and Answers about Mercury and Human Health

Summary:	<p>The group reviewed the regulatory requirement for submitting the Risk Management Plan (RMP) by June 2015, including a suite of communication products. The importance of a balanced message related to mercury and human health was reemphasized. It was agreed that a draft of the RMP would be distributed to the Partner First Nations by April 30th for their review.</p> <p>The group discussed the planning of an initial discussion with representatives from the Northern Regional Health Authority in April 2015. The group discussed draft goals for the RMP, hair monitoring and a baseline survey, discussed a draft schedule of the overall process of addressing the issue of mercury risk in wild food and reviewed the revised communication products. Implementation of the RMP was highlighted, with details on an implementation plan targeted for discussion at a subsequent meeting.</p>
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Meeting Seven – Exploratory Session with the Northern Regional Health Authority, Thompson/Gillam

Date:	April 16, 2015
In attendance:	Manitoba Hydro InterGroup Consultants Representatives from the Northern Regional Health Authority (MB Health)
Handouts:	Draft Agenda PowerPoint Presentation: Background re: Mercury and Health – April 16, 2015
Summary:	Note to Draft – will complete once meeting notes are finalized.

Meeting Eight

Date:	TBD – June 2015
In attendance:	
Handouts:	
Summary:	

APPENDIX B:
HUMAN HEALTH RISK ASSESSMENT:
TECHNICAL DETAILS

1.0 HUMAN HEALTH RISK ASSESSMENT METHODOLOGY SUMMARY

Human health risk assessment (HHRA) is a process that is accepted by Canadian and international health agencies for evaluating the potential for chemical, biological and physical agents to cause adverse health effects in people. Although it is desirable to minimize exposures to some environmental chemicals, exposures to chemicals and physical agents cannot be avoided in many circumstances. Potentially harmful chemicals and physical agents can exist naturally, and there were exposures prior to modern civilization. This is also true for mercury. Examples of regulatory agencies that currently use risk assessment to assist in making health-based decisions include the World Health Organization, US Environmental Protection Agency and Health Canada.

It is stressed that there are uncertainties in risk assessment and it is virtually impossible to prove complete safety in almost anything that is evaluated. Consequently, risk assessment normally comments on the reasonable likelihood of adverse health effects in people exposed to various environmental chemicals or physical agents rather than providing absolute certainties of no adverse health effects.

It should also be noted that most health agencies and scientists contend that risk assessment is much more likely to overestimate than underestimate risks. Due to the various uncertainties in risk assessment, health agencies tend to use large safety factors and default assumptions that result in overestimation of health risks. For a detailed description of the methodology used in the Keeyask Project HHRA, please refer to Appendix 5C of SE SV (original version filed in July 2012; revised version filed in April 2013).

2.0 CONSUMPTION RATES

During the course of the Environmental Assessment, the Partner First Nations chose not to undertake a full-scale consumption survey. An alternative approach was used to obtain relevant information for the HHRA. Each of the Partner First Nations identified Members who participated in a workshop to provide information about the types of wild foods used by people in their communities in the local area (Split Lake, Gull Lake and Stephens Lake). They were asked which wild foods were eaten, how often, and in which season(s). Realistic estimates of wild foods eaten were required and the Partner First Nations community Members assisted in providing this information as well as ensuring that all major food groups of wild food were represented. The Partner First Nations community Members were also asked to advise if anything was missed.

The most common food types and rate of consumption are provided in Table B1 below; these food types and rates of consumption were then integrated into the HHRA.

Table B1: Assumed Consumption Rates of Various Country (Wild) Foods Consumed by Local First Nations Communities

Table B1: Assumed Consumption Rates of Various Country (Wild) Foods Consumed by Local First Nations Communities

Food Type	Serving Size for Young Child	Serving Size for Adult	Frequency of Consumption
Fish			
Whitefish	100 g (or 3.5 ounces)*	400 g (or 14 ounces)	Three times per week
Jackfish (northern pike)	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Pickarel (walleye)	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Sturgeon	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Wild Game			
Beaver	57 g (or 2 ounces)	200 g (or 7 ounces)	Three times per week
Muskrat	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week
Moose	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Five times per week
Snowshoe hare	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week
Waterfowl			
Duck	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week

Source: Workshop with Partner First Nation representatives, October 2009.

*One ounce = 28.4 grams.

It is recognized that the fish serving sizes provided in Table represent quite large serving sizes compared to those typically assumed for the general public in Canada's Food Guide; however, these serving sizes were determined through consultations with local Partner First Nations representatives at the October 2009 workshop. It is possible that many persons would consume smaller portion sizes or may eat foods at a lower frequency. For such persons, the Risk Management Plan has provided risk estimates as Recommended Maximum Weekly Intakes in units of grams per week (i.e., independent of serving size).

3.0 RECOMMENDED MAXIMUM WEEKLY INTAKE CONSUMPTION RECOMMENDATIONS

The following series of tables provide Recommended Maximum Weekly Intake (RMWI) consumption recommendations for fish, wild game and waterfowl under present and post-impoundment conditions that are **independent of serving size**. For example, a RMWI of 1,200 g/wk for women of childbearing age eating lake whitefish of less than 300 mm from Gull Lake means that a woman could have about 3 meals per week if the serving size is 400gm (14 ounces) or 6 meals per week if the serving size is 200 gm (7 ounces).

Table B-2A and B provides the RMWI that would result in a Hazard Quotient value of 1 for the fish species considered in the HHRA under current conditions.

Table B-2A: Recommended Maximum Weekly Intake Based on Fish Size Class for a Hazard Quotient of 1: Present Condition¹

Species	Fish Size Class								
	Lake Whitefish			Jackfish (Northern Pike)			Pickerel (Walleye)		
	<300 mm	300-450 mm	>450 mm	<400 mm	400-800 mm	>800 mm	<400 mm	400-550 mm	>550 mm
Gull Lake									
Mean concentration of mercury in tissue (µg/g; wet weight)	0.042	0.071	0.149	0.129	0.270	0.789	0.117	0.394	0.688
RMWI ² for Toddlers (g/week)	550	330	160	180	86	29	200	59	34
RMWI for Women of Child Bearing Age (g/week)	2,000	1,200	570	650	310	110	720	210	120
Consumption Recommendation for All Others (g/week)	5,600	3,300	1,600	1,800	870	300	2,000	600	340
Stephens Lake									
Mean concentration of mercury in tissue (µg/g; wet weight)	0.068	0.088	0.156	0.108	0.306	0.917	0.173	0.409	0.719
RMWI for Toddlers (g/week)	340	260	150	220	76	25	130	57	32
RMWI for Women of Child Bearing Age (g/week)	1,200	960	540	780	280	92	490	210	120
RMWI for All Others (g/week)	3,400	2,700	1,500	2,200	770	260	1,400	570	330

Source: North South Consultants, 2015. Memo Rationale for Update of Mercury Concentrations for Keeyask HHRA, Attachment 1

Note:

1. Mercury concentrations were revised in October 2014 based on monitoring data up to 2012. Data for Gull Lake are unchanged because the most recent data for this lake are for 2014 and have not yet been incorporated into any revisions.
2. RMWI = Recommended Maximum Weekly Intake (g/week; wet weight)

Table B-2C: Recommendations for Maximum Weekly Consumption for Gull Lake Sturgeon for a Hazard Quotient Value = 1 – Present Conditions¹

Fish Species	Assumed Concentration (µg/g, wet weight)	Recommended Maximum Weekly Intake (g/week) for a HQ = 1 (For Fish of 1095 mm mean Fork Length)		
		Toddlers	Women of Childbearing Age	All others
Lake Sturgeon	0.196	120	430	1,200

Source: North South Consultants, 2015. Memo Rationale for Update of Mercury Concentrations for Keeyask HHRA, Attachment 1

Notes:

1. Mercury concentrations revised in October 2014 based on monitoring data up to 2013.

Table B-3 provides the post-impoundment RMWI that would result in a Hazard Quotient value of 1.

Table B-3: Recommend Maximum Weekly Intake of Fish for a Hazard Quotient Value = 1: Post-Impoundment Conditions

Fish Species	Assumed Concentration (µg/g, wet weight)*	Recommended Maximum Weekly Intake (g/week) for a HQ =1 (All for Fish of Standard Length)		
		Toddlers	Women of Childbearing Age	All others
Gull Lake				
Lake Whitefish	0.19	120	440	1,200
Northern Pike	1.0	23	84	230
Walleye	1.0	23	84	230
Lake Sturgeon**	0.30	77	280	780
Stephens Lake				
Lake Whitefish	0.15	160	560	1,600
Northern Pike	0.50	46	170	470
Walleye	0.50	46	170	470
Lake Sturgeon**	0.25	93	340	940

Source: Wilson Scientific 2012.

Notes:

* Standard lengths: lake whitefish 350 mm; northern pike 550 mm; walleye 400 mm.

Individual mercury concentrations would be dependent upon the size of the fish with the smaller fish having generally lower concentrations than bigger fish.

** Calculations use arithmetic mean concentration instead of length standardized concentrations.

The important aspect of this RMWI information is that it provides consumption recommendations that are independent of serving size. For example, a RMWI of 440 g/week for women of childbearing age consuming lake whitefish from Gull Lake means that a woman could have about 1 meal per week if serving size is 400 g (14 ounces) or two meals per week if the serving size is 200 g (seven ounces) or three meals per week if the serving size is 150 g (5.3 ounces). All three scenarios would still result in a woman consuming about 400 to 450 g of lake whitefish which would equate to an exposure approximately equal to a Hazard Quotient value of 1 (assuming consumption of lake whitefish of standard length). Thus, if a person does not consume 400 g of fish in a single serving, they can use these RMWIs to estimate the amount of fish that can be consumed.

Table B-4 provides the RMWI that would result in a Hazard Quotient value of 1 for the various wild game species considered in the HHRA (Wilson Scientific 2012).

Table B-4: Recommended Maximum Weekly Intake of Wild Game: Present Conditions

Wild Game Species	Assumed Concentration ($\mu\text{g/g}$, wet weight)*	Recommended Maximum Weekly Intake (g/week)		
		Toddlers	Women of Childbearing Age	All Others
Beaver	0.01	6,600	24,000	28,000
Muskrat	0.02	3,300	12,000	14,000
Moose*	0.07	940	3,400	4,100
Snowshoe hare*	0.05	1,300	4,800	5,700

*Mercury concentration in moose and snowshoe hare were literature estimates and may have greater uncertainty than other species for which measured values were obtained from the study area.

Table B-5 provides the post-impoundment RMWI that would result in a Hazard Quotient value of 1. The RMWI values provided in Table B-5 all appear to be greater than the typical amounts of wild (country) foods that the Partner First Nations communities have reported to consume. Consequently, it is unlikely that unacceptable risks from consumption of wild game would exist under post-impoundment conditions due to mercury.

Table B-5: Recommend Maximum Weekly Intake of Wild Game: Post-Impoundment Conditions

Wild Game Species	Assumed Concentration ($\mu\text{g/g}$, wet weight)*	Recommended Maximum Weekly Intake (g/week)		
		Toddlers	Women of Childbearing Age	All Others
Beaver	0.01	6,600	24,000	28,000
Muskrat	0.04	1,600	6,000	7,100
Moose*	0.07	940	3,400	4,100
Snowshoe hare*	0.05	1,300	4,800	5,700

*Mercury concentration in moose and snowshoe hare were literature estimates and may have greater uncertainty than other species for which measured values were obtained from the study area.

Table B-6 provides the RMWI that would result in a Hazard Quotient value of 1 under present conditions. Since geese are expected to have even lower concentrations than ducks, no unacceptable risk would be predicted from goose consumption at these RMWI values for ducks.

