# Health impact assessment of the 2014 Mount Polley Mine tailings dam breach: Screening and scoping phase report

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# LIST OF ACRONYMS

| | |
|---|---|
| AANDC | Aboriginal Affairs and Northern Development Canada |
| BC | British Columbia |
| CMDRC | Cariboo Mine Development Review Committee |
| CRD | Cariboo Regional District |
| CSR | Corporate Social Response |
| CVD | Cardiovascular Disease |
| DFO | Fisheries and Oceans Canada |
| EA | Environmental Assessment |
| ESIA | Environmental and Social Impact Assessment |
| EWG | Environmental Working Group |
| FLNRO | Forest, Lands and Natural Resource Operations |
| FN | First Nation |
| FNEMC | First Nations Energy and Mining Council |
| FNHA | First Nations Health Authority |
| FPIC | Free, Prior and Informed Consent |
| GD | Group Discussions |
| GoC | Government of Canada |
| HIA | Health Impact Assessment |
| KII | Key Informant Interviews |
| IC | Implementation Committee |
| IFC | International Finance Corporation |
| LTC | Lillooet Tribal Council |
| MARR | Ministry of Aboriginal Relations and Reconciliation |
| MDRC | Mine Development Review Committee |
| MEM | Ministry of Energy and Mines |
| MFC | Monkey Forest Consulting Ltd. |
| MLA | Member of the Legislature Assembly |
| MoE | BC Ministry of Environment |
| MPMC | Mount Polley Mining Corporation |
| NAHO | National Aboriginal Health Organization |
| NStQ | Northern Secwepemc te Qelmucw |
| OCAP | Ownership, Control, Access and Possession |
| PLC | Public Liaison Committee |
| PS | Performance Standard |
| RHIS | Regional Health Information System |
| SCIB | Soda Creek Indian Band |
| SOC | Senior Officials Committee |
| TNG | Tsilhqot'in National Government |
| TSF | Tailings Storage Facility |
| TWG | Technical Working Group |
| UBCIC | Union of BC Indian Chiefs |
| UN | United Nations |
| UNDRIP | United Nations Declaration on the Rights of Indigenous Peoples |
| WLIB | Williams Lake Indian Band |
| XFN | Xat'sull First Nation |

# EXECUTIVE SUMMARY

On August 4, 2014, the Mount Polley copper and gold mine tailings dam breached, and over the next three days the four-square-kilometre pond drained, releasing approximately 17 million cubic metres of tailings water and eight million cubic metres of tailings into Polley Lake, Quesnel Lake and Hazeltine Creek. Following the spill, the Government of British Columbia (BC) and the company released technical, environmental and assessment reports that described pre-event infrastructure issues, post-event impacts to the receiving environments, and future pathways for re-permitting. To date, no assessment has identified the communities impacted by this event, nor how they were impacted, from a social or health perspective.

The two main objectives of this project are to:

(1) address this gap in knowledge by identifying potentially impacted communities and;

(2) undertake the initial phases of a health impact assessment (HIA) of the Mount Polley Mine event, using international assessment standards.

This project was funded by the First Nations Health Authority (FNHA). Established in 2013, the FNHA plans, designs, manages, delivers and funds First Nations Health programs across BC. The following report describes findings from the screening and scoping phases of the Mount Polley Mine HIA.

**Approach and Project Activities**

The HIA screening and scoping phase involved:

- Identifying potentially impacted communities;
- Reviewing available environmental, industry and community health data;
- Identifying probable community-level impacts on determinants of health linked to Mount Polley Mine tailings dam breach;
- Undertaking a gap analysis based on existing literature to highlight existing data and identify additional evidence required for the full HIA; and
- Identifying interim measures that could reduce ongoing health impacts and risks for affected First Nations

Between September 21 and November 30, 2015, the project team contacted 47 communities (46 First Nation communities; one non-First Nation community) to participate in the screening phase of the Mount Polley Mine HIA. Of the 47 selected communities, 22 participated in this study. Community selection was based on the following criteria:

1. Experienced direct impacts to traditional land
2. Geographical location (community and/or traditional territory is in close proximity to the Mount Polley Mine site and/or are situated along the Quesnel or Fraser Rivers)
3. Community identified by the FNHA or FNHA Community Engagement Coordinator
4. Community identified by a First Nation leader (e.g., during the screening/scoping phase, participants recommended the project contact a specific First Nation community for additional information)

## Findings

*Aboriginal Health*

The Aboriginal population in Canada is vulnerable to changes in environmental and socioeconomic conditions stemming from resource development projects. This vulnerability is primarily due to their physical, mental, spiritual, and emotional connections to traditional land and natural resources. And it is underpinned by a history of adverse cultural impacts of colonialism and subsequent assimilation practices spanning more than 150 years.

During the course of the project, First Nations representatives repeatedly expressed concerns over the health of the Fraser River system and for the viability of salmon. There is growing awareness of cumulative impacts on the river from multiple sources (e.g., tailings dam breaches and the direct discharge of tailings waste through permit approval, point source discharges, organic pollutants, fish farming impacts etc.).

*Impacts and Risks to Identified Communities*

Screening and scoping phase activities identified a broad range of existing and potential health impacts and risks. The impacts identified during the screening and scoping phase are described in Table 1. The following sections describe how the Mount Polley dam failure appears to have impacted community health in more detail. As the table demonstrates, similar key impacts were experienced across all communities, although there are some notable differences.

***Table 1**. Reported impacts/key issues related to the Mount Polley Mine tailings dam failure experienced by communities who participated in the scoping phase of the project.*

| Community | Reported impacts/key issues related to the Mount Polley Mine tailings dam failure experienced by community | | | | |
|---|---|---|---|---|---|
| | Traditional territory directly impacted | Decrease in individual fishing practices | Impacts on commercial fisheries | Emotional stress | Increased administration burden experienced |
| Boston Bar First Nation | | | | | |
| ?Esdilagh First Nation | | X | X | X | X |
| Lhtako Dene First Nation | X | X | | X | X |
| Likely | | | | X | X |
| Nak'azdli Band | | X | | X | X |
| Simpcw First Nation | | X | | X | X |
| Sekw'el'wás First Nation | | X | | X | X |
| Spuzzum First Nation | | X | | X | X |
| Stswemecem'c Xgat'tem | | X | | X | X |
| T'it'q'et First Nation | | X | | X | X |
| T'exelcemc | X | X | | X | X |
| T'eqt'aqtn'mux First Nation | | X | | X | X |
| T'it'q'et First Nation | | X | | X | X |
| Tl'azt'en Nation | | X | | X | X |
| Tl'esqox First Nation | | X | X | X | X |
| Tl'etinqox First Nation | | X | X | X | X |
| Tsal'alh First Nation | | X | | X | X |
| Tsi Deldel First Nation | | X | X | X | X |
| Xaxli'p First Nation | | X | | X | X |
| Xat'sull First Nation | X | X | | X | X |

| Community | Reported impacts/key issues related to the Mount Polley Mine tailings dam failure experienced by community | | | | |
|---|---|---|---|---|---|
| | Traditional territory directly impacted | Decrease in individual fishing practices | Impacts on commercial fisheries | Emotional stress | Increased administration burden experienced |
| Xeni Gwet'in First Nation | | X | X | X | X |
| Xwisten First Nation | | X | | X | X |
| Yunesit'in Government | | X | X | X | X |

As previously mentioned, First Nations communities experienced varying types and degrees of impacts. Three First Nations – Xat'sull, T'exelcemc and Lhatko Dene First Nation – suffered direct impacts that were immediate and ongoing. Access to sacred land and territory, traditional food sources and medicine has been lost. Although these three First Nations are experiencing impacts involving a wider range of potential pathways that can influence community health, similar impacts have been reported by all participating First Nations:

- A key health impact that appears to be shared among all communities is the continued emotional stress in relation to the Mount Polley incident. The level of emotional stress is linked to the severity of potential impacts and risks perceived by the community and the level of uncertainty and lack of trust in the information provided.
- The tailings dam breach has resulted in a decrease in fishing practice. As a result, shifts in diet composition, physical activity and cultural practices were reported. Commercial fishing activities were also affected, resulting in reduced community income and employment opportunity.
- Decreased fishing activities, as well as practice of fish-related cultural practices, has had a negative impact on the physical activity of affected communities, which is directly associated with their health status. Following the incident, all communities reported increased administrative burden. This increased burden was placed on community leadership who reported substantial workloads.

The similarity in impacts associated with the Mount Polley tailings dam failure for First Nations across BC (i.e., communities ranging in proximity to the impact zone from close to further away) is best understood through an in-depth understanding of the importance of the Fraser River as a source of salmon for their communities. This work highlights the extent of emotional trauma prompted by real or perceived threat to salmon health that was and has been exacerbated by a lack of reliable information from trusted sources in the aftermath of the breach. These factors led affected First Nations communities to cease or significantly reduce salmon fishing during 2014, and for some, this issue remains.

Likely, a small community located close to the Mount Polley Mine site, is the only non-First Nation community that participated in the study. While respondents in Likely also raised concerns over health impacts and over increased community conflict linked to the incident, their concerns focused on loss of income and livelihood, the safety of water for drinking, household, and recreational use. Conflicts emerged in Likely between groups that are satisfied that data suggest no significant impacts and those who perceive potentially serious impacts. The impacts to this community are discussed in Section 3.4.5.

Through an iterative process, the foundational finding from this work draws attention to the strong links between First Nations, the land and resources, culture and associated health outcomes. In

considering the importance of First Nations health and culturally appropriate health pathways the project team identified four key impacts including:

- Environmental dispossession
- Emotional stress
- Altered dietary patterns
- Changes in physical activity

Based on a gap analysis of the key culturally appropriate determinants of health and health outcomes, for which information is needed to provide the full HIA, the project team identified information requirements shown in Table 2 for HIA completion.

***Table 2**. Data required for the full HIA.*

| | |
|---|---|
| **Cultural determinants of health**<br><br>(Questionnaire survey will assess current and past practice/ behaviour) | • Personal fishing practices<br>• Ability to hunt, trap, fish, forage and travel on the land<br>• Access to traditional territory<br>• Fears over contaminated fish, land and water<br>• Economic power<br>• Cultural/traditional practices<br>• Food security<br>• Hunting and gathering activities<br>• Conflict and violation of rights<br>• Unhealthy behaviours<br>• Dietary practices<br>• Composition of diet<br>• Self-esteem |
| **Clinical health assessment** | • Self-reported health status<br>• Self-reported physical fitness<br>• Mental health status<br>• Systolic blood pressure<br>• Fast Plasma Glucose Test (diabetes type 2; feasibility needs to be assessed)<br>• Body mass index<br>• Hair sampling for heavy metal analysis |
| **Assessment and analysis of routine health information system data**<br><br>(Data need to be specific for First Nations and might be compared to other population groups) | • Cardiovascular disease diagnostic rates<br>• Cancer diagnostic rates<br>• Diabetes diagnostic rates<br>• Mental disorder diagnostic rates<br>• Neurologic disorders diagnostic rates<br>• Nutritional disorders diagnostic rates<br>• Miscarriages<br>• Suicide |

| | |
|---|---|
| **Environmental data collection** | • Longitudinal, systematic sampling of fish and plankton for heavy metal analysis<br>• Systematic and longitudinal monitoring of wildlife health<br>• Potential additional environmental data required as important to those First Nations whose traditional territories have been directly impacted. |
| **Economic data related to commercial fisheries** | • Fish catch and fisheries economic data |

### The Future

The next step in completing the HIA process is the collection and participatory analysis of the data specific to the impacted First Nations that are identified in the above table. In view of the data gaps identified, this will require primary data collection in the affected First Nations, as well as an assessment and analysis of the data that are available through the routine health information system.

Overall, additional data collection will aim to:

- Add to and amend information at a local level to describe the current status of health determinants and outcomes in affected communities fully. Researchers will also include analysis of retrospective components in the data collection, to support the modelling of health impacts and associated management/mitigation measures; and
- Establish a solid health, environmental and socio/cultural baseline as part of an overarching surveillance and response mechanism to identify potential long/term impacts and monitor change over time. First Nations participating in the study viewed this as particularly important in light of the fact that the Mount Polley Mine is currently operating again and has recently received approval for tailings water discharge into Quesnel Lake.

In addition to contributing to the design of the full HIA, the screening and scoping phase work identified ongoing health impacts and risks for First Nations communities that could be significantly reduced through targeted interventions. Chronic emotional stress is known to be detrimental to health and strategies could be implemented in the short term to reduce the drivers of stress and to mitigate its symptoms and physiological impacts. These include:

- Improve access to counselling and cultural healing processes: One approach to reducing stress would be to ensure access to counselling for affected community members and to develop and implement a culturally appropriate healing process.
- Improve access to trusted information on a range of issues: Finding appropriate channels for providing information that can be trusted by impacted First Nations and working with them to develop data to address their concerns could alleviate the uncertainty and distrust. Community-based participatory processes could be considered The FNHA appear to be in a strong position to facilitate the identification and delivery of trusted information.
- Address ongoing constraints to accessing traditional diets and medicine: It will take time to collect information needed to restore trust in the safety of consuming traditional food or to identify prudent alternatives that take into consideration the unique concerns of First Nations. In the interim, maintaining health levels depends on replacing the losses in salmon and other

foods/medicines with equivalent sources that communities trust to be safe.

- Instigate a grievance and compensation process for use by affected individuals and communities: Developing a grievance process acceptable to the affected First Nations would provide a channel to seek redress from the Mount Polley Mining Corporation (MPMC). In the interest of limiting ongoing and further damage, an interim compensation fund could be established by the MPMC to address the priorities identified in this report.

Another recommendation is to provide advocacy support to Lhtako Dene, as evidence contained in this report places their traditional territory within the Mount Polley Mine tailings breach area. It is recommended that they have access to meetings in Likely (or elsewhere) at no cost to determine appropriate actions for the BC Ministry of Environment (MoE) and MPMC.

Finally, this report identifies a series of policy recommendations based on the research and on experiences working with Indigenous communities and with international mining companies worldwide. The most important of these recommendations is for the First Nations Health Authority to play an advocacy role in explaining the central role that salmon fishing plays in a wide variety of determinants of First Nations health ranging from physical exercise to social cohesion, building and sharing cultural identity, and a wide range of factors affecting emotional health. More holistically these could be seen as a range of factors leading to a sense of environmental and cultural belonging (the opposite of environmental dispossession).

The project team recommend that FNHA advocates for studies and mitigation actions that will protect the river ecosystem and identify the causes of the observed impacts on salmon populations and health effectively. First Nations health appears to be intrinsically linked to an urgent need to protect the health of the Fraser River system in an integrated manner. This study calls for attention to the health of the Fraser River and to the importance of salmon for First Nations.

"We live on fish, this is who we are."

# 1. INTRODUCTION

This report describes the findings of the screening and scoping phase of a health impact assessment (HIA) carried out for the First Nations Health Authority (FNHA), focusing on the health impacts from the Mount Polley mine tailings breach on First Nations communities in British Columbia (BC), Canada.

## 1.1 HOW TO READ THIS DOCUMENT

This report begins by describing the purpose of the work, the qualifications of the team, the approach and methodology, and then proceeds to findings, recommendations and conclusions. The findings section frames the work in current understandings of potential pathways commonly seen among First Nations and other aboriginal communities interacting with natural resource projects affecting their traditional resources. It then presents detailed findings for each of the communities that participated in the project and synthesizes these situation analyses to identify patterns of similarity and difference among the communities. This synthesis then led the project team to identify key health impacts and risks and associated pathways. Readers with less time may want to focus on the findings in Sections 3.3 and 3.4 and the subsequent sections identifying gaps and recommendations. Readers with an interest in understanding the key impacts in greater depth should read through the document in order.

## 1.2 BACKGROUND

The Mount Polley Mine is an open pit copper/gold mine with developing underground operations. It is located in south-central British Columbia (BC), 56 kilometres northwest of Williams Lake. On August 4, 2014, the tailings storage facility breached, resulting in the loss of about 17 million cubic metres of tailings water and eight million cubic metres of tailings into Polley Lake, Quesnel Lake and Hazeltine Creek (BC Ministry of the Environment, 2015). This happened the first day salmon fisheries opened for First Nations along the Fraser River.

Engineering investigations into why this occurred have been completed (Morgenstern et al., 2015). The investigations focussed on four hypotheses for failure: human intervention (or lack of), overtopping,[1] piping and cracking,[2] and foundation failure. The panel did not find evidence that human intervention, overtopping, or piping/cracking contributed to the breach and also determined that inspections of the facility would not have prevented the incident. Prior to the breach the BC Ministry of the Environment (MoE) warned Mount Polley five times that it had exceeded the permitted level of waste water in the pond and Mount Polley made two applications to increase its water discharge permits (Ministry of Environment, 2014). Morgenstern et al. (2015) determined that the main cause of the breach was a design 'oversight' wherein the complexities of the geological environment made the dam susceptible to foundation failure and were not adequately addressed in the design. The foundation failure, termed an "undrained failure",[3] appears to have been triggered when construction at a downstream rockfill zone on the tailings dam was built to an improper slope. The slope was in the process of being flattened to meet the original design criteria when the breach occurred.

In addition to the engineering assessment, environmental and regulatory assessments are ongoing. These include (but are not limited to): a post-event impact assessment commissioned by the

[1] *Water flowing over the crest of a dam*
[2] *Types of internal erosion*
[3] *Undrained failure occurs when a weak geological layer is present and, when stressed, develops high pore pressure that results in weakening of an otherwise strong material*

Mount Polley Mining Corporation (Golder Associates, 2015); a report on observations of changes to Quesnel Lake and Quesnel River (Pettigrew et al., 2015); a five-week water quality monitoring program conducted by the BC MoE (Swan et al., 2014); a fish sampling program undertaken by FNHA (FNHA, 2014); and continuous quarterly water quality monitoring reports submitted to the BC MoE by MPMC as part of the Amended Pollution Abatement Order #107461 (Imperial Metals, 2015).

### 1.3 **OVERARCHING PURPOSE OF THE WORK**

Assessments initiated or completed to date have yet to focus on the human dimensions of the impacts. It is the purpose of the initial phases of this HIA to identify who has been impacted by the dam failure, and to identify the specific impacts and pathways from a health perspective. The study was initiated by the FNHA to focus on affected BC First Nations Communities. It also included the non-First Nation community of Likely, a small community of approximately 300 people located just over 20 km from the Mount Polley mine.

An HIA is a systematic approach to assessing the health impacts and risks (both positive and negative) associated with an event, project or policy, that uses qualitative, quantitative and participatory methods (World Health Organization, 2015). This type of assessment is required by the international finance/extractive sector globally as a standard practice associated with impact identification and risk management for projects expected to have significant environmental and social impacts (International Finance Corporation, 2009; International Council on Mining & Metals, 2010). An HIA accomplished to international standards assesses environmental, social and culturally appropriate determinants of health and provides recommendations for subsequent management of health risks and impacts and outlines appropriate surveillance and response mechanisms (International Finance Corporation, 2009). Most HIAs are carried out prior to projects being commissioned and are used to develop management plans to prevent impacts. In this case the methodology is implemented as an ex-post assessment. This sort of application is supported for assessing the impacts of accidents and incidents, such as the Mount Polley tailings breach.

The HIA work addresses the following questions:

- Which First Nation communities have been affected by the Mount Polley tailings breach?
- How has the Mount Polley tailings incident impacted the health of First Nation communities?
- How has the Mount Polley tailings incident impacted critical determinants of Aboriginal health important to First Nation communities?
- What are the future health risks associated with identified impacts if left unmitigated/unmanaged?
- What management, surveillance and response strategies are needed to address impacts and risks?

In the short term, this project will provide First Nations, FNHA and relevant authorities/companies with information about appropriate framing for the full HIA phases to follow, based on the scale of health impacts and risks associated with the Mount Polley dam breach as identified through an evidence-based approach. It will also identify a series of interim measures that may reduce harm in affected First Nations communities, until full results are known. In the longer term, the project team and affected communities both believe the Government of British Columbia should integrate the results of this investigation into the ongoing revisions to BC mining law and policy to ensure the topic of First Nation health and the identification and management of risks and impacts is more comprehensively considered and addressed in BC resource development.

## 1.4 **TEAM MEMBERS**

Two international HIA professionals who hold credentials in this field as consultants and academics led this work.

**Dr. Janis Shandro** leads Monkey Forest Consulting's (MFC) community health and safety practice. She has a background in engineering/population health with extensive health assessment/large-scale development project experience in Canada, Australia, Asia, Africa and Latin America. She specializes in mitigation measures, culturally appropriate HIA, community health baseline methodology, and has significant experience developing and implementing community health monitoring programs and other related initiatives (such as influx management). Currently, she leads the implementation of community health and safety and influx programs associated with the construction of a large petrochemical complex to international standards in addition to co-managing community health research projects associated with the extractive sector for a number of Canadian Indigenous communities.

**Dr. Mirko Winkler** has a background in environmental epidemiology and is an established international leader in the HIA field. He has substantial experience in conducting and managing HIAs, including epidemiological and environmental data collection to describe community health status and the underlying determinants of health for affected communities to international/World Bank standards. His work has included projects in the extractive and renewable-energy sectors, as well as for the public sector. He has led HIAs across sub-Saharan Africa, South America, Canada and Asia.

In addition to professional experience, Drs. Shandro and Winkler respectively hold research and teaching portfolios with the University of British Columbia, the University of Victoria, and the Swiss Tropical and Public Health Institute, an affiliated institution of the University of Basel. Their current research initiatives are focused on health impact assessment in the extractive industries (Dr. Winkler and Dr. Shandro), the health of Indigenous Peoples (Dr. Shandro), and HIA of resource reuse systems (Dr. Winkler).

Two community health and safety specialists supported screening and scoping activities with previous research experience on projects with Dr. Shandro in BC. **Ms. Laura Jokinen** recently participated in a health risk and opportunity assessment for a northern BC First Nation, assessing the cumulative impacts and risks of multiple development projects on community health. She also leads data collection for an HIA evaluating the impacts of an existing BC mining operation. Laura holds an MSc in Health Science and is a researcher and health practitioner. She has almost a decade of experience working with vulnerable populations living with concurrent disorders (co-occurring mental health and substance use problems). **Ms. Alison Stockwell** recently completed a comprehensive investigation into the health risks and impacts of the extractive sector on Aboriginal and northern women in BC. She currently assists in implementation efforts related to community health and safety and livelihood replacement for a large, extractive project, under construction in Vietnam. She has an MSc in mining engineering.

Production of this document involved several stages of client and peer review. Each First Nations community that participated in the research received a draft version of the report. The project team lead shared the initial findings of the research with FNHA on December 4, 2015. In addition, **Dr. Aleck Ostry**, professor at the University of Victoria Geography Department and Canada Research Chair in Rural Health, provided comments on the report, from his perspective as a respected academic in the field of BC health, the extractive sector and First Nations. **Ms. Carol**

**Odell**, an experienced social reviewer has led social due diligence teams reviewing mining and other resource-based projects worldwide for International Financial Institutions. She leads Monkey Forest Consulting's assessment practice and reviewed this report as a practitioner familiar with best international practices. This report was finalized after reviewing findings and recommendations with participant communities.

## 2. APPROACH

The project team developed the approach in collaboration with FNHA and several First Nation communities. After submitting initial HIA proposals on behalf of eight First Nations and holding a series of discussions with FNHA and some of the participating First Nations, the team refined the final HIA proposal to focus on the initial screening and scoping phases of an HIA. FNHA has funded this work. As part of the participatory approach used by the project team, this work involved six community coordinators from participant communities. Communities internally selected their community coordinator. In all cases, selection was based on the individual holding an official role within the health or natural resource sector. The coordinators supported the team during the scoping site visit and final document review process.

### 2.1 OBJECTIVES

The HIA screening and scoping phase aimed to:

- Identify potentially impacted communities;
- Review available environmental, industry and community health data;
- Identify probable community-level impacts on determinants of health linked to Mount Polley Mine tailings dam breach;
- Undertake a gap analysis based on existing literature to highlight existing data and identify additional evidence required for the full HIA; and
- Identify interim measures that could reduce ongoing health impacts and risks for affected First Nations.

### 2.2 METHODOLOGY

The team's main activities during the screening and scoping phases of the HIA are summarized in Figure 1. This section describes the screening and scoping phases in more detail and provides information about the site visits.

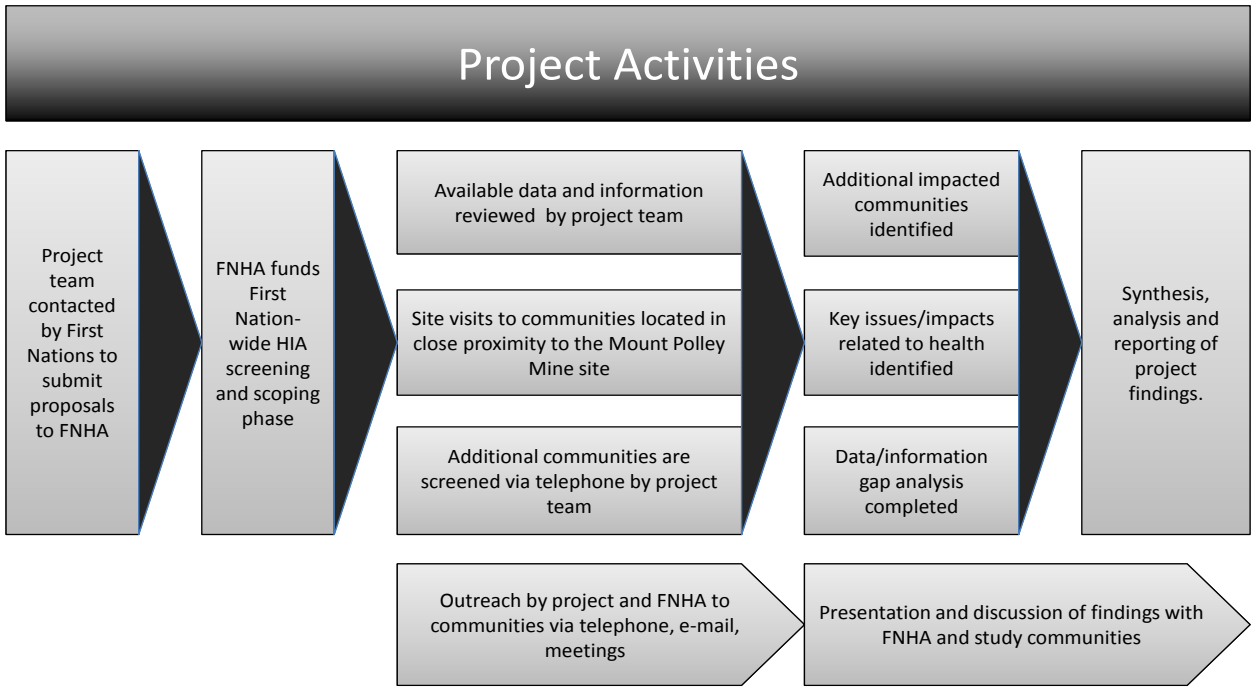


***Figure 1**. Mount Polley Mine HIA screening and scoping phase activities.*

### 2.2.1 SCREENING PHASE

Community involvement in the screening phase was based on the following criteria:

1. Direct impacts on traditional land and geographical location: The team selected communities where the community or traditional territory are located in close proximity to the Mount Polley Mine site and/or are situated along the Quesnel or Fraser Rivers;
2. Recommendations provided by the FNHA and FNHA Community Engagement Coordinators; and
3. Recommendations provided by First Nation leaders: For example, during the screening/ scoping phase, participants recommended the project contact a specific First Nation community for additional information.

In total, 47 communities (46 First Nation and one non-First Nation) were engaged in the screening phase of the Mount Polley Mine HIA. Using publically available online sources (e.g., community websites, documents, registries) and information provided by FNHA, the project team contacted First Nation health directors, chiefs, band councils, and health centre Administrators, or in the absence of specific contact information, the band administration by phone and/or email. The researchers used the telephone as their preferred method for contacting communities, when numbers were available, often leaving messages and having to make follow-up calls. E-mails included an overview of the project, briefing note, flow chart describing project activity, and contact information for the project lead (Dr. Janis Shandro). The research team provided additional information about the project to First Nations that responded to the initial contact and then carried out screening interviews with First Nations that wanted to participate.

During the screening phase, the research team developed a basic screening instrument to identify communities potentially impacted by the Mount Polley Mine tailings breach. The screening instrument contained a short set of questions on potential impacts (e.g., impacts to personal fishing practices, commercial fisheries, traditional land use) stemming from the Mount Polley event. The research team administered the screening instrument by telephone with a First Nation representative. Table 3 shows the total number of communities identified, contacted, those that responded and completed the screening phase interview administered by the project team.

***Table 3**. First Nation communities identified and participation rates during project-specific activities.*

| Screening phase project activities | Count | Percentage (%) |
|---|---|---|
| Total number of First Nation communities identified by project team | 47 | 100 |
| Number of communities contacted directly by research team via telephone or e-mail | 44 | 94 |
| Number of communities that responded to request for project participation | 23 | 49 |
| Number of communities that completed screening interview | 22 | 47 |

As the table shows, the project team was unable to find publically available contact information for three of the original 47 communities identified. Out of the 44 communities that were contacted by the project, 23 responded (a 49% response rate). After receiving project-related information, only one First Nation community did not complete the screening interview. Altogether, 22 communities completed the screening interview administered by the project team.

### 2.2.2 SCOPING PHASE

The scoping phase organizes diverse, often fragmentary, evidence into a coherent framework to enable the research team to identify potential health risks and impacts related to the Mount Polley tailings dam breach and in ways specific to each community. This involved a review of available data, a site visit including interviews, focus groups, and observation. A subsequent gap analysis determined the needs for further baseline data collection.

#### REVIEW OF AVAILABLE DATA

Prior to the scoping site visit, the investigation team reviewed and organized available data on the Mount Polley tailings dam failure (See *Appendix A* and *References* at end of report for a full list of sources). These data included: community demographic and health information for First Nation communities (e.g., Aboriginal Affairs and Northern Development Canada community data), project-related documents for the Mount Polley tailings dam breach (e.g., environmental reports, academic studies, press releases) and water and fish sampling studies.

#### SITE VISIT

Dr. Janis Shandro and Dr. Mirko Winkler led the fieldwork from October 11 to 21, 2015. The field work consisted of interviews with key informants focusing on the key impacts/issues associated with the Mount Polley tailings dam failure and their effects on individuals and on the community. To provide additional insight into socio-cultural aspects and to support local capacity development, local coordinators assisted with the research, facilitating site visits (organizing and facilitating key informant interviews and group discussions) and gathering locally available data.

During the site visit, the team held interviews using a grounded theory approach (Corbin & Strauss, 2008) with purposefully selected key informants from the heath and natural resource sector. Informants selected were directly involved in health service provision or natural resource monitoring for the communities visited and were identified with support of the community-based coordinators and other interviewees. During the interviews, key-informants were asked to provide their perspective on community and individual-level health impacts linked to the Mount Polley tailings dam. The team also participated in Nation Assembly meetings, Chiefs' meetings, Chief and Band Council meetings, lunches with Elders, facilitated a community forum, and had key informant interviews with health directors, natural resource directors and other related officials. The scoping phase focused on the communities closest to the Mount Polley Mine area of direct impacts and also involved several First Nation communities on the Fraser River. Table 4 details the date and community visited by the project team.

***Table 4**: Scoping phase site visits by date and community.*

| Date of site visit by project team | Community |
|---|---|
| October 12, 13 & 21, 2015 | Xaxli’p First Nation |
| October 13 & 21, 2015 | Sekw’el’wás First Nation |
| October 13, 2015 | T’it’q’et First Nation |
| October 13, 2015 | Tsal’alh |
| October 13 & 21, 2015 | Xwisten First Nation |
| October 13, 20 & 21, 2015 | T’exelcemc |
| October 14, 2015 | Yunesit'in Government |
| October 14, 2015 | Xeni Gwet’in First Nation |
| October 15 &16, 2015 | ?Esdilagh First Nation |
| October 15, 2015 | Tl'etinqox First Nation |
| October 15, 2015 | Tl'esqox First Nation |
| October 15, 2015 | Tsi Deldel First Nation |
| October 16 & 20, 2015 | Xat’sull First Nation |
| October 17, 2015 | Lhtako Dene First Nation |
| October 17 & 21, 2015 | Stswemecem'c Xgat'tem |
| October 18, 2015 | Likely |
| October 21, 2015 | Esk’etemc First Nation |

# 3. FINDINGS

This section begins with the current state of knowledge in the fields of Aboriginal Health and the intersection between Aboriginal Health and the extractive sector, with a focus on BC. Community-specific situational analyses developed as part of the scoping phase fieldwork are presented to ground identification of the key issues associated with the Mount Polley Mine tailings dam failure relevant to health. This section provides a framework for the discussion of impacts and risks that follows. The following section summarizes all impacts experienced by communities to date and is followed by a more detailed analysis of potential health outcomes that are associated with these impacts. This section concludes with a gap analysis of available data related to impacts reported during the scoping phase.