Table B-6: Recommended Maximum Weekly Intake of Waterfowl: Present Conditions

Waterfowl	Assumed Concentration (µg/g, wet weight)*	Recommended Maximum Weekly Intake (g/week)		
		Toddlers	Women of Childbearing Age	All Others
Gull Lake				
Duck	0.07	330	1,200	3,400
Stephens Lake				
Duck	0.09	260	940	2,600

**Mercury concentration in duck was assumed to be similar to that predicted for lake whitefish.

Table B-7 provides the post-impoundment RMWI that would result in a Hazard Quotient value of 1. The post-impoundment RMWI appear to be greater than the typical amounts of duck that the Partner First Nations communities have reported to consume. Consequently, it is unlikely that unacceptable risks from consumption of waterfowl would exist under post-impoundment conditions due to mercury.

Table B-7: Recommended Maximum Weekly Intake of Waterfowl: Post-Impoundment Conditions

Waterfowl	Assumed Concentration (µg/g, wet weight)*	Recommended Maximum Weekly Intake (g/week) for Fish of Standard Length		
		Toddlers	Women of Childbearing Age	All Others
Gull Lake				
Duck	0.19	120	440	1,200
Stephens Lake				
Duck	0.15	160	560	1,600

*Mercury concentration in duck was assumed to be similar to that estimated for lake whitefish.

References:

North South Consultants 2015. Memo summarizing the rationale for the update of fish mercury concentrations in the Keeyask Study Area.

Wilson Scientific 2012. (Revised 2013). Human Health Impact Assessment of the Mercury from the Proposed Keeyask Generation Project. Prepared by Wilson Scientific, Vancouver, BC for InterGroup Consultants Ltd.

ATTACHMENT 1:

**North South Consultants, 2015. Memo
Rationale for Update of Mercury
Concentrations for Keeyask HHRA**

Memo summarizing the rationale for the update of fish mercury concentrations in the Keeyask Study Area

W. Jansen, 22 April, 2015

The Human Health Risk Assessment (HHRA) of mercury (Wilson 2012, 2013) provided as part of the Keeyask Environmental Impact Statement (EIS) was mainly based on fish mercury data collected up to 2009 (KHLF 2012). As stated in the EIS, updates of fish mercury data collected under the Keeyask Aquatic Effects Monitoring Program (AEMP) will be provided to the Partnership and regulators in a timely fashion. The input of recently collected fish mercury data into Keeyask HHRA and Hg related communication products to make assessments more current was also requested during recent discussions by Manitoba Hydro with provincial and federal health authorities. An update of fish mercury concentrations in the context of the HHRA was completed in October 2014 (see Table 1 below).

Because the risk assessment of fish mercury concentrations for human consumption is specific to certain fish length categories and requires a relatively large number of samples for each species considered to provide statistically viable results, multiple years of data are pooled to calculate mean concentrations. Results are made more current by including data from the most recent sampling year(s) while dropping the results for the oldest data year(s), thus calculating a running average concentration for each size class and species.

Following this principle, the current update included new data for Stephens Lake collected in 2012, while excluding data for years 2001 and 2002. For Lake Whitefish, Northern Pike, and Walleye from Gull Lake new mercury data were not yet available at the time of the update (fish were sampled for mercury in September 2014). However, two additional samples for Lake Sturgeon collected in 2010 and 2013 were included to calculate the average mercury concentration for this species. The total sample size for Lake Sturgeon from Gull Lake is relatively small and does not allow calculations of length class-specific mean concentrations.

The current update has highlighted an issue that may require a slight adjustment in the length classes of Northern Pike. During the environmental studies for the EIS large (>800 mm) pike were frequently sampled. The current sampling (mainly conducted under CAMP) emphasizes a balanced size range distribution of fish. This results in the sampling of only few pike larger than 800 mm. This issue will become more pronounced in the future as the older samples will be sequentially dropped from the calculations and the largest size class (>800 mm) of pike will see further declining sample sizes. Also, the intermediate size class (400-800 mm) has by far the largest sample size, and the smallest size class (<400 mm) is mostly irrelevant for consumers, as no fisher is likely to retain pike of <400 mm length. These two issues could be solved by a small rearrangement of the pike size classes: Class 1: <500 mm; Class 2: 500-750 mm; Class 3: >750 mm.

Table 1: Updated Mean Mercury Concentrations in Fish Tissue – Existing Conditions; based on data for years 2001-2006 (Gull Lake), 2003-2012 (Stephens Lake), and 2002-2013 (Gull Lake sturgeon).

Species	Fish Size Class								
	Lake Whitefish			Jackfish (Northern Pike)			PickereI (Walleye)		
	<300 mm	300-450 mm	>450 mm	<400 mm	400- 800 mm	>800 mm	<400 mm	400- 550 mm	>550 mm
Gull Lake									
Mean concentration of mercury in tissue (µg/g; wet weight)	0.042	0.071	0.149	0.129	0.270	0.789	0.117	0.394	0.688
Stephens Lake									
Mean concentration of mercury in tissue (µg/g; wet weight)	0.068	0.088	0.156	0.108	0.306	0.917	0.173	0.409	0.719
Gull Lake – Lake Sturgeon									
For a mean Fork Length of 1095mm									
Mean concentration of mercury in tissue (µg/g; wet weight)	0.196								

References

Keeyask Hydropower Limited Partnership (KHLP) 2012. Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Support Volume, Winnipeg, Manitoba. June 2012. 1, 745 pp.

Wilson Scientific 2012. (Revised 2013). Human Health Impact Assessment of the Mercury from the Proposed Keeyask Generation Project. Prepared by Wilson Scientific, Vancouver, BC for InterGroup Consultants Ltd.

APPENDIX C
PRE-IMPOUNDMENT
COMMUNICATION PRODUCTS

Fish

Good For You
and Good to Eat!

Split Lake

Safe Monthly Intake Under Current Conditions

Lake Whitefish
Less than 12"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)

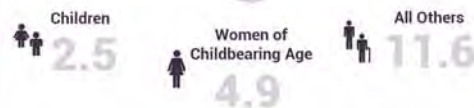


Jackfish
Less than 20"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)

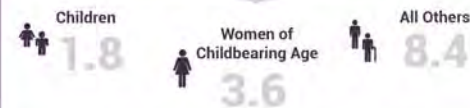


Pickereel
Less than 16"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)

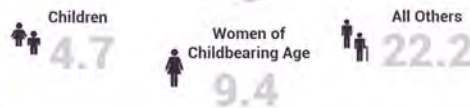


Lake Whitefish
12-18"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)

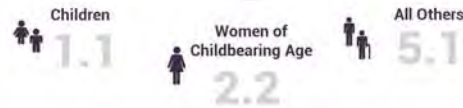


Jackfish
20-30"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Pickereel
16-22"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)

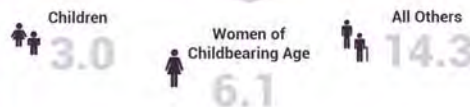


Lake Whitefish
Larger than 18"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)

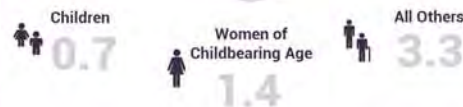


Jackfish
Larger than 30"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)

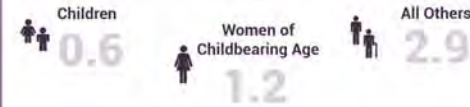


Pickereel
Larger than 22"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Information provided in
2015

Based on guidelines from
Manitoba Health and
Health Canada.

Placemat developed with
involvement of Manitoba
Health and Health Canada.

Contact your local
community health
representative for more
information.



www.keeyask.com/mercuryandhealth

See back side for how you can combine eating different types of fish species



Fish

Good For You and Good to Eat!

How to Use the Placemat to Choose the Best Fish for Eating

- All fish (in the world) contain some mercury; fish that eat other fish have the most, especially older/larger fish
- Fish are very nutritious and provide many health benefits – everyone should eat fish.
- Some mercury is OK to have in our bodies – too much is not good for your health. Children and women of child-bearing age can handle less mercury than men and seniors.
- **The goal is to choose the best fish for you.**
- This guide shows the commonly eaten fish species in Split Lake and the safe monthly amount of each size and type of fish that can be eaten without starting to cause a health concern.
 - It is stressed that the term "safe monthly intake" is the maximum recommended amount of fish to ensure mercury intake remains acceptable. **It does not mean that you need to eat that much fish to be healthy.**
- These guidelines do not mean you have to eat all the fish indicated as "safe monthly intake".
- If there is a fish feast planned – save up your fish quota for the feast by eating less fish in the weeks before and after the feast so that your monthly total will be the same.
- Under the Keeyask Project, there are placemats prepared for Split, Gull and Stephens lakes. If you are eating fish from other lakes, or other fish types, contact your local health care provider to see if further information is available.
- Individuals should check with their local health care provider to ensure they are using the most current version of the placemat.

There are many good reasons to eat fish:

- Fish is a traditional food that provides our people with important nutrients for growing bodies and overall good health.
- Our ancestors ate fish and fish soups as part of a healthy diet all year round.
- Protein from fish gives our bodies energy and strength.
 - Vitamins in fish help keep our bodies healthy;
 - Calcium and Vitamin D are good for our bones
 - Iron and B Vitamins are good for our muscles, heart and brain
 - Unsaturated fat (good fat) helps prevent heart disease
 - Vitamin A is good for our eyes, healthy skin and to fight infection
- Eating fish when pregnant is good for the developing baby.

Today, we can still eat fish

Today fish from local lakes are a good source of food. Testing of fish for mercury for Split Lake 2001-2013 show that whitefish and smaller pickerel and jackfish are low in mercury and are good for us to eat. Testing also shows that large pickerel and jackfish have more mercury. When eaten regularly and in large amounts, these fish are less healthy to eat. This placemat shows the best choices to make. It updates information that you may have seen on a previous version of this placemat.

Mercury in fish

- Fish can accumulate mercury in their muscle from the food they eat (e.g., bugs and other fish).
- Mercury can also accumulate in people from the food they eat – especially large predatory fish like jackfish and pickerel which have higher mercury levels than whitefish and sturgeon. Suckers have similar mercury levels as whitefish.
- Generally, larger, older fish have more mercury than smaller, younger fish.
- It is important to include fish in your diet – the key is to choose fish that have less mercury.

What is mercury and where does it come from?

- Mercury occurs naturally in low amounts in the air, water and soil, as well as plants, fish, animals and people. You can't see mercury with your eyes.
- Flooding of plants and soils in hydro reservoirs causes mercury levels in fish to increase.
- Fish mercury levels in reservoirs can stay high for about 20-30 years – after that time they usually return to previous levels.

What are the risks from eating fish with high levels of mercury?

- Women of child-bearing age and children (6 months to 12 years) need to be careful when eating fish.
 - Mercury in fish can be transferred through the blood into the growing baby of a pregnant woman and cause developmental problems.
 - High levels of mercury can affect thinking, speaking skills, memory and coordination.
- Women of child-bearing age and children (6 months to 12 years) should try and eat the fish with the lowest mercury levels - the best choice fish.
- The rest of the population should follow the guide shown on the reverse of this page, eating the best choice fish the most.
- Please check the Northern Food Guide for recommended amounts of different types of foods based on nutritional needs:
<http://www.hc-sc.gc.ca/fn-an/pubs/fnim-pnim/index-eng.php>

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Fish

Good For You
and Good to Eat!

Gull Lake

Safe Monthly Intake Under Current Conditions

Lake Whitefish Less than 12"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish Less than 20"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Pickeral Less than 16"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Lake Whitefish 12-18"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish 20-30"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Pickeral 16-22"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Lake Whitefish Larger than 18"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish Larger than 30"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Pickeral Larger than 22"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)



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www.keeyask.com/mercuryandhealth

See back side for how you can combine eating different types of fish species



Fish

Good For You and Good to Eat!