## 3.1 ABORIGINAL HEALTH

BC is arguably one of the country's most diverse provinces. The province is home to 201 First Nations speaking 32 First Nation languages (representing 60% of First Nation languages in Canada) with 59 dialects (First Peoples' Heritage, Language and Cultural Council, 2010).

From an Aboriginal perspective, health calls for attention to the interconnectedness of mental, physical and spiritual domains, encourages focus on the child, and requires support from family and community (Loppie Reading & Wien, 2009). However, cultural differences exist among Aboriginal communities and therefore, how these groups define health may vary (FNHA, 2013).

Compared to the general population of Canada, poor health outcomes (e.g., lower life expectancy, higher rates of mental disorder, diabetes and child mortality) are more likely among the Aboriginal population (Booth and Skelton, 2011; Speldewinde, Cook, Davies & Weinstein, 2009). Factors that influence health outcomes and/or perpetuate health inequities experienced by Aboriginal communities in Canada can include:

- Adverse impacts on local physical environments;
- Dispossession from traditional territories;
- Loss of land and access to traditional food sources (food insecurity);
- Limited access to health services;
- Unemployment and lack of educational and training opportunities;
- Poor community infrastructure, resources and capacities, environmental stewardship and cultural continuity;
- Ongoing impacts of a history of colonialism, racism and social exclusion; and
- Lack of self-determination and self-government (Loppie Reading & Wien, 2009).

Evidence-based research focused on the unique experience of First Nation groups in Canada consistently reports linkages between social, cultural and land-use determinants to health outcomes (Chandler & Lalonde, 1998; Kants, Vertinsky, Zheng & Smith, 2013). These determinants have strong linkages with resource development.

## 3.2 THE LINKAGES BETWEEN ABORIGINAL HEALTH AND RESOURCE DEVELOPMENT

The consequences of resource development from a First Nations perspective have been examined in the BC context. Major concerns linked to natural resource development include: negative impacts on land, wildlife and culture, reduced security of traditional foods, challenges with economic planning leading to increasing economic vulnerability in communities, lack of adequate training/capacity/education to enable effective management of impacts, and the need for mechanisms to increase opportunities; for example, meaningful employment with extractive projects to help de-

crease reliance on government support programs. (National Aboriginal Health Organization, 2008; Booth and Skelton, 2009; Harvard Law School, 2010; Shandro et al., 2014; Jokinen et al., 2015).

The intersection between environmental change, socio-economic conditions and Aboriginal health is complex. Researchers recognize that the Aboriginal population in Canada is vulnerable to changes in environmental and socioeconomic conditions stemming from resource-development projects. Increased vulnerability is primarily due to ongoing adverse cultural impacts of colonialism and subsequent assimilation practices endured for more than 150 years (Veland, et al., 2012).

One key pathway for negative health outcomes for Aboriginal People is environmental dispossession, which is defined as the processes by which the access of Aboriginal Peoples to the resources in their traditional environments is reduced (Richmond & Ross, 2009). According to Cunsolo et al. (2013), First Nations' "identity, conceptions of the self, and mental wellness is directly and intimately linked to the environment, and to the ability to hunt, trap, fish, forage, and travel on the land and continue to practice cultural traditions related to being 'on the land'" (p. 260). Positive health outcomes (e.g., improved diet, exercise, increased self-esteem, improved mental health) were reported when individuals engaged in land-based activities (Burgess, Johnson, Bowman & Whitehead, 2004; Shandro et al., 2014; Jokinen et al., 2015). In contrast, a wide range of negative health outcomes were associated with changes in the environment. When Aboriginal access to land was restricted, studies reported increases in mental health stressors, family stress, substance use, suicidal ideation, and prevalence of cardiovascular disease (Cunsolo et al., 2013; Dillard, Smith, Ferucci & Lanier, 2012; Gibson & Klinck, 2005).

Environmental dispossession can also limit access to traditional food sources. For First Nation communities, especially for those in rural and remote areas, the consumption of traditional food is directly linked to positive health outcomes. Not only is traditional food a fundamental source of nutrients, the collection of traditional food also provides social and cultural benefits for individuals, families and communities (Nagy, 2010). Limited access to the physical environment and decreased personal knowledge/skills related to food harvesting reduces consumption of traditional food, leading individuals to rely increasingly on store-bought food or government-sponsored food programs. When accessing non-traditional foods in stores or through government programs, the risk for cardiovascular disease increases due to increased consumption of unhealthy food (Mitchell, 2012; Richmond & Ross, 2009).

Natural resources development also impacts the socioeconomic condition of communities and their residents. Evidence "tends to support the 'poverty in the midst of plenty' thesis. Indeed, previous studies show that many Indigenous communities remain disengaged from nearby resource projects, and therefore remain impoverished despite rapid resource industry growth during the past decade" (Tonts, Plummer & Lawrie, 2012, p. 299). Although earning potential may improve in association with resource-development projects, unequal distribution of income and resources can prevent First Nation communities from experiencing socioeconomic (and subsequent health) benefits. The following socioeconomic issues have been identified as creating negative impacts on the health of First Nation communities: short-term economic planning increasing economic vulnerability in communities, higher costs of living for residents through increased goods and services, and an increased strain on housing availability and health service providers due to an influx of non-resident workers (Hossain, et al., 2013; NAHO, 2009).

## 3.3 **SCREENING PHASE FINDINGS**

Results from the screening phase highlighted the extent of impacts experienced by First Nation communities throughout the province. For example, communities from as far south as T'eqt'aqtn'mux First Nation, to the north in Tl'azt'en Nation, reported community-level impacts from the Mount Polley Mine tailings dam breach. The majority of communities reported impacts to personal fishing practices, increases in emotional stress and inter-community tension.

Traditional fishing areas were avoided by some communities, due to their connection to the Fraser River system. As a result, members of these communities reportedly travelled further distances to catch fish for the season. In other communities, such as T'eqt'aqtn'mux First Nation, leadership proactively encouraged members to fish following the Mount Polley Mine tailings breach. Based on a cost-benefit assessment, the health impacts that would result if community members ceased fishing outweighed the potential concerns leadership had regarding the safety of consuming fish from the Fraser River.

Results of the additional screening phase also highlighted the extent of post-breach emotional stress at the community level. For instance, the Nak'azdli Band (near Fort St. James) described an intense emotional response associated to the tailings dam failure and health service providers noticed increases in anger, sadness, fear and confusion among band members. The uncertainty surrounding the event and the potential irreversible impacts to the environment were described as deeply concerning. Another major impact was increased inter-community tension, in particular the actions, motivations, decisions and/or mitigation measures of one First Nation being questioned and critiqued by another.

Overall, the screening instrument provided preliminary data indicating potential community-level impacts related to the Mount Polley tailings dam breach and the extent of impacts, experienced by First Nation communities throughout BC. Additionally, the process helped establish scoping interview questions.

## 3.4 **COMMUNITY-SPECIFIC SITUATION ANALYSIS**

These community-specific situation analyses are presented to show the grounded information used to identify the health determinant 'themes' and groupings laid out in the general findings section (Section 3.6) and to highlight the similarities and differences across study communities. The flow is from the individual community level to the patterns of impacts among communities and then to overall findings. Readers wishing to begin with the overall findings should turn to Section 3.6.

The findings identify the themes that emerged from the interviews and observations of the project team during the site visits (see Figure 2 for geographical locations of communities included). The lack of specific attribution of the findings throughout the situational analysis should not be construed to mean that the issues are the project team's opinion. All statements in the situational analyses are derived from a systematic process of gathering and reporting on qualitative data on community perspectives raised in interviews and meetings.

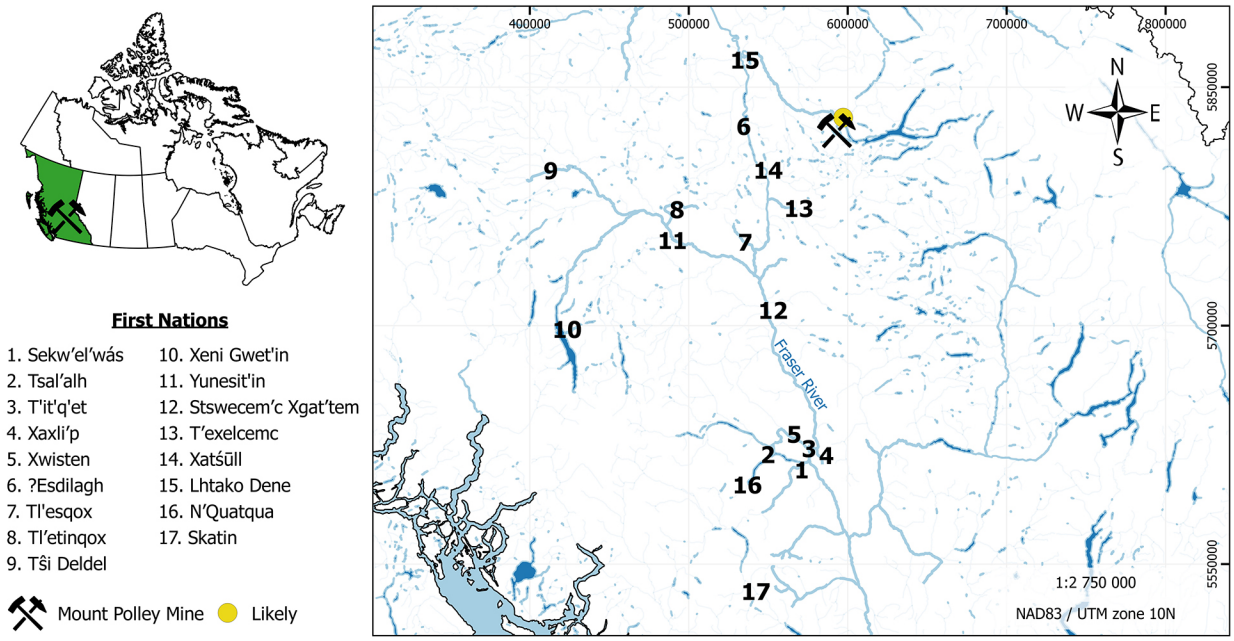


***Figure 2**. Geographical locations of communities included in scoping phase activities.*

### 3.4.1 FIELDWORK FINDINGS SPECIFIC TO THE LILLOOET TRIBAL COUNCIL REGION

The Lillooet Tribal Council (LTC) represents seven First Nation communities in the Lillooet area, approximately 200 km south of the Mount Polley Mine. While LTC communities are south of the dam failure site, the key connection between the LTC and the Mount Polley tailings breach is the centrality of the Fraser River salmon fishery to LTC livelihoods, culture, social cohesion and overall community well-being.

Communities governed by the LTC have a traditional relationship with the Fraser River and its tributaries and associated salmon species. Fishing on the Fraser has been ongoing for generations and is a major part of their life. Culturally, it is a festive occasion providing the basis for a series of community gatherings that underpin community cohesion and reaffirm values. Fishing, fish processing and preserving are also important times when elders share their knowledge of cultural practices with youth. Economically and nutritionally, fishing represents a critical source of protein for LTC members, with households requiring an estimated 100 to 300 fish to last a year. With lower than average income in the LTC, many community members cannot afford to buy alternative foods, nor do they have access to a local substitute.

LTC community leaders and members express serious concerns over the health of the Fraser and its salmon for two reasons: first, their lives are intrinsically linked to salmon fishing for nutritional and cultural purposes; and second, they have observed impacts to the salmon over the past 20 to 30 years that they attribute to increased commercial fishing closer to shore, increased water temperatures, low water levels, industrial effluents and other uses of the Fraser River. Findings from a report for the 2011 Commission of Inquiry on the Decline of Sockeye Salmon in the Fraser River suggest there is a strong possibility that exposure to contaminants of concern and/or emerging concern and endocrine-disrupting chemicals contributed to the observed decline of sockeye salmon in the Fraser River over the past 20 years (MacDonald et al., 2011).

During the scoping phase, the project leads visited LTC fishing locations and learned about traditional fishing practices used by LTC communities. Community leaders also invited them to attend

a Nation Assembly in T'it'q'et on October 13, 2015, and facilitated a community forum to explore community understandings of the impacts and risks of the Mount Polley tailings breach at the P'egp'ig'lha Community Centre on October 21, 2015. It is important to note that during fieldwork, there was a violent attack on Xwisten Indian Band employees, which impacted Xwisten participation in the community forum.[4] Overall, the researchers engaged with representatives from five of the seven LTC communities (Sekw'el'wás First Nation, T'it'q'et First Nation, Tsal'alh First Nation, Xaxli'p First Nation and the Xwisten Indian Band) during fieldwork.

Population and household data for these communities identify a range of on-reserve community sizes from approximately 74 individuals to more than 250, with total populations (including off-reserve members) ranging from approximately 200 to more than 2,100 (please see Table 5). All of these individuals hold rights to fish on the Fraser River for food, social, and ceremonial purposes under communal fishing licences.[5]

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| Lil'wat First Nation | 748 | 689 | 1437 | 435 | 2176 |
| Sekw'el'wás First Nation | 39 | 35 | 74 | 35 | 197 |
| T'it'q'et First Nation | 93 | 90 | 183 | 110 | 423 |
| Tsal'alh First Nation | 131 | 123 | 254 | 100 | 681 |
| Ts'kw'aylaxw First Nation | 105 | 92 | 197 | 45 | 558 |
| Xaxli'p First Nation | 134 | 127 | 261 | 100 | 1030 |
| Xwisten Indian Band | 95 | 103 | 198 | 85 | 456 |

***Table 5**. Population and household characteristics for Lillooet Tribal Council First Nations (Aboriginal Affairs and Northern Development Canada (g-n), 2011-2015).*

Community leaders learned about the Mount Polley tailings dam breach from Facebook, the media, and by word of mouth immediately after it happened. Community leaders and members report that they received no contact from Imperial Metals Corporation or provincial (Ministry of the Environment, Ministry of Energy and Mines) or federal authorities (Department of Fisheries and Oceans, Environment Canada) in the aftermath of the dam failure. To date, LTC members report they have received no information regarding the incident, remediation efforts and the safety of salmon for consumption from the above entities.

With a lack of information in regard to the contents of the tailings waste and extent of the environmental impact, some community leaders took a precautionary approach to protect the health of their community members and closed their fisheries. Of the five communities engaged, Xwisten said it had left its fisheries open, while the remaining communities reportedly closed fishing down to their members for food, social and ceremonial purposes.

Responses to the closures by community members varied; at one end of the spectrum, the lack of trustworthy information led many LTC households to avoid fishing, so that they had to rely on salmon caught in previous years or had to consume other foods to compensate for the reduced

*[4] This incident was unrelated to this project.*

*[5] Aboriginal Communal Fishing Licences refer to fishing for food, social, or ceremonial purposes. These licences are managed under the Aboriginal Communal Fishing Licenses Regulations enabled by the Fisheries Act and administered by Fisheries and Oceans Canada (Fisheries and Oceans Canada, 2013).*

amount of salmon. At the other end of the spectrum, fishing was still impacted in communities that kept the fishery open, with many community members reporting that they had not fished for fear of contamination of the salmon. One elder reported that her family decided to stop fishing because of kidney problems in the family. This decision rippled through her family, leaving children and grandchildren with no fish. Some people explained that they had sought alternative sources of fish, including trout in lakes and rivers that were unaffected by the spill, as a result of the closure of the fisheries and fear of contaminated fish.

After the breach, the LTC/Fraser River communities held a Special Fisheries technical meeting on September 24, 2014, at which the First Nations Health Authority presented an update on the salmon-testing program it initiated shortly after the dam failure. The information and data provided from the FNHA program have been the most trusted source of information so far, although community members express concern that the program has not been extensive enough. For instance, a key concern of the LTC community is: "What will happen in three years when the salmon return? Are those salmon safe to eat?"

After the breach, people and administrative structures responded in a variety of ways to access information: community members and administrative personnel financed trips to information events in northern communities to learn about the impacts and extent of the dam breach; administrative bodies raised the importance of the issue with various government and health authorities. Although initially there was a lack of data, community leaders are now overwhelmed by a large volume of technical and other reports, which they find difficult to assess in terms of validity and trustworthiness.

The Mount Polley incident has heightened a growing awareness of the declining health of the Fraser River and its salmon. There was a strong emotional reaction to the event – "This is the beginning of the end of us." – and there are many reports of community members breaking down in tears as they spoke about the state of the Fraser River after Mount Polley. Even now, almost one and a half years after the tailings spill, leaders are still responding to ongoing questions and concerns from community members about fishing and the consumption of salmon.

The loss of fish is critical to the Lillooet First Nations as it impacts on all aspects of their life. For LTC members, salmon is not easily replaced. Grocery stores in the region carry canned salmon and salmon fillets. The replacement cost of whole salmon represents an untenable economic burden for most households. Based on local prices,[6] a salmon costs approximately $20.00 (pink) and $45.00 (sockeye). Given the high levels of salmon consumption, total replacement cost of salmon for the year would be between $4,000 and $9,000 per household, depending on the type of salmon purchased. Assuming every household on reserve (430 for participant LTC First Nations) in each of the five communities engaged consumes an average amount of salmon (i.e., 200 fish/year), total replacement cost is estimated in the range of $1.7 million to $3.8 million.

In addition to the loss of salmon as food, a halt to fishing also led to the loss of fishing, processing and preserving salmon, which are important physical, social and cultural activities. The traditional way LTC members preserve salmon requires it to have a specific fat content that is dependent on the distance the salmon have travelled up the Fraser River. The replacement value of this type of

*[6] In November 2015 researchers surveyed prices in Lillooet grocery stores and determined that only one grocery store carried frozen salmon. The cost for salmon depended on the species: for pink salmon a whole fish (average weight 2.0 kg) was estimated at $18.44 (based on a price of $9.22/kg). A whole sockeye salmon ($22.00/kg and weighing an average of 2.0 kg) would cost $44.00.*

salmon cannot be quantified, as such fish are not available, and this also means replacement fish cannot be preserved using traditional methods.

In the short term, LTC leadership needs trustworthy information about the safety of salmon consumption on an ongoing basis, so that it can provide accurate information to community members. Leaders also need authorities to understand their information requirements in situations that might affect, or be perceived to affect, the Fraser River and salmon fishery to ensure effective communication in any subsequent incidents or releases.

For the longer term, the leadership highlights an urgent need to address the multiple and cumulative impacts to the Fraser River system and call for an integrated risk assessment leading to the development of an effective management program for the entire Fraser River system. For example, the LTC believes three or four dams within their territory show evidence of the need for maintenance. Finally, the LTC is concerned over the re-opening of the Mount Polley Mine without an impact assessment. There is potential for intra-community tension, as many First Nations use the Fraser for fishing and other practices while others are viewed as having an interest in the re-opening of the mine due to employment opportunities and revenue sharing. Their position, as rights holders, is that there needs to be collective responsibility to ensure unified agreement on acceptable uses and practices on the Fraser River to protect the interests and rights of all. Table 6 provides a summary of key issues and impacts related to the Mount Polley tailings dam breach for participating Lillooet Tribal Council communities.

***Table 6**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported by Lillooet Tribal Council communities.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Community and reported impacts/key issues experienced | | | | |
|---|---|---|---|---|---|
| | Sekw'el'wás First Nation | T'it'q'et First Nation | Tsal'alh First Nation | Xaxli'p First Nation | Xwisten Indian Band |
| Failed to receive information in timely manner about the Mount Polley tailings dam breach from the responsible parties or from representatives of the Government of Canada. | X | X | X | X | X |
| Distrust in received information on Mount Polley Mine breach | X | X | X | X | X |
| Increased administrative burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X | X | X | X | X |
| Decreased/discontinued traditional land use activities | X | X | X | X | X |
| Decreased/discontinued personal fishing practices | X | X | X | X | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | | | | | |
| Emotional stress | X | X | X | X | X |
| Increased intra-community tension | X | X | X | X | X |
| Increased inter-community tension | | | | | |

### 3.4.2 FIELDWORK FINDINGS SPECIFIC TO THE LHTAKO DENE NATION

The Lhtako Dene Nation is a small First Nation with communities located approximately 85 km directly downstream from the Mount Polley Mine site. They access seasonal salmon fishing in the Quesnel River. The Lhtako Dene are part of the Carrier Chilcotin Tribal Council and the nation has four reserves, with two residential communities. The largest community is Red Bluff (Quesnel Indian Reserve No. 1) situated one mile south of Quesnel and close to other three reserves: Dragon Lake, Rich Bar, and Sinnce-Tah-Lah (First Peoples Heritage, Language and Culture Council, 2010). Lhtako Dene's traditional territory borders the Northern Secwepemc people to the south, the Nazko people to the west, the Tsilhqot'in people to the southwest, and the Lheidli Tenneh people to the north. Based on extensive historical records and oral historical accounts, the Lhtako Dene's claim to exclusive ownership of the land and resources within their territory is well established. Their territory, located along the Fraser River, extends from above the West Road (Blackwater) River to below ?Esdilagh, including the Quesnel River and the north arm of Quesnel Lake (Moore & Wheelock, 2011). As displayed below in Figure 2, both Quesnel River and Quesnel Lake were identified as remediation areas by the Mount Polley Mine after the tailings dam failure (Mount Polley Mining Corporation, 2015).

Traditional activities are at the centre of livelihoods and cultural life for the Lhtako Dene Nation. Salmon and wild game are identified as an important dietary component for community members, accounting for approximately 40% of the total protein consumed by on-reserve members. Community members report that, on average, each household consumes 200 to 300 fish per year. Fishing also represents an important cultural and social activity that reconnects community members on an annual basis. These activities revolve around cutting, drying and preserving salmon, and are critical for cultural continuity, strengthening bonds and revitalizing the community every year. Fishing season is viewed as a time of new life for the community and younger generation. Leaders also report that the Quesnel Lake and River and the Fraser River are important hunting, traditional medicine and berry-harvest areas for Lhtako Dene. The Lhtako Dene collaborate

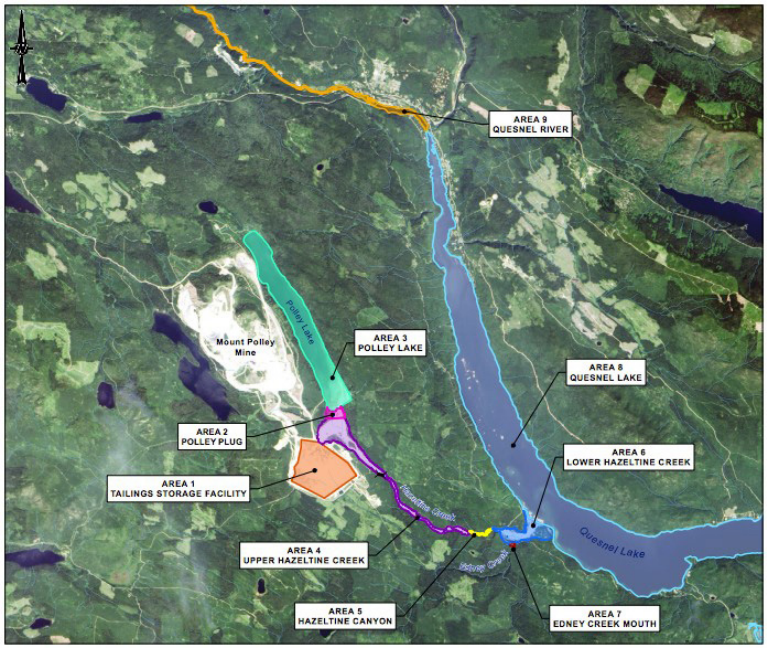


***Figure 3**. Mount Polley Mine site and impact zone (Mount Polley Mining Corporation, 2015).*

closely with the Nazko First Nation, sharing fishing locations and resources with them.

In total, 69 members (29 males, 40 females) live on-reserve and there are 30 households (see Table 7). Also, a number of individuals who do not live within the community continue to engage in cultural practices on the traditional territory of Lhtako Dene Nation, with a total registered population living on and off-reserve of 174 (Aboriginal Affairs and Northern Development Canada, 2011-2015).

***Table 7**. Population and household characteristics for select Lhtako Dene Nation (Aboriginal Affairs and Northern Development Canada (q), 2011-2015).*

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| **Lhtako Dene Nation** | 29 | 40 | 69 | 30 | 174 |

During the scoping phase, the project leads met with community leaders to develop a deeper understanding of the relationship between Lhtako Dene and the Mount Polley Mine and to identify any potential impacts. Community leaders/members reported that the late Chief Frank Boucher Jr. from Lhtako Dene had expressed deep concerns regarding impacts from the development of the Mount Polley Mine on their nation during initial community meetings prior to the mine opening. The current Lhtako Dene leadership is particularly concerned about the Mount Polley Mine tailings dam failure, as their communities are located directly downstream from the mine site and since the failure, they have observed direct impacts on their asserted traditional territory and experienced impacts on food security and traditional practices.

Immediately after the Mount Polley tailings dam breach, community leaders and members learned about the Mount Polley Mine spill through radio and television broadcasts and internet news sources. The Union of Indian Chiefs also notified leaders from Lhtako Dene about the incident via e-mail. According to participants, Imperial Metals Corporation did not contact, inform or consult directly with the Lhtako Dene Nation regarding the tailings spill. To acquire additional information about the Mount Polley dam failure, community members traveled to Likely, BC, at their own expense to attend meetings organized by Mount Polley or the BC Ministry of Environment.

Regular attendance at these meetings was not always possible, as they were often scheduled during the evening and Likely is a two-hour drive from Lhatko Dene communities. During the scoping phase, the team learned that the chief was unaware that Mount Polley had restarted operations in June 2015, when they shared this information. This highlights the ineffective communication between the Mount Polley Mine and the Lhtako Dene Nation during the post-spill period.

Lhatko Dene Nation leaders and members report that cultural practices essential for maintaining health and well-being were impacted following the Mount Polley Mine disaster. Immediately after the tailings breach, the nation closed down the main fishing camp and recommended community members refrain from fishing. To address the fish shortage, participants received canned salmon from Xat'sull First Nation and the Williams Lake Indian Band using funds provided by the provincial government. In addition, 400 salmon caught in the Chilko River (part of the Tsilhqot'in National Government's traditional territory) were distributed among community members. The financial cost, including transport, boat rides and purchase price for each Chilko River salmon ($3 to $5 per fish), was paid by the Lhtako Dene Nation. These efforts were not enough to offset the fish short-

age, as fresh salmon from the Chilko River amounted to 13 to 14 fish per household and canned salmon were distributed preferentially to vulnerable households. This left a significant shortfall compared with the typical level of salmon consumption, and community members reported that there was not enough salmon to last through the winter of 2014. The replacement cost of salmon is not feasible for most Lhtako Dene members to pay. Additionally, community members reported impacts to traditional practices related to salmon fishing, preparation and preservation. For example, during the spring, cultural practices related to fishing provide the opportunity for community members to reconnect. Due to the impacts on the numbers of salmon fished stemming from the Mount Polley Mine incident, fishing, preparation and preservation activities did not occur.

One year later, community members continue to report impacts on fishing practices. Prior to the dam breach, 10 to 15 community members would be fishing every day during the fishing season, beginning in August. In 2015, only four to five community members were fishing on a regular basis. Community members continue to report concerns about the safety of the salmon for consumption. As a result, the consumption of salmon, which community members recognize as an essential source of protein, has decreased since the Mount Polley Mine incident.
Community members also raised concerns about the health of wildlife in hunting areas along the Quesnel and Fraser Rivers, where community members hunt annually. For example, they expressed concerns over the impact of the Mount Polley incident on wildlife (particularly moose, deer and beaver) that are exposed to, and consume, water that has come in contact with mine tailing waste. Hunters have observed changes in the physical condition of hunted meat over the past decade, such as brown masses/lesions under the skin, and potential parasitic trails along the underside of moose skins hunted near the Mount Polley Mine area. Lhtako Dene leaders are concerned about long-term health impacts for community members of broader environmental impacts from the mine as well as, potential impacts as a result of the Mount Polley tailings spill. They have requested increased monitoring of cancer rates in the community as there have been reports of increased chance-incidence rates in other communities exposed to mine waste.

Finally, the Lhtako Dene Nation is concerned about the wider implications of the Mount Polley Mine tailings dam failure in respect to ongoing impacts on the water, land, and environment, which they see as irreversible. As a small First Nation community whose identity, health and well-being is linked directly to the traditional land, the presence of the mine, the lack of environmental impact assessment, the expansion of the mine and then the tailings spill have led to fear, stress and uncertainty for community members. Within their traditional territory, there is also a proposed mining project and the Lhtako Dene have no formal impact benefit/participation agreement with any project operating on their traditional lands, including the Mount Polley Mine. They are concerned that stress on the Fraser River system from multiple effluent sources and the presence of fish farms may have serious implications on the viability of salmon. As a top priority, community members identify the need for reliable information reporting on the health of the Fraser River. Their concerns stem from negative changes recently observed in the condition of salmon, including the presence of long white worms within the flesh and lesions on the outer skin. In addition, leadership supports conservation initiatives. For example, to protect the Stewart River salmon run, they refrained from fishing to protect it for First Nations people further north. From a community health perspective, understanding the importance of the Fraser River, viability of salmon and effective conservation planning that to protects the river and fish is a priority for this First Nation. Table 8 summarizes scoping phase findings for Lhtako Dene First Nation.

***Table 8**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported by Lhtako Dene Nation.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Reported impacts/key issues experienced |
|---|---|
| Failed to receive information in timely manner about the Mount Polley tailings dam breach | X |
| Distrust in received information on Mount Polley Mine breach | X |
| Increased administration burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X |
| Decreased/discontinued traditional land use activities | X |
| Decreased/discontinued personal fishing practices | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | |
| Emotional stress | X |
| Increased intra-community tension | X |
| Increased inter-community tension | X |

### 3.4.3 FIELDWORK FINDINGS SPECIFIC TO THE NORTHERN SECWEPEMC TE QELMUCW (NSTQ)

The Northern Secwepemc te Qelmucw (NStQ), consists of four of the 17 Shuswap bands known as the Secwepemc Nation: the Stswecem'c/Xgat'tem (Canoe Creek), Xat'sull (Soda and Deep Creek) and T'exelc (Williams Lake) Nations that are part of this study, as well as the Tsq'escen' (Canim Lake) Nation. The combined traditional territory of the four nations comprises between 5,300,000 and 5,600,000 hectares, and is located in central British Columbia in the Cariboo Chilcotin Region. The NStQ membership population is more than 2,000 people. Known as "the people from where the water flowed", NStQ traditionally held jurisdiction and managed large tracts of the Fraser River and the surrounding area and watersheds (Northern Shuswap Tribal Council, 2015). In total, three NStQ communities participated in the scoping phase fieldwork including the Stswecem'c Xgat'tem First Nation, the T'exelcemc First Nation and the Xat'sull First Nation. Below is a summary of findings specific to each.

#### FINDINGS SPECIFIC TO STSWECEM'C XGAT'TEM FIRST NATION

The Stswecem'c Xgat'tem First Nation is located southeast of Williams Lake, British Columbia, along the east side of the Fraser River. Prior to the smallpox epidemic in 1862, Stswecem'c Xgat'tem was comprised of two distinct bands (Canoe Creek and Dog Creek). Due to the dramatic decrease in population during the late 1800s, the two bands combined to form one nation. Although these two communities are still extant, the Stswecem'c Xgat'tem band office governs both.

Stswecem'c Xgat'tem are members of the Northern Secwepemc te Qelmucw (NStQ) (Stswecem'c Xgat'tem, 2015). The Mount Polley Mine is located in the NStQ's traditional territory. The total population of Stswecem'c Xgat'tem is more than 774 individuals with 253 members (141 males, 112 females) living on-reserve in 75 households (Table 9). While many individuals no longer live on-reserve, the majority of band members continue to engage in traditional practices including fishing on the territory of Stswecem'c Xgat'tem, coming back for important events and to visit family and friends.

***Table 9**. Population and household characteristics for Stswecem'c Xgat'tem First Nation (Aboriginal Affairs and Northern Development Canada (r), 2011-2015).*

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| **Stswecem'c Xgat'tem** | 141 | 112 | 253 | 75 | 744 |

Traditional activities, including fishing and other food-harvesting activities, play a critical role in food provision for the Stswecem'c Xgat'tem: they are essential for maintaining food security among on-reserve members. As a remote First Nation, the nearest full-service grocery store is a two and a half hours drive from the community along a steep, winding, gravel road that is impassable during bad weather. Traditional and self-sufficient food-harvesting and hunting practices are not only important due to their influence on diet, they also provide shared activity, social cohesion, play an important role in maintaining a sense of identify and represent a physical manifestation of culture. For example, members of this First Nation have utilized traditional fish processing activities and specific fishing sites for countless generations.

Stswecem'c Xgat'tem members estimate each on-reserve household requires approximately 200 fish per year to meet dietary needs. Fishing also provides a vehicle for increasing physical, mental and spiritual health for members of the Stswecem'c Xgat'tem. In order to fish, community members walk to the river through steep, technically difficult terrain, engage in the physical activity of fishing itself and spend time on their traditional land, which provides a deep sense of connection to their identify and culture and enhances their emotional wellbeing.