How to Use the Placemat to Choose the Best Fish for Eating

- All fish (in the world) contain some mercury; fish that eat other fish have the most, especially older/larger fish
- Fish are very nutritious and provide many health benefits – everyone should eat fish.
- Some mercury is OK to have in our bodies – too much is not good for your health. Children and women of child-bearing age can handle less mercury than men and seniors.
- **The goal is to choose the best fish for you.**
- This guide shows the commonly eaten fish species in Gull Lake and the safe monthly amount of each size and type of fish that can be eaten without starting to cause a health concern.
 - ▶ It is stressed that the term "safe monthly intake" is the maximum recommended amount of fish to ensure mercury intake remains acceptable. **It does not mean that you need to eat that much fish to be healthy.**
- These guidelines do not mean you have to eat all the fish indicated as "safe monthly intake".
- If there is a fish feast planned – save up your fish quota for the feast by eating less fish in the weeks before and after the feast so that your monthly total will be the same.
- Under the Keeyask Project, there are placemats prepared for Split, Gull and Stephens lakes. If you are eating fish from other lakes, or other fish types, contact your local health care provider to see if further information is available. Lake sturgeon are a very good choice fish. For any lake sturgeon up to 43", safe monthly intake for children is 1 lb/month, for women of childbearing age is 4 lbs/month, and for all others is 11 lbs/month.
- Individuals should check with their local health care provider to ensure they are using the most current version of the placemat.
- **This placemat should only be used PRIOR to the reservoir being flooded.**

There are many good reasons to eat fish:

- Fish is a traditional food that provides our people with important nutrients for growing bodies and overall good health.
- Our ancestors ate fish and fish soups as part of a healthy diet all year round.
- Protein from fish gives our bodies energy and strength.
 - ▶ Vitamins in fish help keep our bodies healthy:
 - ▶ Calcium and Vitamin D are good for our bones
 - ▶ Iron and B Vitamins are good for our muscles, heart and brain
 - ▶ Unsaturated fat (good fat) helps prevent heart disease
 - ▶ Vitamin A is good for our eyes, healthy skin and to fight infection
- Eating fish when pregnant is good for the developing baby.

Today, we can still eat fish

Today fish from local lakes are a good source of food. Testing of fish for mercury for Gull Lake 2001-2006 show that whitefish and smaller pickerel and jackfish are low in mercury and are good for us to eat. Testing also shows that large pickerel and jackfish have more mercury. When eaten regularly and in large amounts, these fish are less healthy to eat. This placemat shows the best choices to make. It updates information that you may have seen on a previous version of this placemat.

Mercury in fish

- Fish can accumulate mercury in their muscle from the food they eat (e.g., bugs and other fish).
- Mercury can also accumulate in people from the food they eat – especially large predatory fish like jackfish and pickerel which have higher mercury levels than whitefish and sturgeon. Suckers have similar mercury levels as whitefish.
- Generally, larger, older fish have more mercury than smaller, younger fish.
- It is important to include fish in your diet – the key is to choose fish that have less mercury.

What is mercury and where does it come from?

- Mercury occurs naturally in low amounts in the air, water and soil, as well as plants, fish, animals and people. You can't see mercury with your eyes.
- Flooding of plants and soils in hydro reservoirs causes mercury levels in fish to increase.
- Fish mercury levels in reservoirs can stay high for about 20-30 years – after that time they usually return to previous levels.

What are the risks from eating fish with high levels of mercury?

- Women of child-bearing age and children (6 months to 12 years) need to be careful when eating fish.
 - ▶ Mercury in fish can be transferred through the blood into the growing baby of a pregnant woman and cause developmental problems.
 - ▶ High levels of mercury can affect thinking, speaking skills, memory and coordination.
- Women of child-bearing age and children (6 months to 12 years) should try and eat the fish with the lowest mercury levels - the best choice fish.
- The rest of the population should follow the guide shown on the reverse of this page, eating the best choice fish the most.
- Please check the Northern Food Guide for recommended amounts of different types of foods based on nutritional needs:
<http://www.hc-sc.gc.ca/fn-an/pubs/fnim-pnim/index-eng.php>

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Fish

Good For You
and Good to Eat!

Stephens Lake

Safe Monthly Intake Under Current Conditions

Lake Whitefish Less than 12"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish Less than 20"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Pickrel Less than 16"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Lake Whitefish 12-18"



**BEST
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish 20-30"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Pickrel 16-22"



**OCCASIONAL
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Lake Whitefish Larger than 18"



**VERY
GOOD
CHOICE**

Safe Monthly Intake (pounds per month)



Jackfish Larger than 30"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)



Pickrel Larger than 22"



**RESTRICTED
CONSUMPTION**

Safe Monthly Intake (pounds per month)



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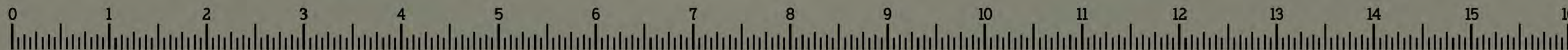
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See back side for how you can combine eating different types of fish species



Fish

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- Individuals should check with their local health care provider to ensure they are using the most current version of the placemat.

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 - Iron and B Vitamins are good for our muscles, heart and brain
 - Unsaturated fat (good fat) helps prevent heart disease
 - Vitamin A is good for our eyes, healthy skin and to fight infection
- Eating fish when pregnant is good for the developing baby.

Today, we can still eat fish

Today fish from local lakes are a good source of food. Testing of fish for mercury for Stephens Lake 2003-2012 show that whitefish and smaller pickerel and jackfish are low in mercury and are good for us to eat. Testing also shows that large pickerel and jackfish have more mercury. When eaten regularly and in large amounts, these fish are less healthy to eat. This placemat shows the best choices to make. It updates information that you may have seen on a previous version of this placemat.

Mercury in fish

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- Flooding of plants and soils in hydro reservoirs causes mercury levels in fish to increase.
- Fish mercury levels in reservoirs can stay high for about 20-30 years – after that time they usually return to previous levels.

What are the risks from eating fish with high levels of mercury?

- Women of child-bearing age and children (6 months to 12 years) need to be careful when eating fish.
 - Mercury in fish can be transferred through the blood into the growing baby of a pregnant woman and cause developmental problems.
 - High levels of mercury can affect thinking, speaking skills, memory and coordination.
- Women of child-bearing age and children (6 months to 12 years) should try and eat the fish with the lowest mercury levels - the best choice fish.
- The rest of the population should follow the guide shown on the reverse of this page, eating the best choice fish the most.
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Fish, Human Health and Mercury

GULL LAKE

Facts About Mercury

Mercury is a metal found naturally in rock, soil, water and living organisms and can be released into the environment by human activities such as the flooding of land when a reservoir is created.

Mercury reaches people most often through eating fish, especially through large predatory fish that eat other fish such as pickerel or jackfish.

Women of childbearing age and children need to be particularly careful when eating certain fish. Mercury in fish can be transferred through the blood into a growing baby and cause developmental problems. Toddlers whose mothers eat a great deal of fish with high mercury levels may have poorer memory, verbal skills or coordination.

People should eat smaller fish more often than larger fish because they have lower mercury levels. Some kind of fish (species) such as lake whitefish are especially good to eat because they have lower mercury levels than other species such as pickerel or jackfish.

Common Questions

- Q. Can I see silver specks of mercury in fish?
- Mercury is not something you can see with your eyes. Silver specks in fish flesh are not mercury.**
- Q. Is it dangerous to swim or bath if there is mercury in the water?
- No, the level of mercury in the water does not pose a risk to people swimming or bathing.**
- Q. Will I get sick from mercury if I drink the water?
- No, mercury concentrations do not pose a risk to people drinking the water.**
- Q. Does mercury stay in the body forever?
- Mercury leaves the body over time – it takes about 2-3 months to get rid of half the mercury in your body; and about a year to get rid of most of the rest.**

Safe Fish Consumption for Gull Lake

There are many good reasons to eat fish and it is important to include fish as part of a healthy diet.

Fish is a traditional food that provides people with numerous nutrients for development and health.

Our ancestors considered fish and fish soups a well balanced food to eat year round. Protein from fish gives energy and strength, while vitamins and minerals in fish help keep the body healthy. Fish also contain essential fatty acids that are not found in any other food.

Although higher mercury levels have been reported in some kinds of fish, many fish can still be eaten safely.

Predatory fish such as pickerel and jackfish contain higher concentrations of mercury than fish that mainly feed on bugs such as whitefish, sturgeon and suckers.

If you eat different kinds of fish over the month, keep track of the amounts of each type. For example, if you have eaten half of the same monthly amount of lake whitefish, you can have half of the safe monthly amount of either jackfish or pickerel for the rest of the month.

When you reach the limit for pickerel and jackfish as described in the map below, switch to whitefish or other healthy country food choices.

Smaller pickerel and jackfish are better for you. Lake whitefish up to 18 inches are the best choice fish for eating from Gull Lake.

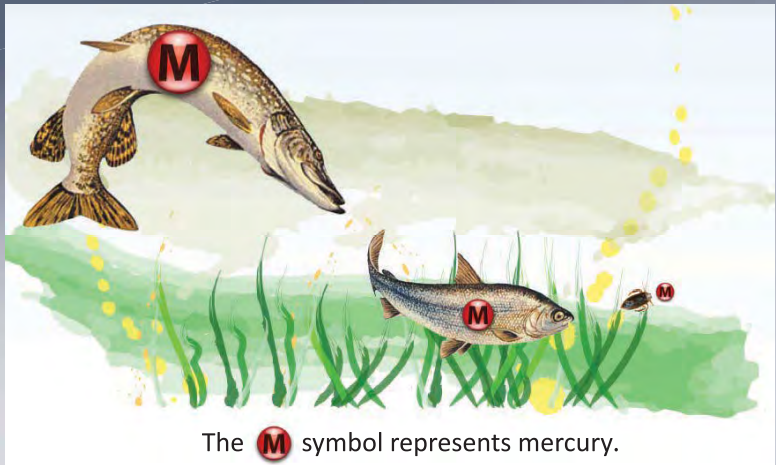
Mercury in the Food Chain

In the food chain, mercury is absorbed by bacteria, plankton and small and large bugs which are then eaten by fish.

Smaller fish are eaten by larger ones which are themselves eaten by some animals such as loons and otters, and by people.

From plankton to people, mercury concentrations increase from one level of the food chain to the next.

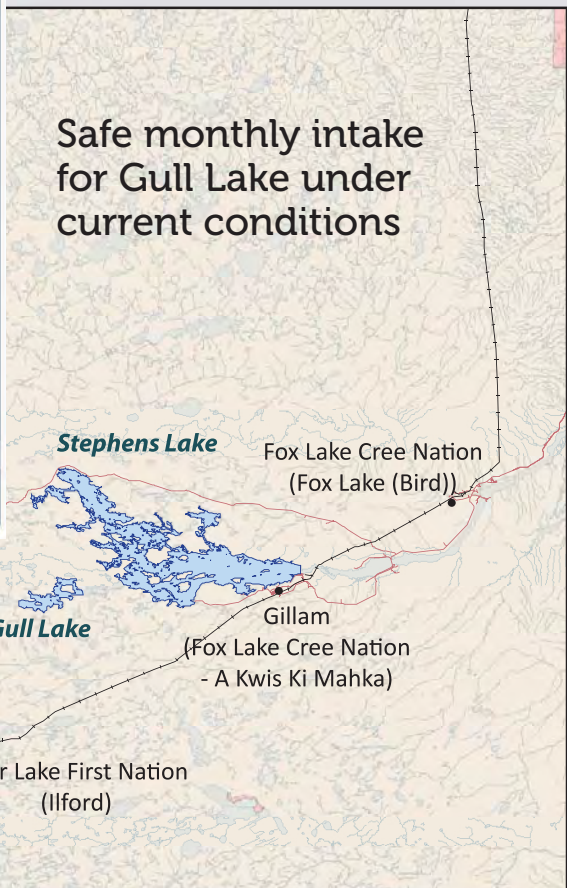
Mercury is not of concern when drinking water or eating mammals, ducks, geese and plants. The main way that people take in mercury is by eating fish with higher mercury levels.



Best or Very Good Choice for Eating



Assumed Serving Size



Fish, Human Health and Mercury

SPLIT LAKE

Facts About Mercury

Mercury is a metal found naturally in rock, soil, water and living organisms and can be released into the environment by human activities such as the flooding of land when a reservoir is created.

Mercury reaches people most often through eating fish, especially through large predatory fish that eat other fish such as pickerel or jackfish.