During fieldwork, the project leads interviewed the Stswecem'c Xgat'tem health and food security leaders, who reported that, on the day the tailings dam breached at the Mount Polley Mine, community members from Stswecem'c Xgat'tem had just began the 2014 fishing season. A group of youth, adults and elders were on the river fishing, when they received notification about the breach from the media, from community members who were mine employees and through information from NStQ. Leaders described that initial reports contained no information regarding the safety of the Fraser River, the potential impacts on salmon entering Stswecem'c Xgat'tem fishing areas and potential human health risks of salmon consumption. Given the proximity of the fishing areas to the spill and the lack of information, Stswecem'c Xgat'tem leaders responded by advising community members to cease fishing immediately.

The limited information available to the community about the short- and long-term environmental impacts associated with this type of event significantly increased the emotional impacts experienced by community members. Grave concern was felt by the community at large, with members reporting feeling they had "lost a part of who they are". Youth have made videos and posted them on the health centre's Facebook page to highlight their concern for the Fraser River, the salmon and the impacts of the Mount Polley Mine incident. The cessation of fishing also had reported social consequences; fishing represents an important time that contributes to community cohesiveness through both the activity itself and the distribution of fish to vulnerable community members who were unable to fish for themselves. As a result of the breach, the cessation of fishing reduced opportunities for community members to connect and socialize.

As a result of the Mount Polley Mine tailings dam breach, Stswecem'c Xgat'tem experienced a fish shortage. To address this, every household received five donated fish in 2014 from XFN and

WLIB. A food program that stored 8,000 potatoes helped alleviate a portion of the food insecurity within the community. Additionally, community members reported an increase in traditional hunting activities in an effort to replace lost salmon protein. In 2015 (the year following the spill), each household received 24 tins of canned fish, also from XFN and WLIB. At the time of the work in October 2015, just under one and a half years after the tailings spill, a few members from the community had decided to start fishing again, but many still questioned the safety of consuming the fish and reported they were not fishing. Community members express mistrust particularly in relation to information about the Mount Polley Mine tailings breach provided by the company and the provincial government. The community received fish-quality data from the FNHA in 2014, but members feel additional data is needed to provide a clear rationale for them to resume fishing practices. They believe ongoing testing of fish rather than just of water is needed in light of the close interactions of salmon with sediments in the spawning ground and their understanding of the cycles of turn-over of water and sediments in the spawning lakes. They question whether acceptable thresholds of contaminants in salmon would take into account the high levels of salmon consumption in their community and they do not have enough information to understand what the relationship between water-quality data and salmon health might be.

Finally, since the Mount Polley tailings dam failure, the Stswecem'c Xgat'tem report increased conflict within families and among the distinct First Nation communities impacted by the event. Leaders report tension between family members who are employed by the mining sector and those who are not. In addition, they describe developing inter-community tensions around the agreement and decision-making processes in relation of the extractive industries, with the Stswecem'c Xgat'tem questioning the validity of these processes. Table 10 summarizes findings from the scoping phase for Stswecem'c Xgat'tem.

***Table 10**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported by Stswecem'c Xgat'tem First Nation.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Reported impacts/key issues experienced |
|---|---|
| Failed to receive information in timely manner about the Mount Polley tailings dam breach | X |
| Distrust in received information on Mount Polley Mine breach | X |
| Increased administration burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X |
| Decreased/discontinued traditional land use activities | |
| Decreased/discontinued personal fishing practices | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | |
| Emotional stress | X |
| Increased intra-community tension | X |
| Increased inter-community tension | |

## FIELDWORK FINDINGS SPECIFIC TO T'EXELCEMC FIRST NATION (WILLIAMS LAKE INDIAN BAND)

T'exelcemc, also known as Williams Lake Indian Band (WLIB), is a member of the Secwepemc te Qelmucw, which is the largest nation within the interior of British Columbia. Secwepemc territory extends north of Shuswap Lake to Quesnel Lake and from west from Columbia-Kootenay Range to Alexis Creek Area (Williams Lake Band, 2015). The Mount Polley Mine is located directly within the traditional territory of T'exelcemc. In total, 230 members live on-reserve (105 males, 125 females) and there are 80 households (see Table 11). The total registered population for WLIB is 779 with many off-reserve members still accessing and using traditional lands (Aboriginal Affairs and Northern Development Canada, 2011-2015).

***Table 11**. Population and household characteristics for select T'exelcemc (Aboriginal Affairs and Northern Development Canada (o), 2011-2015).*

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| **T'exelcemc** | 105 | 125 | 230 | 80 | 779 |

During the scoping phase, the project leads visited WLIB and held interviews with natural resources staff, community leaders including the chief and council members, the health director, and held a forum on the topic during an elders' lunch.

The WLIB was directly impacted by the Mount Polley tailings dam failure. Pre-breach, the impact area was used by members of the WLIB to fish, hunt and gather. These practices are an inherited right among the T'exelcemc and are intrinsically linked to their culture, customs, traditions and values. For example, each year, the T'exelcemc travel to Quesnel Lake to engage in fishing practices that provides connection to their community, environment and a source of protein that can be consumed throughout the year. The lake itself is meaningful to the T'exelcemc, who regard water as one of their four sacred matters. It has been referred to as "the heart of our territory." Immediately after the dam failure, WLIB received initial information through word of mouth, media sources (e.g., television, radio) and text message. The impact of the breach had a major emotional impact on community members, who reported feeling "angry", "confused", "sad" and "shut down". The community received large numbers of Mount Polley-related media reports, yet was uncertain about future environmental consequences and whether this event would change its traditional way of life. Additionally, some community members were able to see the visual impact of the breach via helicopter, which further enhanced the emotional impact. Images of an area that was once described by T'exelcemc elders as a "beautiful, pristine wilderness" were unrecognizable due to the environmental damage. In response, the T'exelcemc launched an internal investigation. It was reported that two days after the breach, Imperial Metal Corporation (owner of MPMC) contacted the T'exelcemc via telephone to inform them about the dam failure.

As with the Stswecem'c Xgat'tem and Xat'sull First Nation (XFN), T'exelcemc was also present during the first Mount Polley Mine community meeting held in Likely. It was reported they did not receive information directly from the company regarding the meeting, but again, depended on their own information channels to receive the information. During the first month after the Mount Polley tailings dam failure, the T'exelcemc gave numerous phone interviews and were attending up to seven meetings per day. Representatives from the Mount Polley Mine and/or the provincial

government led meetings that were often described as inefficient, due to a lack of communication. As a result, it was reported that presentation material was often recycled and re-presented on a number of occasions. To date, the majority of the public meetings held in Likely are reported to have been organized by MPMC. One of the meetings (January 15, 2015) was organized by WLIB/XFN, whose consultants provided an overview of response activities to date and answered questions from Likely residents.

WLIB and XFN have shared information with the Northern Secwepemc te Qelmucw membership at a series of community meetings in 2015: February, March, April, June, August and December. The meetings are typically organized and facilitated by WLIB/XFN staff, although company and/or government representatives attend to give presentations, answer questions and provide updates and/or gather feedback from membership on specific permit applications. Thirty to 40 community members, mainly from WLIB/XFN, have attended each meeting, as well as band staff. In early November, MPMC arranged a site tour for interested community members.

The WLIB is deeply concerned about the impact on fish after the Mount Polley Mine breach and how the tailings breach will affect future runs. Local fish are an essential component of the T'exelcemc diet; approximately each household consumes 100 fish annually. During the summer months, community members catch enough fish to last them throughout the year. There is also an added socio-cultural value of fishing within the community, as members gather during the fishing season to socialize and renew connections to their community and culture. As mentioned, the tailings breach occurred during the fishing season, which reduced the number of fish caught for consumption, as well as future community events and gatherings associated with the traditional practice.

Immediately after the Mount Polley Mine tailings dam failure, WLIB members ceased fishing completely. Food insecurity became a major issue and the nation arranged for fish to be brought into the community through alternative pathways, including from other bands. Approximately 1,000 fish were distributed to each community. To cover the cost of bringing in the additional fish, capacity funds provided by the provincial government were used. In total, $10,000 was paid to cover the first installment of fish, which was distributed across four communities. However, the fish they received could not be dried, due to its high fat content, so an additional $45,000 was spent on canned fish, which was provided to nine communities. In 2015, community members who are unable to access store-bought/alternative food have started to fish again.

The T'exelcemc are concerned not only about impacts to fishing practices, but also long-term impacts on wildlife and environment. Although hunting practices continued throughout 2014-2015, community members were fearful that animals living in the area were drinking from contaminated water sources. In addition, certain plants are known to grow only around the area surrounding Quesnel Lake, so there has been a shift in the availability and diversity of specific plant product. For example, prior to the Mount Polley event, elders from T'exelcemc reported gathering plants from the impacted site to treat specific health conditions, but post-breach, these sites no longer exist. The emotional impact of this type of loss is deeply experienced by the T'exelcemc, who have now started questioning the health and safety of all plants gathered from the area.

During the scoping phase, it was reported that the Mount Polley Mine tailings breach also had an impact on community dynamics. Although the T'exelcemc have expressed empathy for neighbouring communities (e.g., Likely) that they fear are experiencing their own set of post-event challenges, there are strong opinions among northern BC residents about the operational status of Mount Polley Mine. The T'exelcemc are aware that Mount Polley may be operational for an-

other 20 years, but will eventually shut down, which raises the issue of employment; a number of residents want to see Mount Polley fully operational to enhance employment opportunities in the region, yet the T'exelcemc question the whether the benefit of employment outweighs the right to protect their traditional land, community health, culture and way of life. "Mining overall is important for the economy, but for whose economy?" asked a community leader. These differences in opinion lead to increased tension, not only between communities, but also among band members. It was noted during the scoping phase that intercommunity tension driven had also increased as a result of the Mount Polley breach.

Following the Mount Polley incident, there was an increase in the administration workload of WLIB community leaders. It is estimated that since August 2014 half of their workload has involved issues related to the Mount Polley tailings breach. Currently, WLIB staff continue to participate in daily conference calls, and an improvement in both organization and efficiency of these meetings was noted. The nation has also hired five consultants to gather data, monitor environmental conditions and conduct independent reviews of technical documents related to the Mount Polley Mine tailing breach. These initiatives allowed the nation to better understand the impacts associated with this event by comparing its own independently collected data to data collected and reported by consultants working directly for the project proponent. The T'exelcemc do not trust findings reported by environmental studies conducted on behalf of the project proponent. For example, Golder and Associates Ltd. did not hold a Post-Event Environmental Impact Assessment Report specific workshop with the WLIB prior to releasing the report's key findings (2015), and further engagement issues exist between the WLIB and the Department of Fisheries and Oceans (DFO). According to the nation, there was minimal contact between it and the DFO immediately following the Mount Polley tailings breach, although this has since improved. For example, the nation reports increased engagement with the Habitat Objectives Committee (chaired by the DFO) and DFO representatives have provided updates and answered questions during Environmental Working Group and WLIB community meetings.

The WLIB/XFN team, the company and the government (especially provincial representatives) participate in a number of committees that meet regularly to address incident-related issues around Mount Polley. Most of these groups were established shortly after the tailings dam failure, although other committees have since been formed as needed. For instance, development of a First Nation/BC Ministry of Environment Work Plan (see Table 12) necessitated the formation of a Government to Government Technical Working Group in October 2015. In addition to committee meetings, WLIB)/XFN have met with the company and/or province to participate in site tours and to discuss issues as they arise. In 2015, this amounted to at least weekly meetings with the government and/or company. Given the establishment of the working group and Mount Polley Mine Corporation's submission of its application for full restart, WLIB and XFN anticipate that the frequency of these meetings will increase in the future. The commitment required by leadership to participate in these forums has made Mount Polley the focus for now over a year. This has been reported to be extremely stressful on WLIB and XFN leaders as they try to ensure the views, interests and rights of their communities are addressed in the process, and the dam failure has taken away the ability of the leadership to focus on other community priorities. Table 13 summarizes findings from the site visit with WLIB.

***Table 12**. WLIB/XFN Meetings.*

| Name | Purpose | Participants | Dates Active/Meeting Frequency |
|---|---|---|---|
| **Principals Table** | To oversee a government-to-government response to the Mount Polley Mine Disaster, consistent with the guiding principles established in the LOU. | WLIB XFN, MARR (Ministry of Aboriginal Relations and Reconciliation), MEM (Ministry of Energy and Mines), MoE | - Established shortly after the breach (Aug. 2014)<br>- At least **4 meetings/year** |
| **Senior Officials Committee** | To ensure government-to-government shared decision-making regarding response, future permitting and dialogue on mining. Reports to the Principals Table. | WLIB/SCIB, MARR, MEM, MoE, FNS (First Nations), FNEMC (First Nations Energy and Mining Council), UBCIC (Union of BC Indian Chiefs) | - Established shortly after the breach (Aug. 2014)<br>- Generally **1 meeting/month** |
| **Mount Polley Government to Government Technical Working Group** | To carry out response activities as envisioned in the FN/MoE Work Plan. Issues for which parties do not achieve consensus are elevated to the SOC. | WLIB/SCIB, MoE | - Newest committee (established Oct. 2015)<br>- Since mid-October, 2-3 meetings/week<br>- Anticipate **3 meetings/week for the next few months** |
| **Environmental Working Group (EWG)** | To make recommendations to MPMC and Imperial regarding ongoing monitoring and remediation. To advise the Province of concerns on the adequacy and scope of these activities. | WLIB/SCIB, MPMC (Mount Polley Mining Corporation)/Imperial, MoE, DFO (Fisheries and Oceans Canada), FNHA, IH (Interior Health), CRD (Cariboo Regional District), Likely Community | - Established shortly after the breach (Aug. 2014)<br>- First meeting held on Aug. 19, 2014<br>- **32 meetings so far**<br>- Initially weekly meetings; currently **1 meeting every 2 weeks** |
| **Science Panel** | To provide advice to the EWG. | WLIB/SCIB, MPMC/Imperial, MoE, DFO, Universities, private companies | - Not certain when this committee was established<br>- Meetings on an as-needed basis |
| **Cariboo Mine Development Review Committee (CMDRC)** | To review applications for mine approvals and reclamation permits referred by the Chief Inspector of Mines (e.g. M-200 Restricted Restart/Full Restart permit | WLIB/SCIB, MPMC/Imperial, MEM, MoE, FLNRO (Forest, Lands and Natural Resource Operations), DFO, Environment | - Existed prior to the breach, but has since been involved in reviewing the following breach-related permit applications: 1) breach repair for 2015 freshet 2) restricted restart 3) short-term water discharge 4) main |

| Name | Purpose | Participants | Dates Active/Meeting Frequency |
|---|---|---|---|
| | applications). | Canada, IH, CRD, City of Williams Lake, Community of Likely | embankment buttressing 5) use of TSF for 2016 freshet 6) full restart<br>- Generally **1-3 full MDRC meetings/application**, although additional meetings of the Province and FNs are also typically convened |
| **Habitat Remediation Technical Working Group** | To evaluate the residual effects and efficacy of remedial measures on fish habitat and fisheries productivity as a result of the TSF breach. To identify, evaluate and recommend habitat off-setting measures. | WLIB/SCIB, MPMC/Imperial, MoE,<br>FLNRO, DFO | - Established Q1 of 2015<br>- So far **1 meeting every few months** |
| **Mount. Polley Implementation Committee (IC)** | To develop remediation plans and reach consensus on permit applications before sending these to government. | WLIB/SCIB, MPMC/Imperial | - Existed prior to the breach, but has since dealt mainly with breach-related issues<br>- Slightly less than **1 meeting/month**<br>- Meetings include tours of the mine site and remediation works |
| **Mount. Polley Breach Technical Working Group** | To address issues related to the breach. | WLIB/SCIB, MPMC/Imperial | - Established after the breach; meetings held in conjunction with IC meetings (above)<br>- Slightly less than **1 meeting/month** |
| **Public Liaison Committee (PLC)** | To provide an opportunity for MPMC to share information about mine activities and the results on monitoring programs with its members and for members to share such information with their respective membership. | WLIB/SCIB, MPMC/Imperial, CRD, City of Williams Lake, Community of Likely, regulators | - Formed in 1999, although specific requirements for the PLC were updated in the July 9, 2015 amendment to permit 11678<br>- Meetings held at regular intervals; at least **4 meetings/year** |

***Table 13**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported during the HIA scoping phase by WLIB.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Reported impacts/key issues experienced |
|---|---|
| Failed to receive information in timely manner about the Mount Polley tailings dam breach | X |
| Distrust in received information on Mount Polley Mine breach | X |
| Increased administration burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X |
| Decreased/discontinued traditional land use activities | X |
| Decreased/discontinued personal fishing practices | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | |
| Emotional stress | X |
| Increased intra-community tension | X |
| Increased inter-community tension | X |

## FIELDWORK FINDINGS SPECIFIC TO THE XAT'SULL FIRST NATION

Xat'sull First Nation (XFN) is the most northern Shuswap tribe of the NStQ, which is the largest nation within the interior of British Columbia. XFN is the responsible steward for traditional land ranging between the Coast Mountain Range east to the Rocky Mountain range (Xat'sull First Nation, 2014). The Mount Polley Mine is located in the northern part of the Secwepemc te Qelmucw traditional territory and is within the traditional territory of the XFN. In total, 141 members (75 males, 66 females) live on-reserve and there are 55 households (see Table 14). A number of individuals who do not live on-reserve continue to engage in cultural practices on the traditional territory of XFN, and the total registered population living on and off-reserve is 427 (Aboriginal Affairs and Northern Development Canada, 2011-2015).

***Table 14**. Population and household characteristics for Xat'sull First Nation (Aboriginal Affairs and Northern Development Canada (p), 2011-2015).*

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| Xat'sull First Nation | 75 | 66 | 141 | 55 | 427 |

During the scoping phase, the project leads visited XFN and interviewed natural resource managers and staff, chief and band council members, the health director and had follow-up conversations with personnel involved in managing processes associated with the Mount Polley tailings dam breach. While many of the findings are similar to those reported in WLIB, this community summary includes additional information.

Following the Mount Polley Mine tailings dam breach, XFN members reported receiving information from public media channels and online sources such as Facebook. Shortly afterward, the Cariboo Regional District contacted the nation to discuss the event. Community members were initially shocked, due to the unknown extent and consequences of the breach. During a meeting in XFN, the community was told a meeting in Likely (located approximately 100 km north of Williams Lake, BC) was taking place. In response, the meeting at Sugar Cane ended promptly and community members from XFN rushed to attend the meeting in Likely. That meeting was described as very emotional, and in response to the high level of stress experienced by those in attendance, several conflicts erupted. To date, the Mount Polley Mine has held regular community meetings on a regular basis. These meetings typically include presentations by the mine's technical staff. The community has reported a number of reasons why these meetings are stressful for those in attendance. First, although it is delivered in plain language, the content of these meetings is often difficult for attendees to fully comprehend; second, the meetings are often two to three hours long and are scheduled during the evening, and; finally, the topic prompts strong emotional reactions, which makes it difficult for community members to discuss over and over again. To date, XFN is struggling to analyze and interpret Mount Polley-related information. As additional technical documents, independent studies and governmental reviews are completed, the nation is in a position to determine the reliability of information it receives.

The Mount Polley Mine tailings breach has had a large emotional impact on community members. There was little to no information available after the incident, which increased uncertainty about broader/long-term consequences on the environment (e.g., salmon run, water sources, plants, wildlife). XFN has relied on traditional land-based activities for its overall health and well-being, so the consequences not only threaten the environment (e.g., fish, wildlife, plants and berries), but also potentially impact cultural practices and overall way of life. The uncertainty that followed the event was identified as the major source of stress and negative emotions experienced by XFN community members.

Immediately after the incident, the large majority of XFN stopped eating local fish, and about half of those who fished regularly in the past stopped fishing. In response to the shortage in the fish supply, one First Nation community from the southern coast provided raw fish to XFN, and about half of the community accepted the donated fish. Further donations of canned fish were provided and these were more widely accepted.

The Mount Polley tailings dam breach has added increased uncertainty regarding the safety of fishing in the Fraser River, Quesnel River and Quesnel Lake. As a result, changes in dietary trends among members of XFN have been reported. Prior to the Mount Polley incident, fish consumption among community members was already declining, in part due to concerns about the quality, purity and safety of fish caught in the Fraser River. Community members had observed physical abnormalities, including worms, scars and discolouration. The tailings dam breach further impacts whether community members choose to engage in fishing practices and meet dietary requirements through the consumption of locally caught fish. For example, there is growing fear among the community that environmental incidents (e.g., exposure to mine tailings from the Mount Polley breach) have contaminated traditional food sources (i.e., fish, wildlife, plants, berries) and if these are consumed, the risk of cancer increases. It is believed that this fear and uncertainty is partly responsible for the decline of traditional food consumption observed among members of XFN.

Since the Mount Polley spill, XFN has also reported an increase in the conflict that is occurring between communities and within their own Nation. For many individuals living within the region,

the Mount Polley Mine provided much needed employment and after the event, employees were no longer able to work. Although the environmental concerns related to this incident are widespread across BC, the loss of income has also been an important topic, and there are reports of conflict between those who work for the mine and those who do not. For some, the protection and reclamation of the environment is the greatest concern, while for others it is important that people return back to work as soon as possible. These types of conflicts are persistent, and community meetings are often very emotional and include heated debates.

Finally, the administrative burden following the Mount Polley Mine tailings dam breach has been extensive. Media (e.g., radio, television crews) and consultant companies were regularly calling XFN with requests. As a result, employees were claiming large amounts of overtime to address the increased workload created by this event. For example, the Mount Polley-related workload resulted in the chief of XFN working solely on this issue for two straight months. Other staff members in the community reported being overwhelmed. The delivery of essential community services (e.g., health services) was impacted and in response, staff began refusing to address Mount Polley-related requests. An additional consideration is the emotional impact of staff dealing with increased workloads in the aftermath of the tailings dam failure. Not only did workloads dramatically increase, but they were also trying to deal with strong emotions (e.g., stress, anger, fear) related to the event. The Nation initially withdrew approximately $200,000 from its own account to cover staff overtime/wages during this time; later, the provincial government reimbursed XFN for these funds. To date, all funding received by XFN has been used to address the workload burden created by the Mount Polley tailings dam failure; there has been no compensation for any impacts experienced by the Nation. Table 15 summarizes scoping phase findings for XFN.

***Table 15**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported during the HIA scoping phase by Xat'sull First Nation.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Reported impacts/key issues experienced |
|---|---|
| Failed to receive information in timely manner about the Mount Polley tailings dam breach | X |
| Distrust in received information on Mount Polley Mine breach | X |
| Increased administration burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X |
| Decreased/discontinued traditional land use activities | X |
| Decreased/discontinued personal fishing practices | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | |
| Emotional stress | X |
| Increased intra-community tension | X |
| Increased inter-community tension | X |

### 3.4.4 FIELDWORK FINDINGS SPECIFIC TO THE TSILHQOT'IN NATIONAL GOVERNMENT

The Tsilhqot'in National Government (TNG) represents six First Nations located in central British Columbia, Canada. These Nations include Tl'etinqox (located 100 km west of Williams Lake), ?Esdilagh (located 70 km north of Williams Lake on the Fraser River), Yunesit'in (located 114 km west of Williams Lake), Tŝi Deldel (located 188 km west of Williams Lake), Tl'esqox (located 50 km west of Williams Lake) and Xeni Gwet'in (located 187 km west of Williams Lake near Chilko Lake). The TNG was established in 1989 to rebuild a strong political structure and to continue to fight for Tsilhqot'in Aboriginal rights and title of their traditional lands (TNG, 2015). In 2014, the TNG Supreme Court decision granted title to approximately 1,900 km2, including Xeni (Nemiah Valley) and much of the surrounding area, stretching north into Tachelach'ed (Brittany Triangle) and along the Tsilhqox (Chilko River) (TNG, 2014).

Prior to the site visits, the team discussed the Mount Polley Mine HIA with the TNG mine manager and health directors from all TNG communities. During site visits, the project leads interviewed chiefs from ?Esdilagh, Tŝi Deldel , Xeni Gwet'in and Yunesit'in. Additional activities during the site visit included: (1) Interviews with TNG health directors; (2) interviews with TNG community leaders; (3) participation in a workshop with health service providers, chief and council members in Xeni Gwet'in; (4) attendance at an elders' lunch in Yunesit'in; and (5) interviews with TNG fisheries staff. The following sections provide an analysis and interpretation of the information collected during these activities.

TNG represents approximately 3,700 people, with almost 1,500 TNG community members living on-reserve in approximately 355 households (Table 16). The relationship that TNG members have with the land and traditional resources is strong: TNG communities are close to the Fraser River and/or associated water systems, and according to health-service providers, fishing has been an important activity for maintaining health and wellbeing among TNG communities. During the winter and into the fishing season, their food security is largely based on their ability to consume salmon. According to project participants, each household consumes hundreds of fish annually.[7] Although salmon consumption provides nutritional value, TNG members also experience benefits related to the traditional practice of catching fish. This provides members with the opportunity to be in nature, socialize within their community and to engage in physical activity. Furthermore, fishing practices are linked to cultural activities, including using salmon heads to tan the animal skins used in ceremonial and cultural gatherings. It should be noted that the Mount Polley tailings dam breach occurred during a sensitive time of year, as the main salmon runs span from June to September/October.

*[7] TNG Fisheries staff noted that there is a large variability of salmon consumption between households and each year (depending on a number of variables, including but not limited to the salmon run size, availability of moose and other game). Without detailed study and careful information protocols, it is not possible to accurately predict the average number of salmon per household.*

***Table 16**. Population and household characteristics for Tsilhqot'in National Government communities (Aboriginal Affairs and Northern Development Canada (a-f), 2011-2015).*

| Community | Registered population living on reserve (2015) | | | Number of households (2011) | Total registered population living on and off reserve (2015) |
|---|---|---|---|---|---|
| | Males | Females | Total | | |
| ?Esdilagh First Nation | 36 | 13 | 49 | 15 | 201 |
| Tl'esqox First Nation | 67 | 78 | 145 | 40 | 335 |
| Tl'etinqox Government | 303 | 246 | 549 | 120 | 1585 |
| Tŝi Deldel First Nation | 180 | 154 | 334 | 65 | 686 |
| Xeni Gwet'in First Nation | 100 | 103 | 203 | 70 | 434 |
| Yunesit'in Government | 113 | 102 | 215 | 45 | 457 |

TNG communities are familiar with environmental and social impacts related to the mining sector. For example, ?Esdilagh First Nation is located next to a copper-gold mine, which has been in operation since the 1970s. To date, this mine has never been required to undergo an environmental assessment. Its operation has directly impacted traditional land with metal leaching and it has recently been approved to increase the volume of tailings water discharged into the Fraser River. As a result, many community members from ?Esdilagh First Nation have abandoned their traditional fishing locations on the Fraser River due to fear of contamination. Instead, they report travelling further distances to the Chilko River to fish. Along with ?Esdilagh First Nation, Xeni Gwet'in also has multiple projects proposed on its traditional territory, including the Prosperity Mine. TNG communities actively participate in the environmental assessment processes related to this proposed mine.

The Mount Polley Mine tailings dam breach occurred on the day the fishing season opened. Initially, TNG leadership received information about the breach via media sources (e.g., television, radio, social media websites) and shortly after the event, TNG leadership hired a helicopter to view the extent and impact of the breach. TNG leadership took a precautionary approach and advised community members not to fish until further notice. At the time, the risks/impacts of this event on local water systems and the salmon were unknown, and without additional information TNG communities felt it was unsafe to fish. Project participants reported it took an extended period of time for them to receive data describing the risks/impacts of the breach on the salmon run. As a result, TNG communities experienced widespread impacts on both personal fishing practices and commercial fisheries. In terms of commercial fishing, chiefs from TNG communities did not endorse commercial fishing following the breach, due to liability concerns. In order to maintain the federal fishing license, a 'catch-and-release' fishery was conducted on the Chilcotin River. The endorsement of commercial fishing was made after FNHA released findings from their fish analysis, stating the fish were safe for consumption. Unfortunately, these findings were reported approximately seven weeks after the tailing breach, which effectively resulted in the cancellation of commercial fishing interests for TNG. Few fish were caught and the economic impact has been substantial (estimated to be millions of dollars), given the allowable catch provided by the federal license.

The loss of salmon fishing and an ongoing reduction in fishing has been met with anger and frustration. For Tŝi Deldel, approximately 50% of community members did not fish in 2014 and members reported the breach impacted the physical features of their community. For example, members reported feeling disturbed by the absence of fish hanging in local smoke houses. Tŝi Deldel also faced a difficult decision around fishing, as this community had both a commercial fishing business as well as participated in traditional fishing activities for sustenance. In light of the

lack of timely information around fish health and safety, the Chief of Tŝi Deldel advised community members not to fish and did not endorse commercial fishing activities. As previously mentioned, a catch-and-release fishery was conducted in order to maintain the fishing license. Upon receiving the results of the FNHA fish study that stated the fish were safe for consumption, the community was unable to catch a substantial amount of fish because the salmon had travelled too far south. Community members also questioned findings from the FNHA fish study, which was not considered sufficiently robust, leaving questions regarding fish health. Tŝi Deldel leadership reported community members are still not fishing in 2015.

For ?Esdilagh First Nation, the impacts have been cumulative. This small First Nation has been exposed to tailings waste from a discharge pipe that received permitting approval in 2006 (BC Environmental Appeal Board, 2008). This operation already displaced some ?Esdilagh members who had been fishing at traditional locations and Mount Polley further solidified their decision to fish the Chilcotin River and/or the Chilko River. This poses a considerable economic burden for a community where the average annual income is $15,000 to $20,000 and round-trip costs to access trusted fish resources are $200 to $300. The majority of Yunesit'in community members are still not fishing as a result of the Mount Polley tailings dam breach and community members have reported abnormal changes in the appearance and odour of fish caught post-breach; as a result, fish was often discarded. Yunesit'in leadership, health service providers and community members all reported uncertainty regarding fish safety and health impacts related to the Mount Polley Mine event. In addition to emotional stress experienced across the community, food insecurity increased (i.e., community members reported not having enough food to eat). To address the food shortage, the health centre expanded its food provision program, which remains in operation. To compensate for the loss of salmon, it was reported that community members were travelling to Xeni Gwet'in to fish. However, not all members (e.g., Yunesit'in elders) were able to afford this or were capable of travelling long distances. For other members, dietary patterns shifted towards less healthy and inexpensive food choices. Overall, project participants reported an observable increase in hunting practices, which may have an affect on the decline of moose population as reported by all six TNG communities.

Xeni Gwet'in has experienced multiple impacts associated with the Mount Polley Mine breach. Most community members did not fish the year of the breach due to fear of contamination and they experienced a strong emotional reaction to the event, since members thought their inherent right and ability to fish had been taken away. In response, many community members rushed to the river and tried to catch as many salmon as possible, fearing the discontinuation of fishing in the area. In 2015, the safety of fish consumption remained a concern for members of Xeni Gwet'in and as a result, a number of members have not resumed fishing. During the scoping phase, members described not only being concerned about current risks/impacts to fishing, but also about the impacts experienced by future generations. Following the Mount Polley Mine breach, hunting activities increased among members of Xeni Gwet'in in 2014.

Finally, as a result of the Mount Polley Mine breach, a dramatic increase in competition for fish resources within Xeni Gwet'in traditional territory has been reported. In 2013, it is estimated that six communities fished at their traditional fishing locations. In 2015, during a relatively poor year for fishing, reports of up to 15 communities accessing these local fishing spots were made. As a result, increased competition for fish resources has led to inter-community tension and for the first time, fishing protocols on traditional locations have not been respected. Increased inter-community tension was also reported by TNG communities as a whole, in regard to the distribution of

salmon to other First Nations to compensate for impacts stemming from the Mount Polley Mine event. According to TNG community members, they did not receive compensation despite having experienced a wide range of impacts on fishing practices and food security.

During the scoping phase, TNG members reported the desire for additional studies (e.g., fish and water quality, flow and pressure). Following the Mount Polley Mine breach, TNG received a small amount of funding to undertake fish sampling, but due to funding restrictions, data from the study was minimal and therefore was not used by TNG leadership to determine the safety of consuming fish. Project participants highlighted the need for additional data, citing major concerns and questions about heavy metals and other pollutants that have spread due to the Mount Polley disaster. TNG wants to make evidence-based decisions on findings from studies that are characterized as systematic, methodologically rigorous, in-depth, longitudinal and unbiased. TNG members emphasized the importance of recording the history and capturing the knowledge for future generations. Unique examples of traditional knowledge related to fish behaviour and methods for treating contaminated land were provided by TNG elders and should be integrated into future remediation efforts. Additional information considerations need to be made, including the importance of language and trust. The process that industry, government, consultants and other agencies disseminate information must be easily accessed and understood by members of TNG. TNG health service providers reported, “Better translation of results is needed. Pictures tell a thousand words. There is a huge language barrier. Mining companies think we understand, but many of us do not.” TNG members also reported an overwhelming distrust among all TNG communities regarding the level of trust in information they receive. They reported feeling helpless, due to the lack of accurate and trustworthy information available to them. It was widely reported that they do not trust information provided by the project proponent and the provincial government. TNG members are concerned that the potential risks/impacts of the Mount Polley Mine breach are being ‘downplayed’ and that findings from environmental assessments are biased towards the project proponents, since they are commissioning the work. In contrast, TNG members reported viewing the information received from FNHA as more trustworthy, especially in regard to fish safety. In addition to impacts associated to the extractive industry, project participants raised the following community health-related concerns: (1) the consequences of global climate change and the impact it will have on regional water systems and future salmon runs; (2) decreased size of harvested fish eggs; (3) the presence of white worms in the flesh of salmon; (4) the health of local moose; (5) the prevalence rate of cancer among TNG members; and (6) restricted access to traditional land by private ranges/properties along the river(s). TNG leadership described the need for more accountability in respect to issues impacting use of and access to traditional lands, rivers and resources. Table 17 summarizes findings from the scoping phase on TNG communities.