Women of childbearing age and children need to be particularly careful when eating certain fish. Mercury in fish can be transferred through the blood into a growing baby and cause developmental problems. Toddlers whose mothers eat a great deal of fish with high mercury levels may have poorer memory, verbal skills or coordination.

People should eat smaller fish more often than larger fish because they have lower mercury levels. Some kind of fish (species) such as lake whitefish are especially good to eat because they have lower mercury levels than other species such as pickerel or jackfish.

Common Questions

- Q. Can I see silver specks of mercury in fish?
- Mercury is not something you can see with your eyes. Silver specks in fish flesh are not mercury.**
- Q. Is it dangerous to swim or bath if there is mercury in the water?
- No, the level of mercury in the water does not pose a risk to people swimming or bathing.**
- Q. Will I get sick from mercury if I drink the water?
- No, mercury concentrations do not pose a risk to people drinking the water.**
- Q. Does mercury stay in the body forever?
- Mercury leaves the body over time – it takes about 2-3 months to get rid of half the mercury in your body; and about a year to get rid of most of the rest.**

Safe Fish Consumption for Split Lake

There are many good reasons to eat fish and it is important to include fish as part of a healthy diet.

Fish is a traditional food that provides people with numerous nutrients for development and health.

Our ancestors considered fish and fish soups a well balanced food to eat year round. Protein from fish gives energy and strength, while vitamins and minerals in fish help keep the body healthy. Fish also contain essential fatty acids that are not found in any other food.

Although higher mercury levels have been reported in some kinds of fish, many fish can still be eaten safely.

Predatory fish such as pickerel and jackfish contain higher concentrations of mercury than fish that mainly feed on bugs such as whitefish, sturgeon and suckers.

If you eat different kinds of fish over the month, keep track of the amounts of each type. For example, if you have eaten half of the same monthly amount of lake whitefish, you can have half of the safe monthly amount of either jackfish or pickerel for the rest of the month.

When you reach the limit for pickerel and jackfish as described in the map below, switch to whitefish or other healthy country food choices.

Smaller pickerel and jackfish are better for you. Lake whitefish up to 18 inches are the best choice fish for eating from Split Lake.

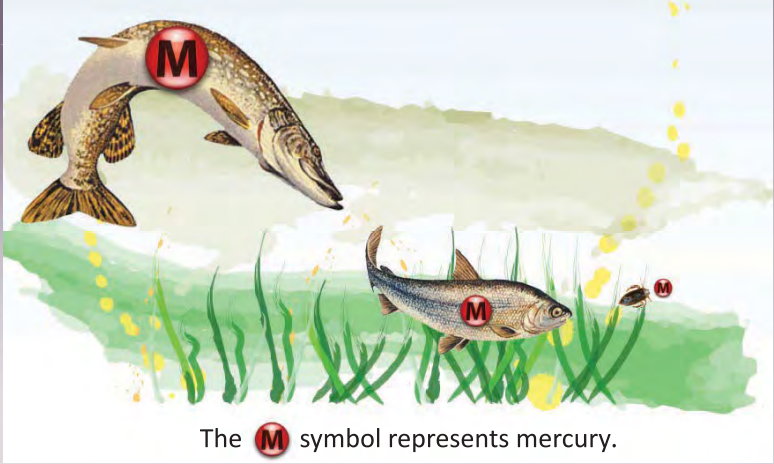
Mercury in the Food Chain

In the food chain, mercury is absorbed by bacteria, plankton and small and large bugs which are then eaten by fish.

Smaller fish are eaten by larger ones which are themselves eaten by some animals such as loons and otters, and by people.

From plankton to people, mercury concentrations increase from one level of the food chain to the next.

Mercury is not of concern when drinking water or eating mammals, ducks, geese and plants. The main way that people take in mercury is by eating fish with higher mercury levels.



Best or Very Good Choice for Eating

Jackfish (Pike)
Size: Under 20"

Walleye (Pickerel)
Size: Under 16"

Lake Whitefish
Size: up to 18"

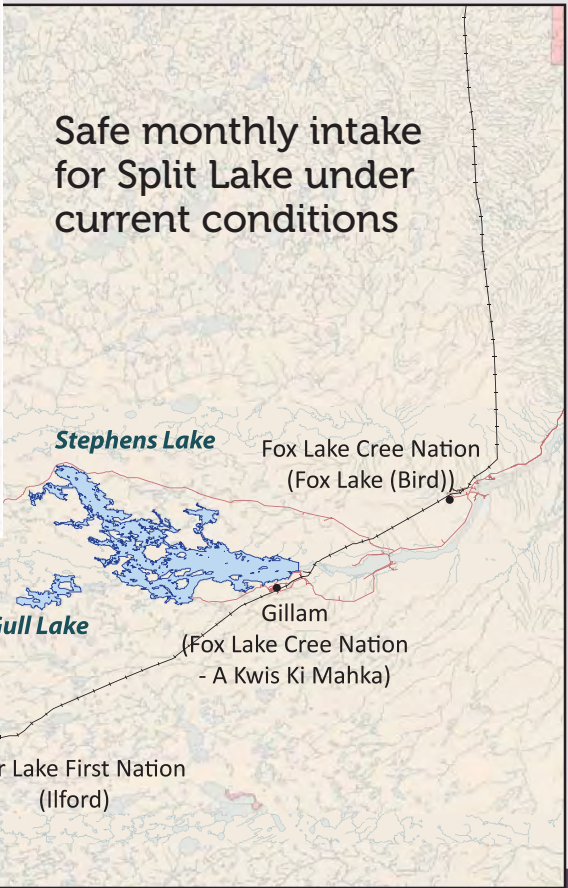
Assumed Serving Size

Toddler

3.5 oz (100 g)

Adult

14 oz (400 g)



Fish, Human Health and Mercury

STEPHENS LAKE

Facts About Mercury

Mercury is a metal found naturally in rock, soil, water and living organisms and can be released into the environment by human activities such as the flooding of land when a reservoir is created.

Mercury reaches people most often through eating fish, especially through large predatory fish that eat other fish such as pickerel or jackfish.

Women of childbearing age and children need to be particularly careful when eating certain fish. Mercury in fish can be transferred through the blood into a growing baby and cause developmental problems. Toddlers whose mothers eat a great deal of fish with high mercury levels may have poorer memory, verbal skills or coordination.

People should eat smaller fish more often than larger fish because they have lower mercury levels. Some kind of fish (species) such as lake whitefish are especially good to eat because they have lower mercury levels than other species such as pickerel or jackfish.

Common Questions

- Q. Can I see silver specks of mercury in fish?

Mercury is not something you can see with your eyes. Silver specks in fish flesh are not mercury.
- Q. Is it dangerous to swim or bath if there is mercury in the water?

No, the level of mercury in the water does not pose a risk to people swimming or bathing.
- Q. Will I get sick from mercury if I drink the water?

No, mercury concentrations do not pose a risk to people drinking the water.
- Q. Does mercury stay in the body forever?

Mercury leaves the body over time – it takes about 2-3 months to get rid of half the mercury in your body; and about a year to get rid of most of the rest.

Safe Fish Consumption for Stephens Lake

There are many good reasons to eat fish and it is important to include fish as part of a healthy diet.

Fish is a traditional food that provides people with numerous nutrients for development and health.

Our ancestors considered fish and fish soups a well balanced food to eat year round. Protein from fish gives energy and strength, while vitamins and minerals in fish help keep the body healthy. Fish also contain essential fatty acids that are not found in any other food.

Although higher mercury levels have been reported in some kinds of fish, many fish can still be eaten safely.

Predatory fish such as pickerel and jackfish contain higher concentrations of mercury than fish that mainly feed on bugs such as whitefish, sturgeon and suckers.

If you eat different kinds of fish over the month, keep track of the amounts of each type. For example, if you have eaten half of the same monthly amount of lake whitefish, you can have half of the safe monthly amount of either jackfish or pickerel for the rest of the month.

When you reach the limit for pickerel and jackfish as described in the map below, switch to whitefish or other healthy country food choices.

Smaller pickerel and jackfish are better for you. Lake whitefish up to 18 inches are the best choice fish for eating from Stephens Lake.

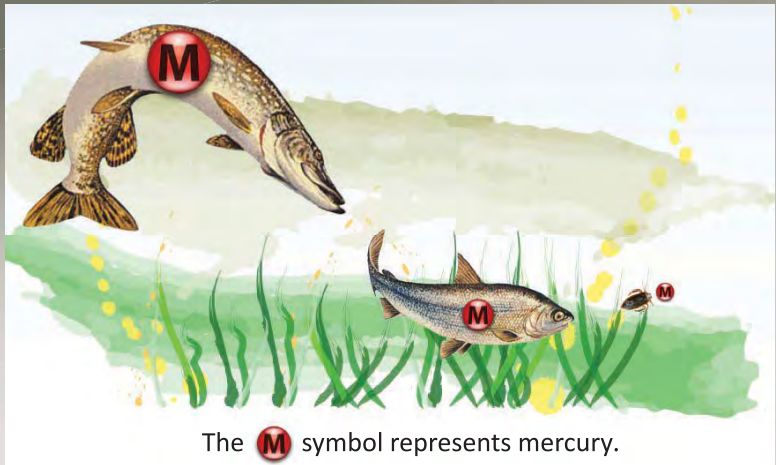
Mercury in the Food Chain

In the food chain, mercury is absorbed by bacteria, plankton and small and large bugs which are then eaten by fish.

Smaller fish are eaten by larger ones which are themselves eaten by some animals such as loons and otters, and by people.

From plankton to people, mercury concentrations increase from one level of the food chain to the next.

Mercury is not of concern when drinking water or eating mammals, ducks, geese and plants. The main way that people take in mercury is by eating fish with higher mercury levels.



Best or Very Good Choice for Eating

Jackfish (Pike)
Size: Under 20"

Walleye (Pickerel)
Size: Under 16"

Lake Whitefish
Size: up to 18"

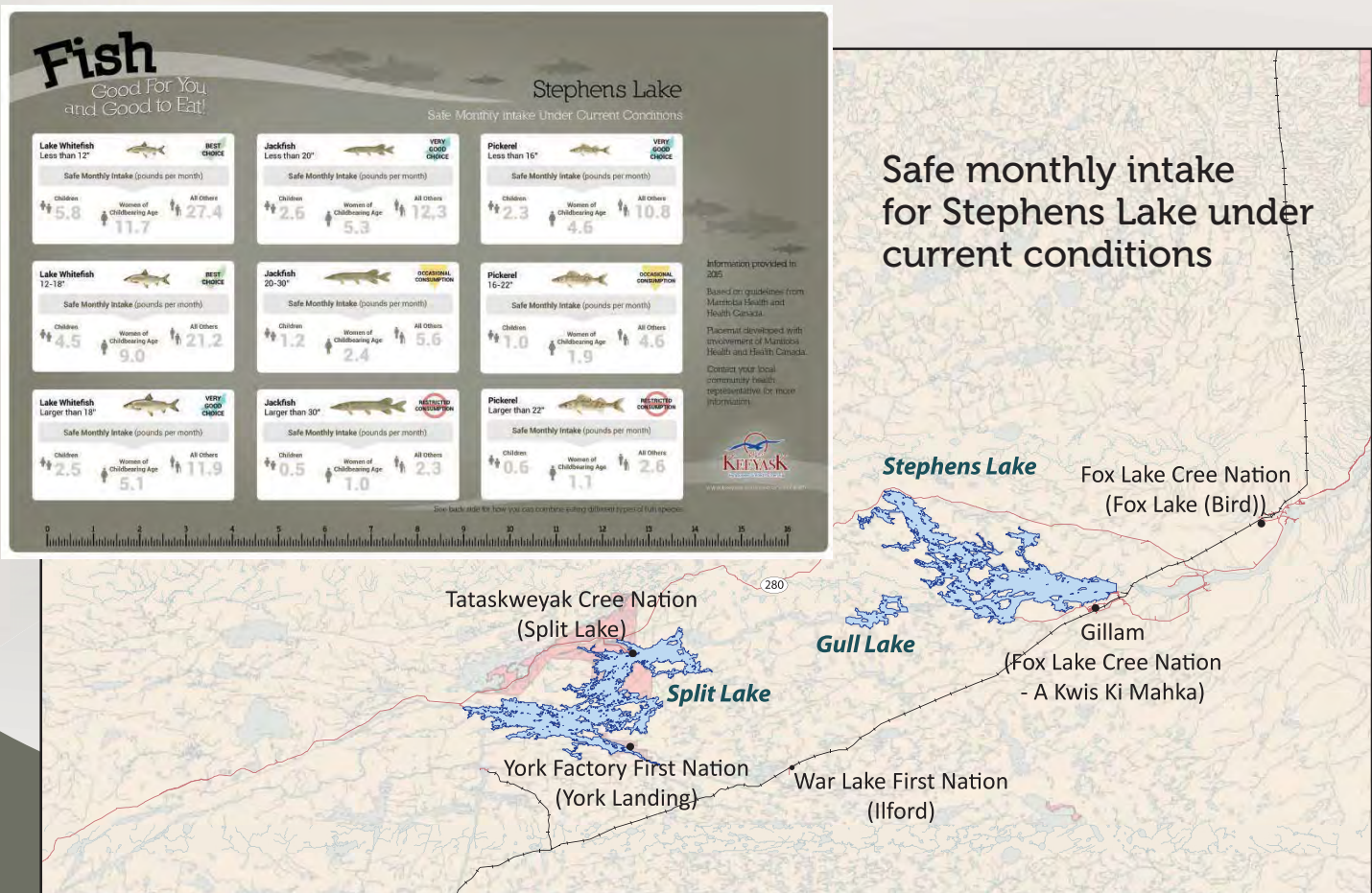
Assumed Serving Size

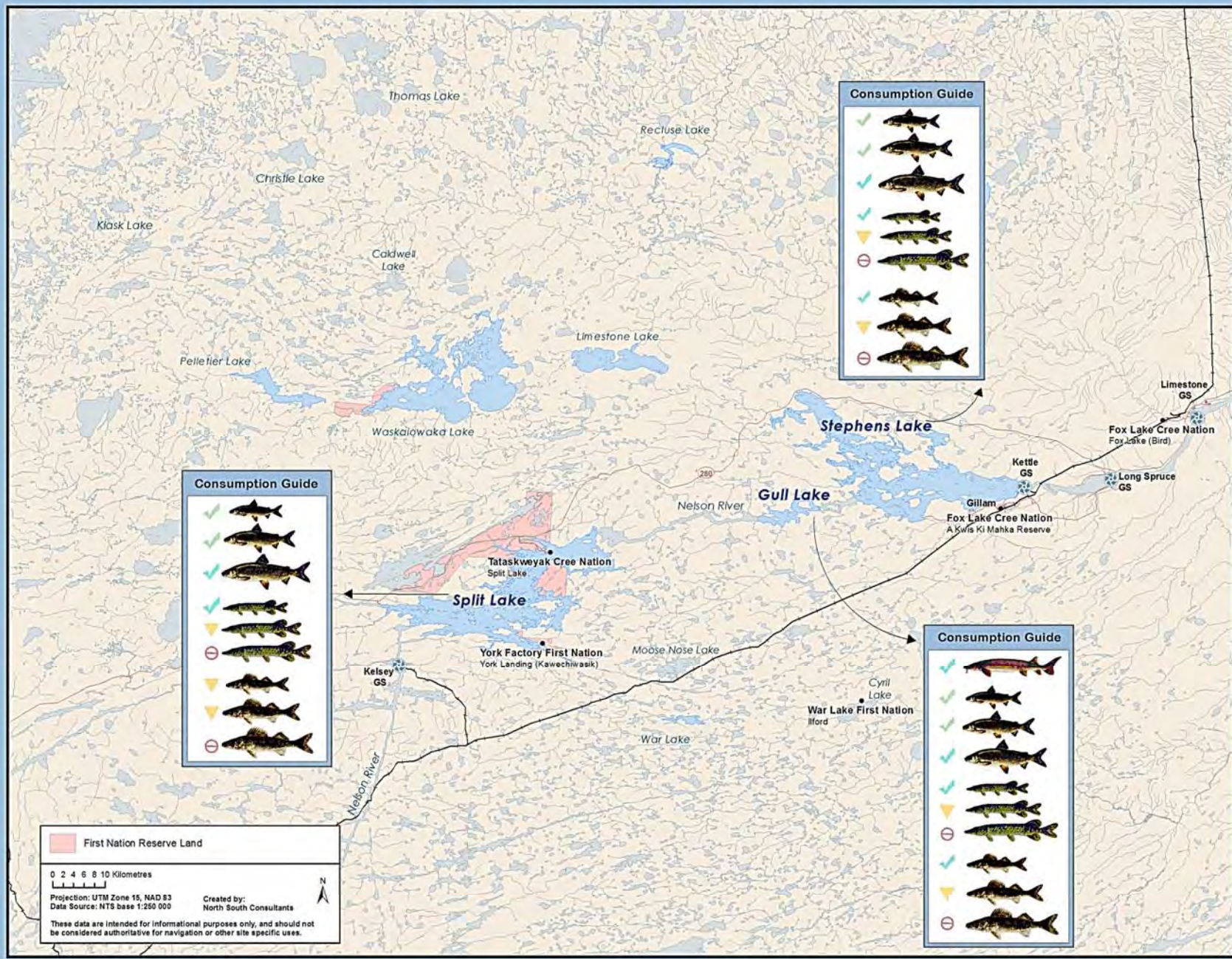
Toddler

3.5 oz (100 g)

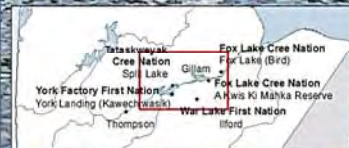
Adult

14 oz (400 g)





Fish Consumption Guide **for Split, Gull and Stephens Lakes** **Current Conditions***



Consumption Guide

- Best Choice Fish
- Very Good Choice Fish
- Occasional Consumption
- Restricted Consumption

See placemat for safe pounds for consumption per month for children, women of childbearing age and all others

Lake Whitefish	Lake Sturgeon
Less than 12"	Any size up to 43"
12 - 18"	
Larger than 18"	
Jackfish	
Less than 20"	
20 - 30"	
Larger than 30"	
Pickereel	
Less than 16"	
16 - 22"	
Larger than 22"	

For all Species: Mercury intake can be reduced by eating smaller rather than larger fish.

*Recommendations are based on muscle mercury concentrations from 2001-2013 for Split Lake, 2001-2006 for Gull Lake and 2003-2012 for Stephens Lake. Based on guidelines from Manitoba Health and Health Canada. Placemat developed with involvement of Manitoba Health and Health Canada.



www.keeyask.com/mercuryandhealth

Information provided in 2015

A Guide to Fish Size For Healthy Eating

This guide applies to **GULL LAKE** under current conditions. Information provided in 2015.



KEEYASK
Municipal Local Authority
www.keeyask.com/healthyandeats

BEST CHOICE

OCCASIONAL CONSUMPTION

VERY GOOD CHOICE

DO NOT EAT

(see guide for maximum safe monthly consumption for children, women of childbearing age and other adults)



LAKE WHITEFISH



JACKFISH



PICKEREL



Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

A Guide to Fish Size For Healthy Eating

This guide applies to **SPLIT LAKE** under current conditions. Information provided in 2015.



KEEYASK
Municipal Local Authority
www.keeyask.com/healthyproducts

BEST CHOICE

OCCASIONAL CONSUMPTION

VERY GOOD CHOICE

DO NOT EAT

(see guide for maximum safe monthly consumption for children, women of childbearing age and other adults)



LAKE WHITEFISH



JACKFISH



PICKEREL



Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

A Guide to Fish Size For Healthy Eating

This guide applies to STEPHENS LAKE under current conditions. Information provided in 2015.



www.keeyask.com/healthyguideline

BEST CHOICE

OCCASIONAL CONSUMPTION

VERY GOOD CHOICE

AVOID CONSUMPTION

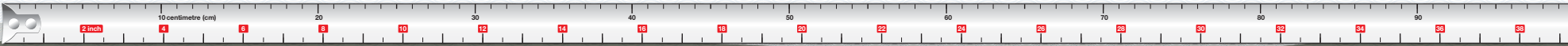
(see guide for maximum safe monthly consumption for children, women of childbearing age and other adults)



LAKE WHITEFISH

JACKFISH

PICKEREL



Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

Maximum Safe Monthly Fish Consumption – Split Lake

In pounds of prepared, filleted or dressed Lake Whitefish, Pickerel (Walleye) or Jackfish (Northern Pike)

Information
provided
in 2015



Hydropower Limited Partnership
www.keeyask.com/mercuryandhealth



Children

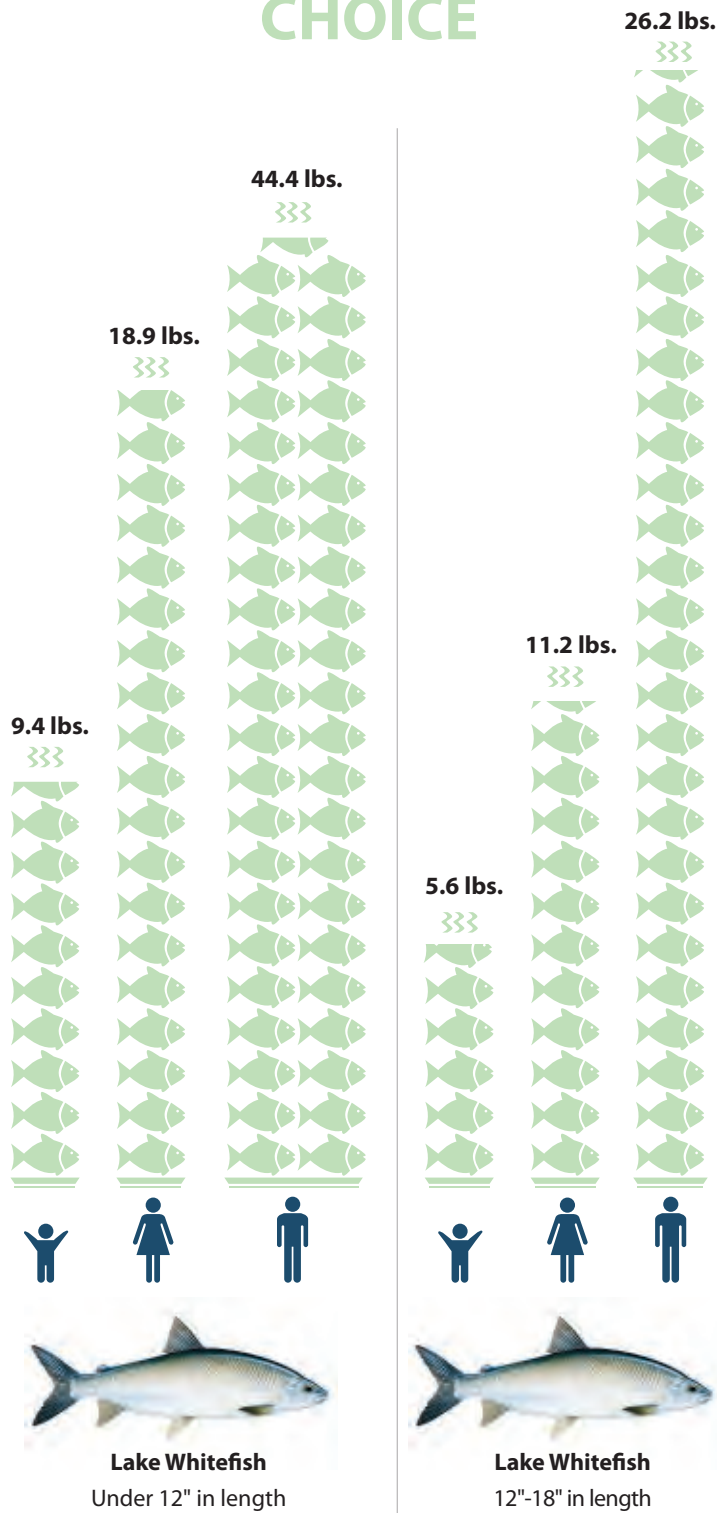


Women
(of Child-bearing Age)