***Table 17**. Key issues and impacts related to the Mount Polley Mine tailings dam breach reported by Tsilhqot'in National Government communities.*

| Key issues and impacts related to the Mount Polley tailings dam failure | Reported impacts/key issues experienced |
|---|---|
| Failed to receive information in timely manner about the Mount Polley tailings dam breach | X |
| Distrust in received information on Mount Polley Mine breach | X |
| Increased administration burden experienced by leadership and staff in attempts to understand the situation around Mount Polley | X |
| Decreased/discontinued traditional land use activities | |
| Decreased/discontinued personal fishing practices | X |
| Decreased/discontinued commercial fishing resulting in loss of revenue | X |
| Emotional stress | X |
| Increased intra-community tension | X |
| Increased inter-community tension | X |

### 3.4.5 FIELDWORK FINDINGS SPECIFIC TO LIKELY

Likely is a small community (approximately 300 residents) on Quesnel Lake in north/central BC. Prior to the dam failure, Likely was a well-known destination for ecotourism, attracting tourists from international destinations. Likely continues to support the mining and forestry sectors, with many residents having employment in these industries. Scoping phase activities for Likely included a site visit by the project team and interviews with residents, a representative from the Cariboo Regional District (the only organization providing administrative support to the community) and subsequent telephone interviews with eight key informants. Interviews consisted of open-ended questions seeking to gain general insights into how Likely residents have been affected by the incident individually and on the community has been affected as a whole.

On the morning the breach occurred, residents were initially informed of the incident primarily by phone calls from local first-responders or neighbours. Several residents reported waking up to the sound of rushing water, but were not alarmed as they are used to hearing noise from Mount Polley from across the lake. Some also reported taking their boats out on the lake to investigate the incident themselves or receiving news from neighbours or other residents who did. Information flow during the first two days was described by residents as chaotic, coming from a number of sources including emails or phone calls to some residents from MPMC, local MLAs or regional district officials, TV news, and bulletins posted in the Likely post office informing residents of public meetings. After this, information generally was shared by word-of-mouth among residents.

After the tailings dam breach, operations at the Mount Polley Mine immediately ceased and the Cariboo Regional District declared a local state of emergency including "do not use" water advisory (Interior Health, 2014a), which meant water in homes was not to be used for any purpose. The advisory was rescinded on August 12, 2014, for all areas except those within 100m of the visible sediment plume at the mouth of Hazeltine Creek (Interior Health, 2014b). Water impacts remain,

with many residents still using bottled water. It was reported that MPMC initially provided bottled water to residents, but that was a short-term program. Community residents who do not trust the water in Quesnel Lake for drinking must pay to bring in water from other sources.

Most residents interviewed attended many or all of the public meetings that were held in Likely over the days, weeks, and months following the breach. Nearly all described them as frustrating because of a perceived lack of transparency from Mount Polley and government personnel. Some said they stopped attending because they were tired of receiving what they felt was "censored, piecemeal information that did not answer their questions." Some residents have technical backgrounds and have reported distrust and dissatisfaction in the process used by MPMC to facilitate meetings for information, to engage with community members, and to provide support for impacts to water that occurred after the breach, and one noted that "everything has been a fight." Community members report no access to a grievance mechanism and no official community liaison/stakeholder engagement officer working on behalf of MPMC post-Mount Polley.

Most residents are still wary of the information they receive from MPMC. They perceive that the company has a deliberately limited scope of information that it shares, particularly around long-term impacts to water quality and long-term monitoring. While the residents understand that there is considerable uncertainty surrounding this, they are frustrated that the government and company will not discuss long-term impacts and plans in detail. Many mentioned the UNBC research station on Quesnel Lake as their most trusted source of information, as they are familiar with the people working there and see them as having little incentive to withhold information. In contrast to most respondents, a few residents felt that the information they receive from Mount Polley is reliable, as it can be cross-referenced with information from other sources such as the research station. Several residents also mentioned they are eager to receive the report of the conservation officer, which has been delayed for several months. One resident observed that this lack of information is contributing to social divides within the community.

The initial response from residents of Likely in terms of what people did and how they felt varied considerably. Most residents agree the town was in a state of panic and shock for the first several days, as there was an extreme visual impact, many rumours, and a lack of information and provisions (drinking water) for the first day. Uncertainty also played a role in elevated community stress concerning health and environmental impacts and the possibility of job losses for those working at the mine. Most residents immediately stopped drinking and using domestic water. However, respondents report that some residents were not concerned about water quality and continued to use tap water. Other actions that were taken following the breach included evacuating the provincial park, physically restraining debris from the breach with booms to prevent it from damaging the bridge, and removing boats and docks from the lake to prevent damage. Some residents reported that they had blood samples taken to test for heavy metals as a way of establishing their own health baseline. In addition, several properties that drew their water directly from the lake were tested for e. coli contamination by local authorities. Results indicated high levels of e. coli that local authorities attributed to a wildlife anomaly.

Residents have observed physical, social, and economic changes attributed to the breach area over the past year. Some perceive that the lake has not recovered to its original clarity, while others say that it is visually back to normal. All residents said  the seasonal lake turnover appeared abnormally cloudy, and one resident said weeds in the lake are dense compared to past years. In terms of social changes, some residents perceive a divide in the communities between those who work or worked at the mine and those who didn't, and those who were greatly impacted and

those who weren't. In terms of economic changes to local tourism businesses and real estate, residents' opinions are divided: most agree that there was an initial drop in tourism activity, which has since recovered, but it is not clear whether there have been observed changes in property sales and values in Likely.

Residents reported a number of personal impacts and concerns at the individual level. Some of the most commonly cited impacts were ongoing stress and concern due to the uncertainty about long-term impacts on water quality, fish and wildlife. There are still residents in Likely who will not drink the tap water and are uneasy about consuming wild foods or using the lake for activities such as swimming or fishing. In addition, several residents noted that these impacts are still causing social tension within the community. Economically, residents of Likely were impacted in a number of ways: several personally paid for continued water testing, blood work, and household water-filtration systems. Business owners running tour operations lost considerable profits during the first few months following the spill, and continue to feel frustrated that no compensation has been offered. In addition, one ecotourism operator noted that an access road used by a few local operators was closed due to the spill, causing hours of detours for their businesses. Finally, some residents expressed concerns over their property values and ability to sell property on the lake. In conclusion, residents of Likely report that they continue to experience social and economic impacts of the Mount Polley breach and they are eager to receive more information and studies from a source they can trust.

### 3.5 **IDENTIFIED IMPACTED COMMUNITIES**

Screening and scoping activities led to the identification of the communities identified in Figure 4 and in Table 18 (below) as potentially suffering health impacts from the Mount Polley tailings dam failure. The project team hypothesizes that this list of affected communities is unlikely to be exhaustive, since communities that the team was unable to contact or that did not respond to initial contacts share many of the characteristics of the affected communities and are within the same geographical area. The team hypothesizes that other communities within this geographical area will have some degree of impact if fishing practices have sustenance, culture and spiritual significance and if they have changed their fishing practices in response to the Mount Polley tailings breach.

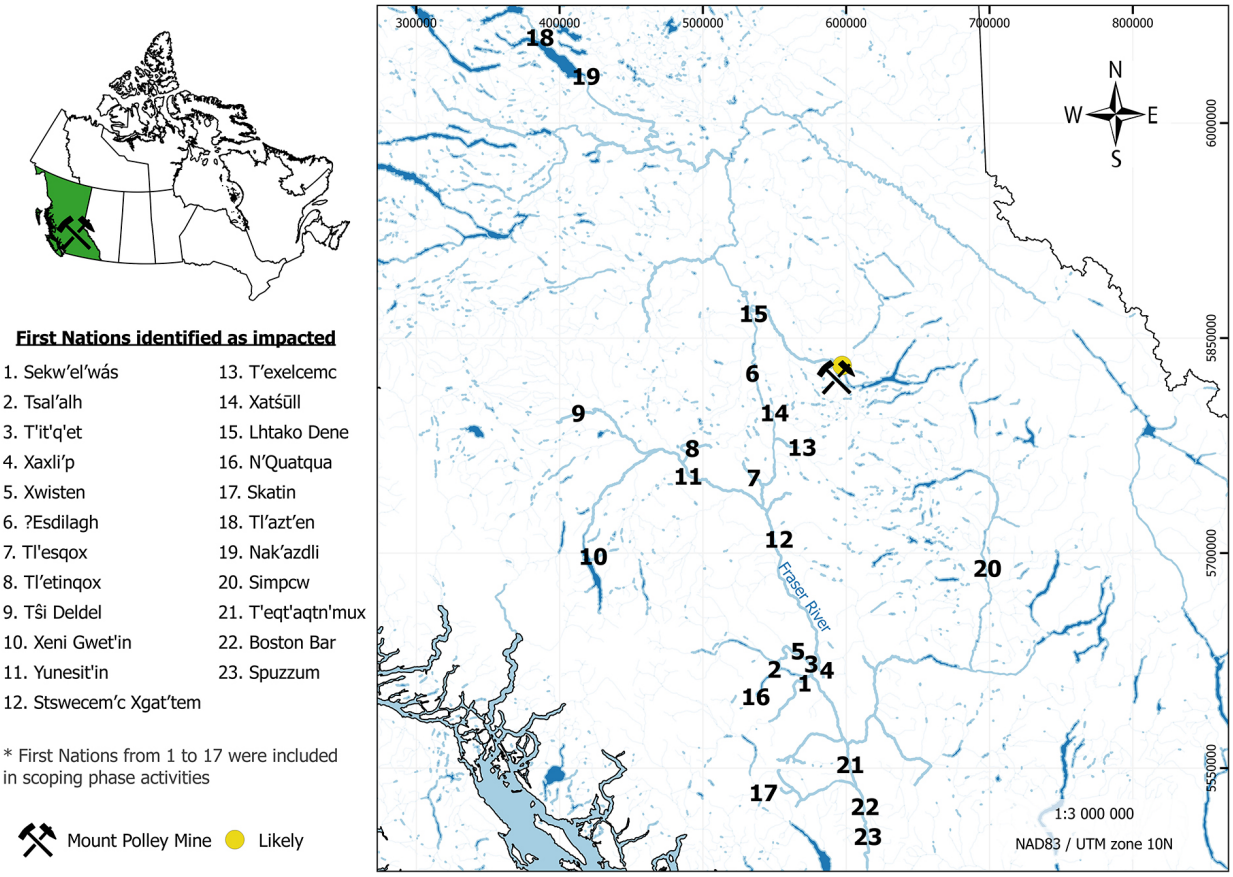


*Figure 4. A map of impacted communities and the location of the Mount Polley Mine site.*

## 3.6 MAIN IMPACTS/RISKS IDENTIFIED AND POTENTIAL HEALTH OUTCOMES

Screening and scoping phase activities identified a range of existing and potential impacts and risks on the health of the communities that participated in the study. Table 18 outlines the impacts identified during the screening and scoping phase. The following sections describe the key ways that the Mount Polley spill appears to have impacted community health in more detail and provide some initial frameworks for analysis. As the table shows, the key impacts reported are similar across all of the communities, although there are some notable differences.

Likely is the only non-First Nation community that participated in the study. While respondents in Likely also raised concerns over health impacts and increased community conflict linked to the incident, their concerns focused on the safety of water for drinking, household, and recreational use. Conflicts emerged in Likely between groups that are satisfied that data suggest no significant impacts and those who perceive potentially serious impacts. Because the situation of the community of Likely is the most different, the impacts on this community are discussed separately in Section 3.4.5.

Among First Nations communities, three First Nations (Xat'sull, T'exelcemc and Lhatko Dene First Nations) experienced direct impacts to their traditional territories. This includes loss of access to sacred land, traditional food and medicine. Although these three First Nations are experiencing direct impacts that may be influencing community health, similar impacts were identified for all participating First Nations. First, a key health impact that appears to be shared among all communities impacted by the tailings breach is emotional stress in relation to the Mount Polley tailings dam

***Table 18**. Reported impacts/key issues related to the Mount Polley Mine tailings dam failure experienced by communities who participated in project.*

| Community | Reported impacts/key issues related to the Mount Polley Mine tailings dam failure experienced by community | | | | |
|---|---|---|---|---|---|
| | Traditional territory directly impacted | Decrease in individual fishing practices | Impacts on commercial fisheries | Emotional stress | Increased administration burden experienced |
| Boston Bar First Nation | | | | | |
| ?Esdilagh First Nation | | X | X | X | X |
| Lhtako Dene First Nation | X | X | | X | X |
| Likely | | | | X | |
| Nak'azdli Band | | X | | X | X |
| Simpcw First Nation | | X | | X | X |
| Sekw'el'wás First Nation | | X | | X | X |
| Spuzzum First Nation | | X | | X | X |
| Stswemecem'c Xgat'tem | | X | | X | X |
| T'exelcemc | X | X | | X | X |
| Ts'kw'aylaxw First Nation | | X | | X | X |
| T'it'q'et First Nation | | X | | X | X |
| Tl'azt'en Nation | | X | | X | X |
| Tl'esqox First Nation | | X | X | X | X |
| Tl'etinqox First Nation | | X | X | X | X |
| Tsal'alh First Nation | | X | | X | X |
| Tsi Deldel First Nation | | X | X | X | X |
| Xaxli'p First Nation | | X | | X | X |
| Xat'sull First Nation | X | X | | X | X |
| Xeni Gwet'in First Nation | | | X | X | X |
| Xwisten First Nation | | X | | X | X |
| Yunesit'in Government | | X | X | X | X |

breach. Increased emotional stress is linked to the perceived severity of potential impacts/risks, uncertainty and the lack of trust in information received. Second, the dam breach has resulted in changes to First Nation fishing practices, which has resulted in shifts in diet composition, physical activity, and cultural practices. In some cases, commercial fishing activities were impacted, resulting in reduced economic opportunities. Finally, decreased fishing activities, as well as fish-related cultural practices, reduces the physical activity level of affected communities; from a health perspective, reduced physical activity can be linked to negative health outcomes. All communities have felt increased administrative burden associated with the incident on community leaders.

The similarity in impacts associated with the Mount Polley dam failure across First Nations distant from the breach location and those closest to the spill is best understood through an in-depth understanding of the land and land resources (including salmon) as key determinants of First Nations health. Among First Nation communities near or with access to the Fraser River, the extent of emotional trauma associated with a threat to salmon health was exacerbated by a lack of reliable

information from trusted sources in the aftermath of the breach. These factors led the majority of First Nations communities to cease or significantly reduce salmon fishing during the 2014 salmon run, and in some cases also during the 2015 run.

Through an iterative process, project findings highlight the strong linkage between First Nations, land and resource access, and community health. The following four main impacts that influence community health were identified by the project team:

- Environmental dispossession
- Emotional stress
- Altered dietary patterns
- Changes in physical activity

It should be noted that all four impacts are interrelated and require consideration of the additional cumulative effects of cultural identity and practices on health. These are determinants that might otherwise be lost in a narrow focus on factors contributing to emotional, dietary and physical health.

### 3.6.1 FACTORS RESULTING IN ENVIRONMENTAL DISPOSSESSION AND POTENTIAL ASSOCIATED HEALTH OUTCOMES

It is frequently useful in an HIA to separate health impacts into discrete clusters of issues for in-depth investigation into the specific determinants and drivers of health underpinning each cluster. This creates insight into a variety of potential mitigation measures based on key determinants and drivers that may be easier to address causally than to treat symptomatically. It is, however, critical in the context of First Nations' health to consider the interconnections between the different clusters, determinants and drivers in order to view health in a holistic way (Figure 5).