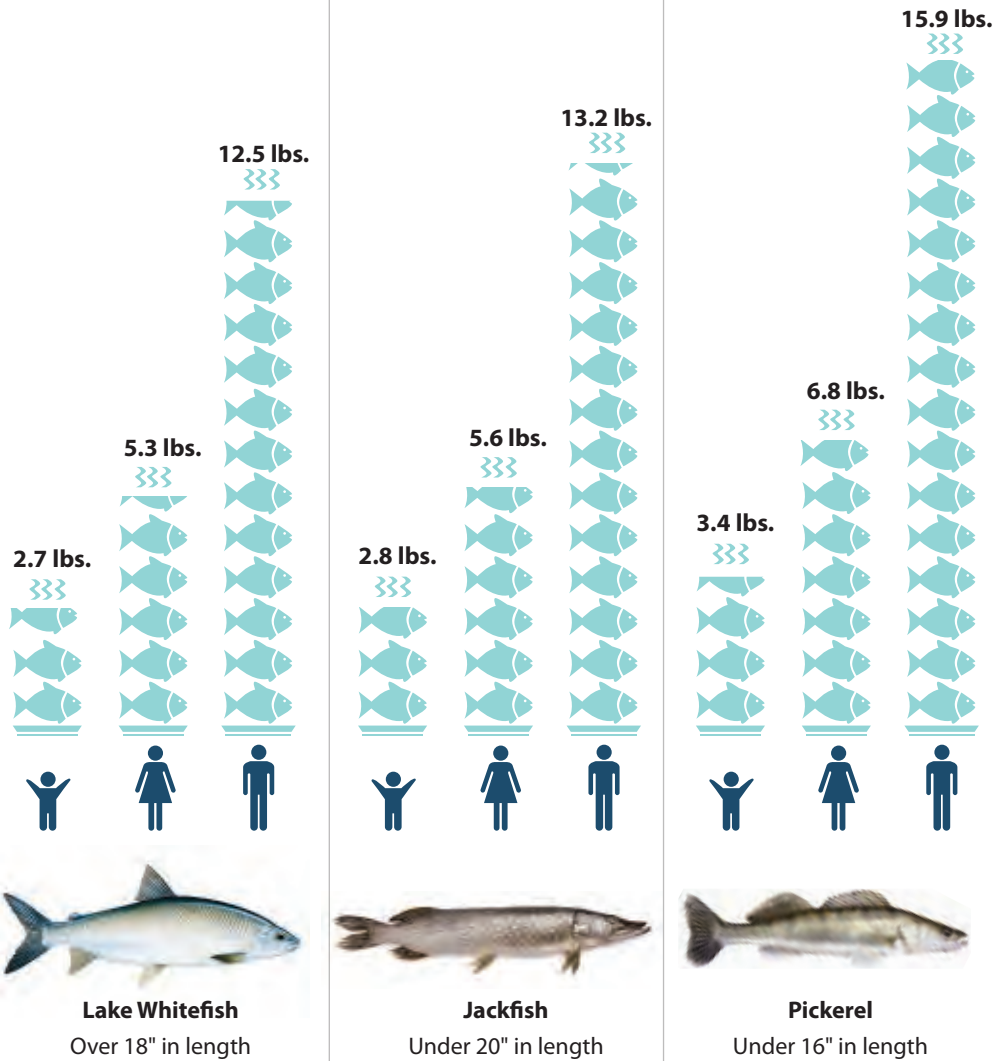


All Others
(Men, Elders, and
Women Over
Child-bearing Age)

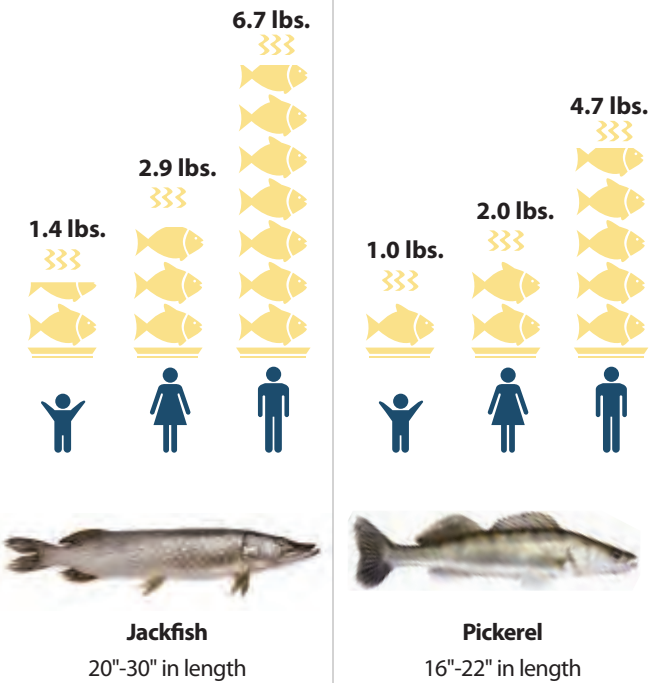
BEST CHOICE



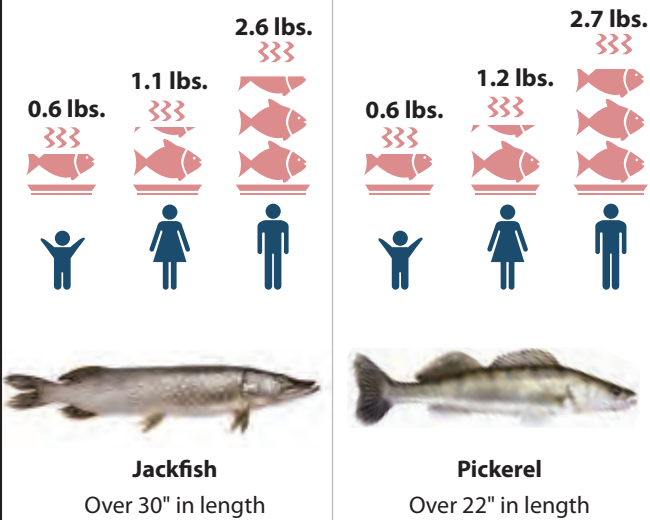
VERY GOOD CHOICE



OCCASIONAL CONSUMPTION



RESTRICTED CONSUMPTION



Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

Maximum Safe Monthly Fish Consumption – Gull Lake

In pounds of prepared, filleted or dressed Lake Whitefish, Pickerel (Walleye) or Jackfish (Northern Pike)

Information
provided
in 2015



Children

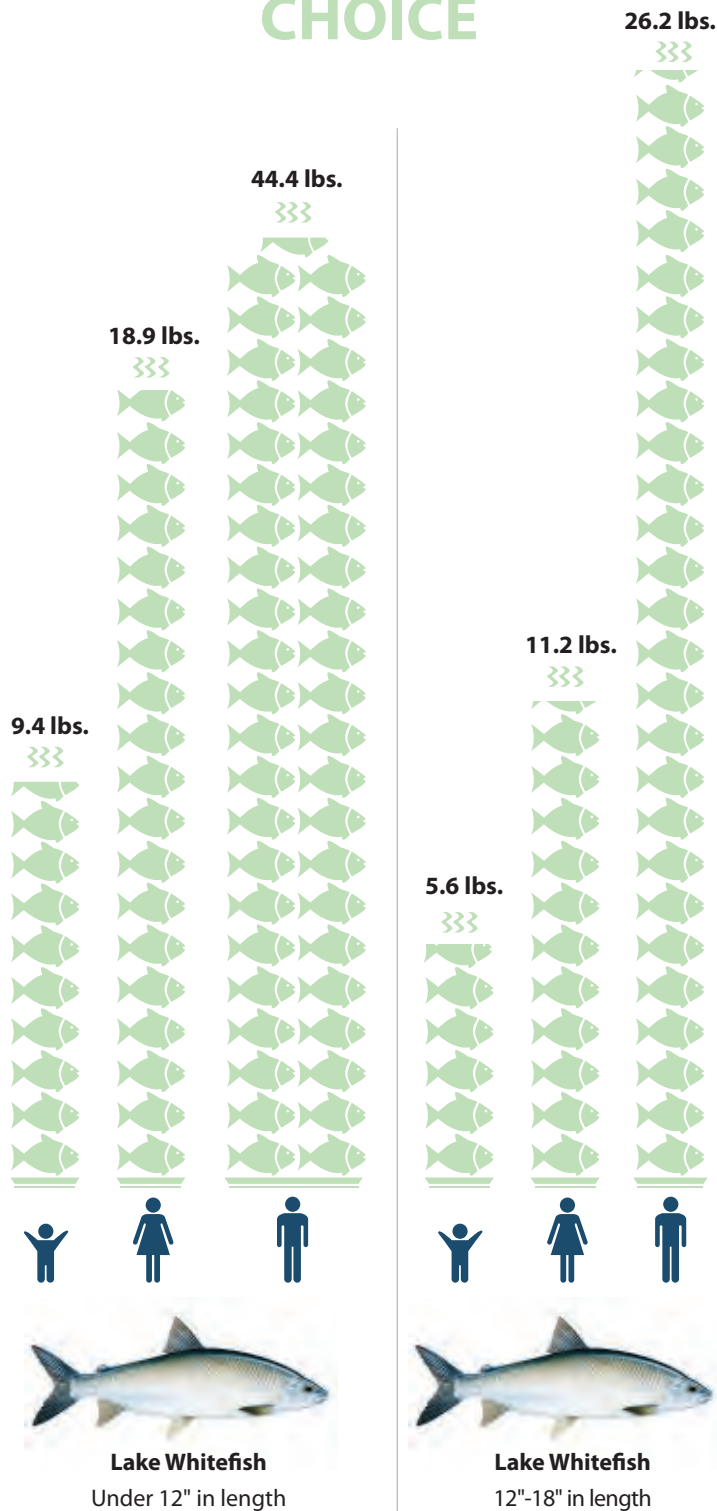


Women
(of Child-bearing Age)

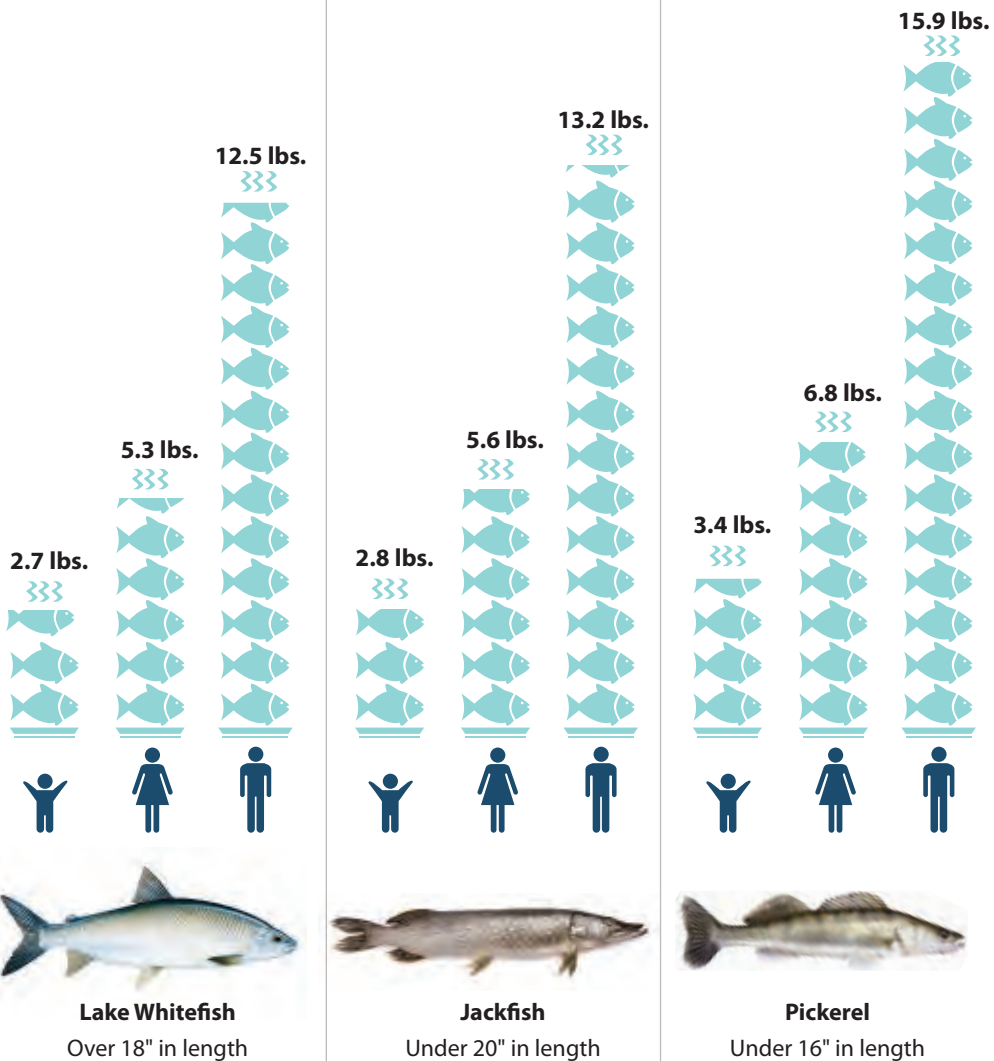


All Others
(Men, Elders, and
Women Over
Child-bearing Age)

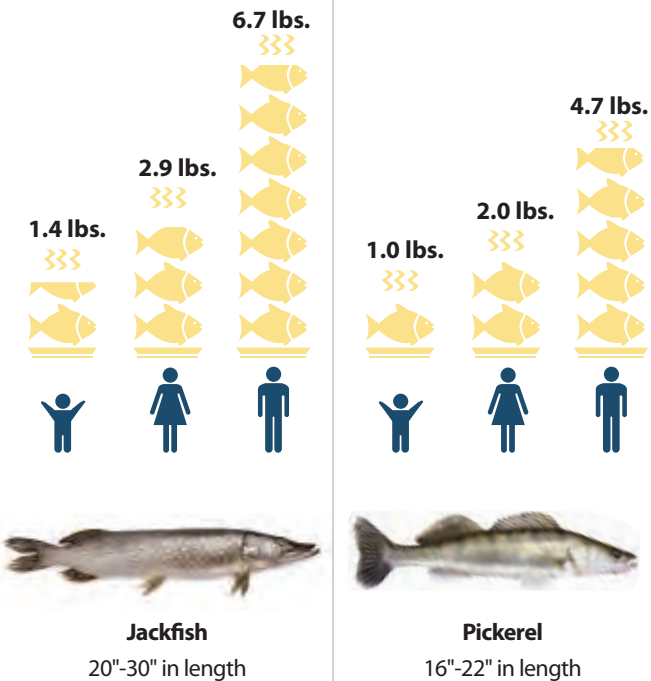
BEST CHOICE



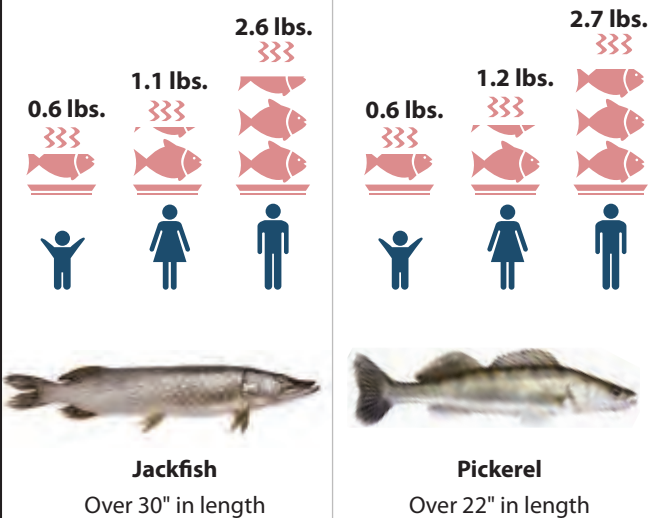
VERY GOOD CHOICE



OCCASIONAL CONSUMPTION



RESTRICTED CONSUMPTION



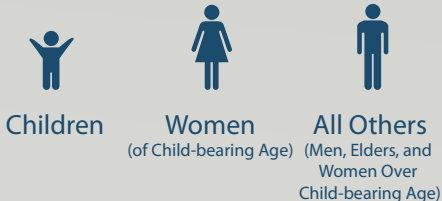
Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

Lake sturgeon are a very good choice fish. For any LS fish size up to 43inches, safe monthly intake for children is 1 lb/month, for women of childbearing age is 4 lbs/month and for all others is 11 lbs/month.

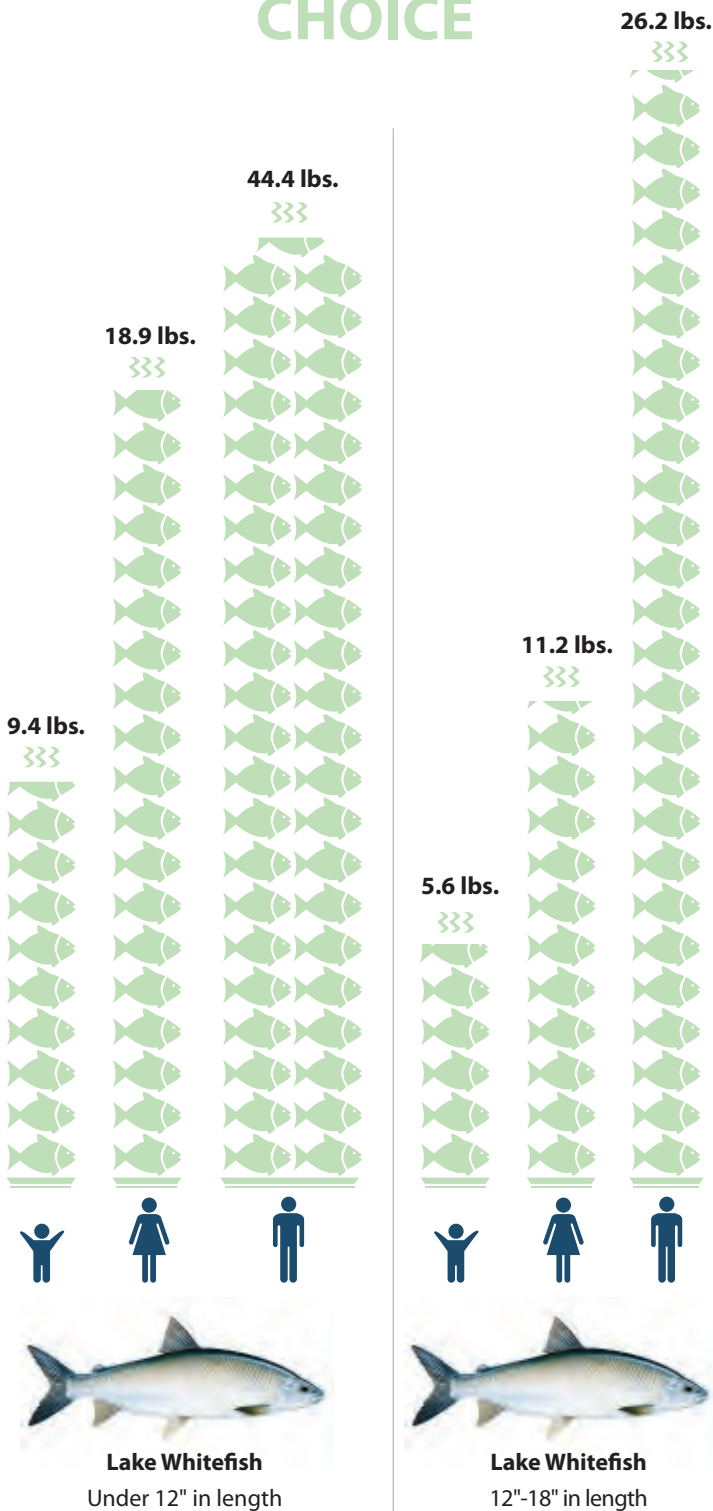
Maximum Safe Monthly Fish Consumption – Stephens Lake

In pounds of prepared, filleted or dressed Lake Whitefish, Pickerel (Walleye) or Jackfish (Northern Pike)

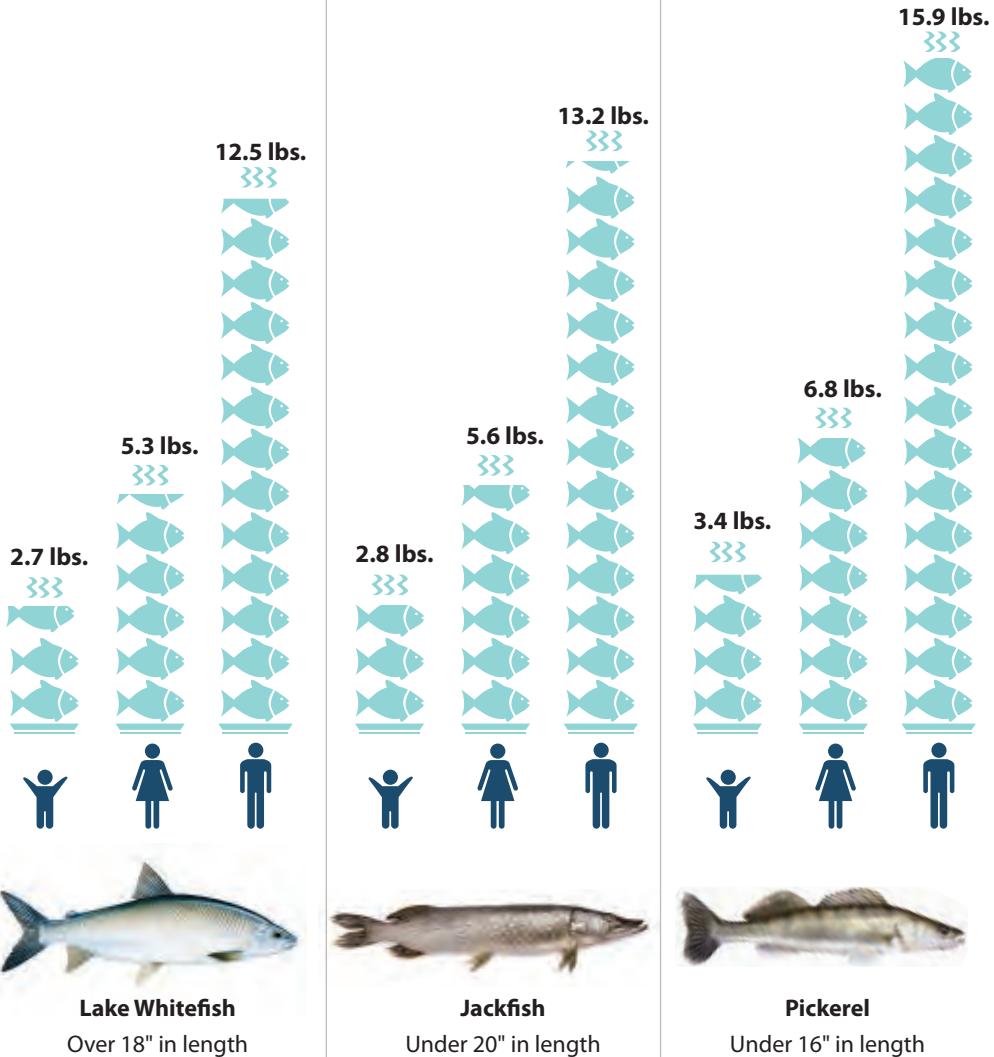
Information
provided
in 2015



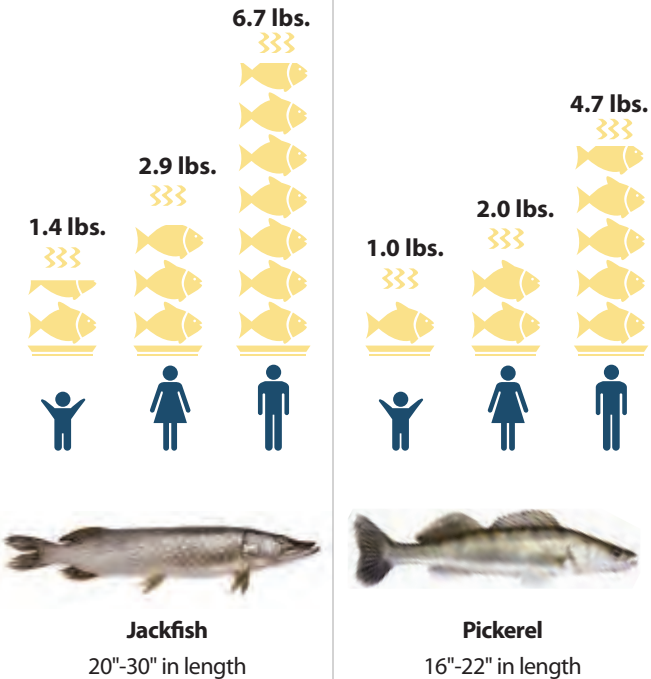
BEST CHOICE



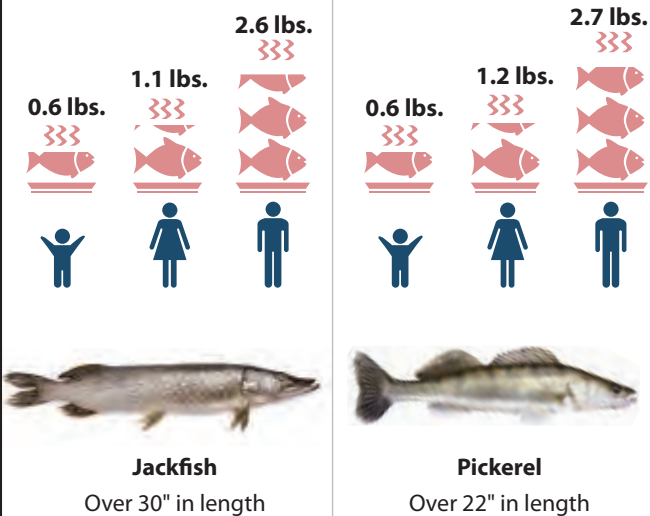
VERY GOOD CHOICE



OCCASIONAL CONSUMPTION



RESTRICTED CONSUMPTION



Based on guidelines from Manitoba Health and Health Canada. Developed with involvement with Manitoba Health and Health Canada. Contact your local community health representative for more information.

[Note: This draft product summarizes the general questions that were asked and answered over the past eight years through the work of the original Mercury and Human Health Technical Working Group and the current Planning Committee.]

Questions and Answers about Mercury and Human Health

Question	Answer
What is methylmercury and where does it come from?	<p>The type of mercury that is produced by bacteria living in wet soils or lake sediments. The bacteria add a component to inorganic mercury that changes it to an organic form called "methylmercury".</p> <p>Flooding of forests on soils with high organic content (i.e., wetlands and peatlands) commonly results in a temporary increase in methylmercury in the water. From there it moves up the food chain to fish, birds, mammals and people who eat them.</p> <p>Throughout these questions and answers, the term 'mercury' is used to mean 'methylmercury'.</p>
Why is mercury of concern?	<p>Higher concentrations of mercury in fish may affect fish growth and health.</p> <p>For people, high levels of mercury can affect thinking, our senses and movement (see below for more details).</p>

Question	Answer
How does mercury move from the environment to people?	<p>Mercury enters the food chain when it is taken up from the water by very tiny plants and bugs. These are then eaten by larger bugs and small fish, which in turn are eaten by bigger fish, aquatic mammals and birds.</p> <p>The mercury accumulates or builds up at each level of the food chain (i.e., at each higher level in the food chain, the concentration of mercury increases). This is called bioaccumulation.</p> <p>People who eat food with high levels of mercury also bioaccumulate the mercury in their bodies.</p>
What are the effects of high levels of mercury on people? What are the signs and symptoms?	<p>High levels of mercury can affect people in three ways:</p> <ul style="list-style-type: none">• Thinking: how we process thoughts; in addition, speech and language are also affected.• The Senses: loss of colour vision; unusual symptoms related to the senses such as tingling, numbness, some deafness.• Movement: shaking or trembling; uncoordinated movements. <p>The key concern with mercury at 2 ppm in women of childbearing age and young children is memory; the other effects noted above are for VERY high concentrations in hair (e.g., 25 ppm).</p>

Question	Answer
<p>Does mercury stay in your body forever? What will happen in my body 5-10 years later if I have eaten a lot of fish over that time? Can mercury levels in the body be reversed?</p>	<p>No, mercury does not stay in your body forever and will leave your body over time – it takes about 2-3 months to get rid of half of the mercury in your body; and about 1 year to get rid of most of the mercury.</p> <p>If a person eats lots of fish but follows the safe consumption recommendations, there will be no adverse effect from mercury and, in fact, the person is likely to be healthier than a person who avoided eating fish. For a person who exceeds the safe consumption recommendation, there is concern of increased risks of neurological and kidney effects (primary concern is unborn babies and young children and effects tend to stay with a person for their lifetime).</p> <p>Mercury hair sampling provides an accurate test of how much mercury is in a person's body.</p>
<p>What about treatment for mercury poisoning?</p>	<p>In cases of very severe industrial pollution (e.g., at Minimata, Japan or Grassy Narrows and Wabasemoong in Ontario) where many tons of mercury were dumped into the water and mercury poisoning made people very sick, treatments are available to help get rid of the mercury faster. This is only done in severe cases since there are also side effects with such treatment.</p> <p>It should be noted that for the Keeyask Project, we are not dealing with this type of industrial pollution resulting in mercury poisoning.</p>
<p>What effect does mercury have on mental health?</p>	<p>Science has not found evidence that mercury contamination makes mental illness worse.</p>
<p>What is the effect of eating a large amount of fish at once (e.g., eating a lot of fish when out on the land or at a feast)?</p>	<p>Scientists do not have a specific answer yet. However, consumption guidelines generally assume that eating fish several times during a week is the same as one large meal of fish.</p>

Question	Answer
Should communities be concerned about the amount of fish being eaten by young people and children when out on the land?	Communities should be encouraging people to eat wild food, including at least 2 servings of fish per week, due to the overall health benefits of wild food.
Is it safe to swim in water that has mercury?	YES, it is safe to swim and bathe in the water.
Will mercury be released after our water is chlorinated through the water treatment process?	Chlorination and the water treatment process do NOT affect mercury levels. Mercury levels in the water in Split, Gull and Stephens Lakes are <u>very low</u> and are NOT a health risk for drinking.
Would flooding increase mercury levels in fish and other animals eaten by people so that mercury levels in people would also increase?	In the case of the Keeyask Generating Station, where flooding will occur over land with large amounts of organic material, mercury levels will increase in fish and, to a lesser extent in other animals, over time. The main concern is for fish species that will have high mercury levels for several years after flooding and that are regularly eaten by people (e.g., jackfish, pickerel). Eating large fish of these two species often would lead to increased mercury levels.
If there was an increase in mercury concentrations, would this pose a health risk to people?	Depending on the amount of mercury in the fish, the type and amount of fish eaten and how often it is eaten, it could pose a risk. Women of childbearing age and children are more vulnerable than women past childbearing age and men. Please see consumption guidance prepared by the Keeyask Partnership with the involvement of Manitoba Health and Health Canada.

Question	Answer
What are mercury guidelines for fish that are sold commercially – are they the same as guidelines for fish that are taken for one's own food?	<p>The commercial limit for mercury in fish is set by Health Canada for fish bought at retail stores – it is currently at 0.5 parts per million (ppm). This is a guideline for the commercial sale of fish in stores and is enforced by the Canadian Food Inspection Agency.</p> <p>There is no official guideline for First Nations consumption of fish; nor is there an official guideline for recreational consumption of fish by the general public.</p>
What happens if fish in a lake are found to have levels of mercury that are too high for eating?	<p>It is the responsibility of the local Medical Officer of Health to issue an advisory for eating types of fish that are found to have high levels of mercury. Typically, the Medical Officer of Health would consult with local communities and MB Conservation and Water Stewardship before issuing a health advisory. [NTD: this requires double-checking with Manitoba Health]</p>

Question	Answer
<p>When will fish be monitored in the Keeyask Region?</p>	<p>Monitoring of fish mercury levels in key species eaten by people – i.e., whitefish, pickerel and jackfish (and small yellow perch) is currently being done every 3 years in Split, Assiniboine, Gull and Stephens lakes as well as the Aiken River (pickerel and jackfish only) through the Keeyask Aquatic Effects Monitoring Program and the Coordinated Aquatic Monitoring Program (CAMP) of the Province and Manitoba Hydro. Monitoring will occur annually in Gull and Stephens lakes once Keeyask is in operation (i.e., 2020) and until maximum mercury concentrations are reached (thereafter monitoring will be every 3 years). If pickerel and jackfish from Stephens Lake reach levels greater than 0.5 ppm (the EIS-predicted maximum), then monitoring will also occur downstream in the Long Spruce forebay. Samples will be sent to an accredited lab to determine the most recent fish mercury concentrations and to compare these mercury levels against the predictions made in the EIS.</p>
<p>When was the last mercury testing of people in the Keeyask communities done?</p>	<p>Testing of mainly hair samples was undertaken in the 1970s and 1980s. Under this program, the last testing (done by Health Canada) on communities in northern Manitoba was in 1989. The communities at Split Lake and York Landing were included along with other Northern Flood Agreement communities.</p> <p>In addition, Nisichawayasihk Cree Nation had community-requested testing done in 2000-2001, reported on in the Wuskwatim Environmental Impact Statement; and the FNFES study undertook sampling in several MB communities as part of their study (Chan et al 2012).</p>

Question	Answer
<p>What sort of advice is being provided to communities beyond the four Partner Cree Nations about mercury levels and human health?</p>	<p>There is MB Conservation and Water Stewardship's <i>Mercury in Fish and Guidelines for the Consumption of Recreationally Angled Fish in Manitoba</i>.</p> <p>Available here:</p> <p>http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007.pdf</p> <p>Manitoba Health is currently working on a Fish and Land fact sheet.</p>
<p>What guidance is available from Health Canada about mercury and health?</p>	<p>In general, there is the Canada Food Guide which includes some information about mercury; there is also a 2009 Health Canada document on prenatal guidelines that has a sidebar on mercury consumption. Health Canada also has fact sheets about mercury and health on their website, including seasonal information for First Nations and Inuit communities (FNIHB – Environmental Health Guides).</p>
<p>Community members have reduced their use of fish due to the concern about mercury. Has the lingering fear of eating fish, people's perceptions about mercury, and the cultural aspect tied to fishing and eating fish been discussed?</p>	<p>Yes. Considerable effort by the group has focused on the items noted. These topics have been expressed regularly by community members and have been taken into consideration by the work the group has done together since 2007.</p>
<p>Have impacts of mercury contamination on the fish been discussed?</p>	<p>Yes – there is a section in the Aquatic Environmental Supporting Volume of the Environmental Impact Statement that speaks to Project effects of increased mercury levels on fish.</p>

Question	Answer
What about Lake trout – have they been tested?	<p>There are no Project effects on Lake trout; the fish species chosen for study were those the communities identified as the most commonly consumed, where present in Split, Gull and Stephens lakes and where mercury data were available.</p> <p>According to aquatic field studies, Lake trout are not present in Split, Gull, and Stephens lakes. The only lakes within the Keeyask area from which Lake Trout have been reported are Kiask and Myre lakes; seven Lake Trout from Kiask Lake were analysed for mercury in 2004 (mercury concentrations were 0.22 ppm).</p>