Richmond & Ross (2009) describe environmental dispossession as a critical pathway for negative health outcomes experienced by Aboriginal People. They define environmental dispossession as the 'processes by which Aboriginal People's access to the resources in their traditional environments are reduced'. According to Cunsolo et al., 2013, First Nations' "identity, conceptions of the self, and mental wellness are directly and intimately linked to the environment, and to the ability to hunt, trap, fish, forage, and travel on the land and continue to practice cultural traditions related to being 'on the land'" (p. 260). On one hand, positive health outcomes (e.g., improved diet, exercise, increased self-esteem, improved mental health) were reported when individuals engaged in land-based activities (Burgess, Johnson, Bowman & Whitehead, 2004). On the other hand, a wide range of negative health outcomes were found to be associated with changes in the environment. When Aboriginal access to land was restricted, studies reported increases in mental-health stressors, family stress, substance use, suicidal ideation, and prevalence of cardiovascular disease (Cunsolo et al., 2013; Dillard, Smith, Ferucci & Lanier, 2012; Gibson & Klinck, 2005).

For the most directly impacted communities, the Mount Polley tailings dam failure has physically restricted First Nations from accessing their traditional territory. All of the affected First Nations communities lost or experienced (and in some cases continue to experience) restricted access to traditional resources that are central to their conceptions of self and their ability to travel on the land and continue to practice cultural traditions.

The environmental dispossession model suggests that the overall sum of the individual clusters of impacts described in the preceding sections – psychological stress, changes in diet and reduced physical activity – is likely to underestimate the overall impacts on health. For First Nation communities, especially those living in rural and remote areas, the consumption of traditional food is

directly linked to positive health outcomes. Not only is traditional food a fundamental source of nutrients, the collection of traditional food also provides social and cultural benefits for individuals, families and communities (Nagy, 2010). In contrast, limited access to the physical environment such as that resulting from the Mount Polley tailings spill leads to decreased personal knowledge/skills related to food harvesting, reduces consumption of traditional food, leads to more individuals relying on store-bought food or government-sponsored food programs, and leads to reduced social cohesion and cultural benefits for communities. In addition, when accessing food through non-traditional sources, the risk of cardiovascular disease increases due to unhealthy food being incorporated into diets more often (Mitchell, 2012; Richmond & Ross, 2009). Overall, the inclusion of the environmental dispossession pathway as a potential source of health impacts and risks, may suggest additional holistic issues to address.

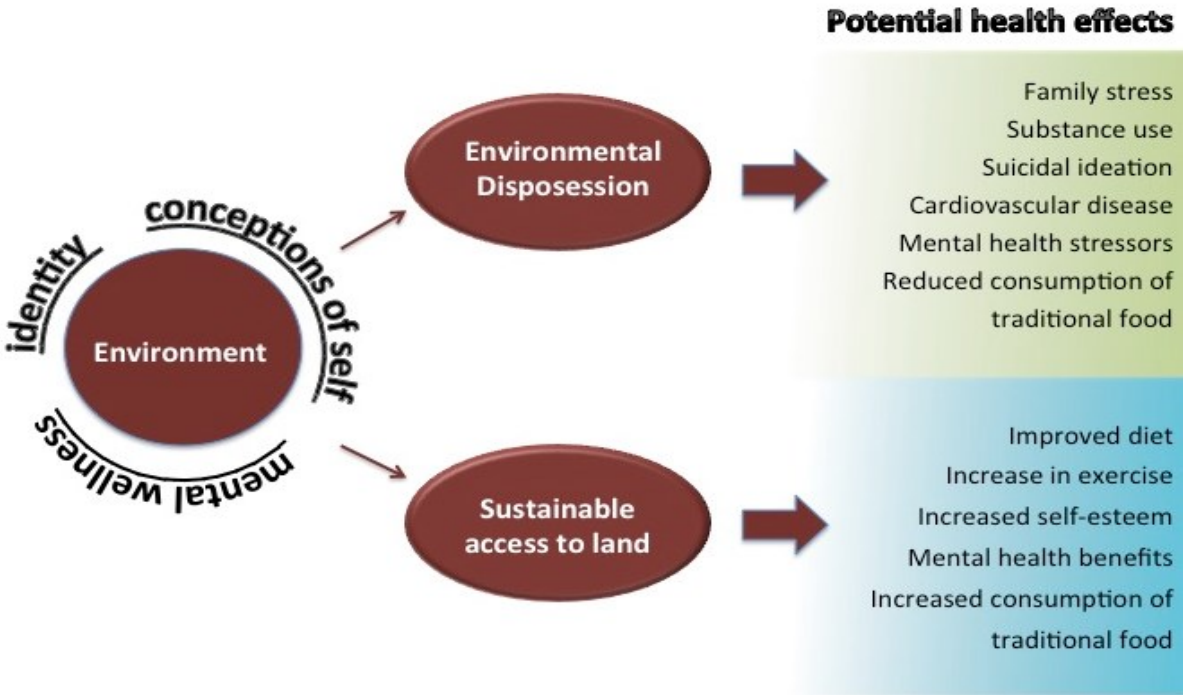


***Figure 5**. First Nation's relationship to the land and potential health effect of environmental dispossession/sustainable access to land.*

### 3.6.2 FACTORS RESULTING IN EMOTIONAL STRESS AND POTENTIAL ASSOCIATED HEALTH OUTCOMES

The strength of the ongoing emotional responses of the First Nations participants in the study more than a year after the Mount Polley dam breach was not entirely expected by the project team. In addition, the team observed similar strengths of emotional response among the First Nations most directly impacted by the spill and among those much further down the Fraser River system, although it had expected more serious reactions from those most directly impacted. All of the communities appeared to be suffering from chronic stress linked to the tailings spill that is ongoing, as to varying degrees, the underpinning issues have not been resolved.

On the basis of the interviews, the team identified four clusters of issues that appeared to be drivers of emotional stress, as illustrated in Figure 6. These issues are:

- **Information**: The first cluster identifies emotional stress linked to the timing, quality of and level of trust in information received on the Mount Polley dam breach. Most communities re-

ported learning of the tailings dam breach through media sources or through communication from other First Nations. Communities unanimously reported that they initially had received no information from MPMC or from the regional authorities and described their lack of trust in information provided by these institutions at a later stage, in some cases going as far to suggest that the information provided was 'misinformation.' The 'lack of information' experienced clearly derives from unsuccessful engagement processes by MPMC and government officials; however, the specific local effect of the communications failure is not yet clear from information gleaned through the scoping study.

- **Fishing**: A second important contributor to emotional stress was the reduction or cessation of fishing activities. Reduced fishing increased food insecurity and led to economic losses from lost sales, both of which produced lower economic security, which has been demonstrated as leading to stress in studies (highlighted below). Finally, fishing-related sources of stress derive from the central role played by salmon fishing, preparation, processing and eating in social cohesion, teaching cultural traditions and as an axis of cultural identity. The centrality of fishing to identity and community health led many to express impacts on fishing as violations of Aboriginal rights, which First Nations have long struggled to protect. The health of the salmon appears to be so important to Fraser River First Nations that the project team suggest that it may be considered a key determinant of First Nations health for these communities. (For more information about salmon as a key determinant of health for Fraser River First Nations see Section 4.3.1).
- **Conflict**: Additional stress also derived from increased inter- and intra- community tension linked to increased pressure on fishing resources perceived as unaffected by the tailings breach and from disagreements among and within communities regarding appropriate responses. Many interviewees expressed frustration over the perceived responses of other First Nations to the spill, especially those with participation agreements with the Mount Polley Mine. These frustrations were exacerbated by the lack of information. This tension manifests as increased conflict and increased emotional stress.
- **Pre-existing and broader environmental issues**: In addition to emotional stress from the specific impacts of the spill on salmon, the impacts of the spill on salmon exacerbated existing concerns that have been increasing in First Nations communities over recent decades regarding the cumulative impacts of various private and public sector activities in combination with global climate change on the Fraser River system (this issue is also further discussed in section 4.3.1). Many respondents described this in terms of a perceived destruction of the Fraser River system and an existential threat to their communities and identities.

Emotional stress has demonstrated links with both psychological and physical health. Stressful events are known to influence the pathogenesis of physical disease by causing negative affective states (e.g., feelings of anger, anxiety and depression), which in turn exert direct effects on biological processes or behavioural patterns (Cohen S, Janicki-Deverts & Miller, 2007). Exposure to chronic stress is considered the most toxic because it is most likely to result in long-term or permanent changes in the emotional, physiological, and behavioural responses that influence susceptibility to and course of disease (McEwen, 1998). More specifically, stress – especially over a prolonged period – is a risk factor for a variety of mood and anxiety disorders, including depression and psychological trauma (McEren, 2007). For example, research conducted in England found that 20% to 25% of persons who experience major stressful events develop depression (Van Praag, De Koet & Van Os, 2004). In addition to mental disorders, stress can also directly foster pathogenic processes such as myocardial ischemia and activate inflammatory mechanisms (Krantz & McCeney, 2002).

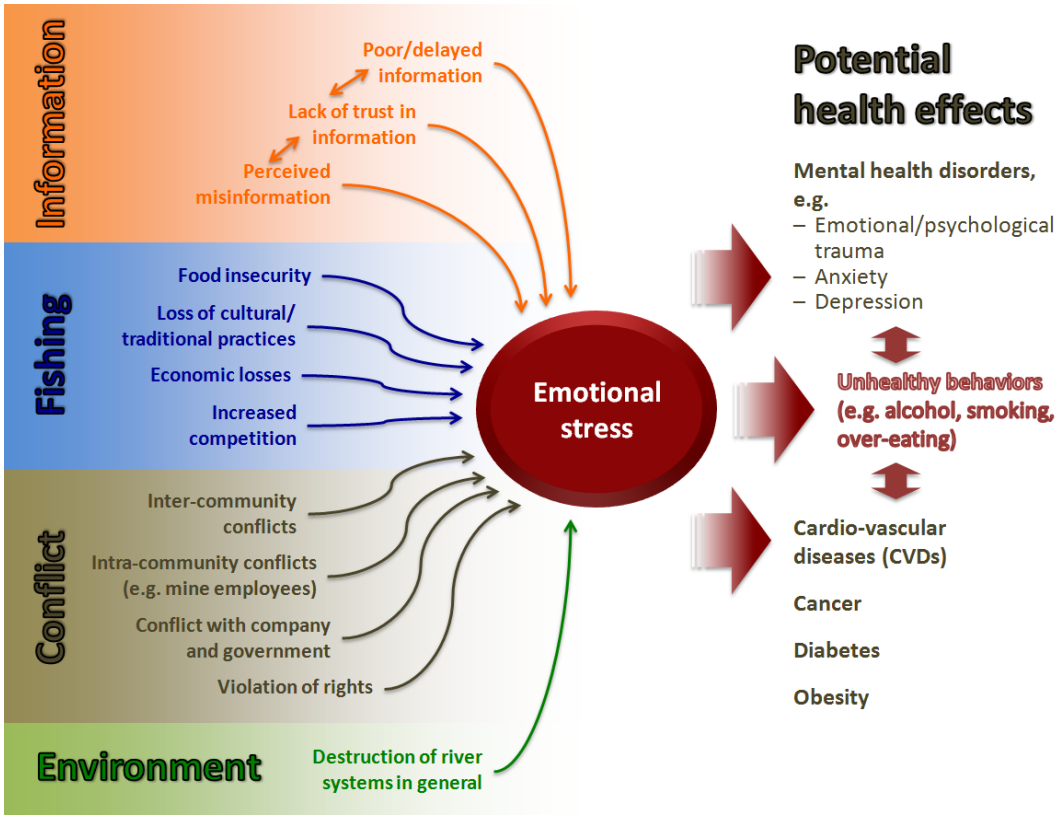


***Figure 6**. Drivers of emotional stress and associated health outcomes.*

Recently, large prospective epidemiologic studies and smaller basic science studies have firmly established a connection between cardiovascular diseases (CVD) and several psychological conditions, including chronic psychological stress and anxiety disorders (Cohen, Edmondson & Kronish, 2015). Other studies have demonstrated that stress, anger, and depressed mood can act as acute triggers of major cardiac events with a pooled relative risk of 2.5 for acute coronary syndrome onset being preceded by stress (Steptoe & Kivimaki M, 2013). Moreover, research also indicates that stress affects key pathogenic processes in cancer, such as antiviral defenses, DNA repair, and cellular aging (Antoni et al., 2006). The evidence on the link between stress and cancer is less clear than the association between CVD and stress. In part, this may be because cancers are frequently diagnosed only after they have been growing for many years, making an association between stress and disease onset difficult to demonstrate (Duijts, Zeegers & Van der Borne, 2006).

In addition to the direct potential adverse health effects of emotional stress, there can be accompanying changes in personal behaviours associated with stress. From a health perspective, behavioural changes can include adopting or intensifying unhealthy behaviours such as smoking tobacco, overeating, substance abuse or dependence and sleeping problems. As a result, unhealthy behaviours triggered by stress can further accelerate the progression of mental disorders and CVD, or directly cause obesity, diabetes, CVD and cancer (Dani & Harris, 2005; Hecht, 1999; Mokdad et al., 2003).

### 3.6.3 FACTORS RESULTING IN ALTERED DIETARY PRACTICES AND POTENTIAL ASSOCIATED HEALTH OUTCOMES

Across BC, the events at the Mount Polley Mine triggered a reduction in fishing activities in affected First Nations, and thus induced significant changes in dietary practices. It is important to view these changes in the context of reports of recent reductions in the availability of salmon in the First Nations communities visited. The mechanisms driving reduced fish availability are not well understood, but probably include climate change; in addition, many First Nations believe there are links with fish farming and the cumulative impacts of contaminants on fish health. This means that the reduction in fish consumption linked to fears of fish contamination from the Mount Polley tailings breach added to already-decreasing fish consumption linked to lower fish stocks. In each community, the team attempted to estimate the significance of the impact of the Mount Polley Mine tailings breach on salmon consumption in affected communities and found that the incident was an important trigger in most communities leading to significant drops in fishing and fish consumption. In almost all participating First Nations, community leaders formally closed fishing in response to the Mount Polley tailings breach in August 2014.

As no respondents reported malnourishment, the team assumed that other food sources such as red meat and poultry, energy-dense foods and carbohydrates have replaced fish consumption. These patterns will need to be fully investigated in the full HIA and considered in the context of changing lifestyles and altered economic conditions.[8] This means that a full understanding of the impacts of changes in dietary practices may vary considerably among and within population groups, depending on a variety of personal, cultural, and environmental attributes (Mead E, Gittelsohn, Kratzmann, Roache & Sharma, 2010). Consequently, also the potential health effects associated with changed dietary practices are multidimensional, dynamic and complex, and need further investigation (Figure 7).

With regard to the potential effects of the Mount Polley event on dietary practices, the team proposes three impact pathways for further investigation:

1. Reduced consumption of fish, in particular, salmon: Fish has a high vitamin content, especially vitamins D and B2, and is an important source of calcium, phosphorus and minerals (e.g. iron, zinc, iodine, magnesium and potassium). Fish is also an important source of protein and nutrients that can lower blood pressure and help reduce the risk of a heart attack or stroke (Mozaffarian & Rimm, 2006). Fish oils are thought to have an effect in lowering triglyceride levels in the blood and thus reduce the risk for developing CVDs (Siegel & Ermilov, 2012). To maintain a healthy diet, regular fish consumption is recommended by the Healthy Food Guidelines for First Nations Communities (FNHA, 2009). Given these links, reduction in fish consumption can be expected to result in adverse health effects.

   On the other hand, fish is viewed by many respondents as vulnerable to contamination by heavy metals and potentially other pollutants, as well as parasites, bearing the potential for a range of health effects and disease. In settings where those risk factors are present, a reduction in fish consumption may be necessary and may produce positive effects on foetal growth, infant growth, neurologic disorders and potentially cancer (Karagas et al., 2012).

2. Increased consumption of other protein sources: Substitution of fish with other protein sourc-

*[8] Substitution of fish with other protein red meat consumption is associated with an increased risk of total, CVD, and cancer mortality. Substitution of other healthy protein sources for red meat is associated with a lower mortality risk.*

es is particularly problematic if the substitute is red meat (English et al., 2006). Increased red meat consumption is associated with an increased risk of CVD and cancer mortality (Pan et al., 2012).

3. Replacing proteins with energy dense foods or carbohydrates: There is an inverse relation between energy density and the economic cost of foods, given that energy-dense foods (composed of refined grains, added sugars or fats) generally represent the lowest-cost option to the consumer (Drewnowski & Specter, 2004). In addition, the high-energy density and palatability of sweets and fats are associated with higher overall energy intakes (Swinburn, Caterson, Seidell & James, 2004). The combination of those factors means that there is a high risk that low-income First Nations households will replace salmon with cheap refined grains, sugars and fats, rather than healthier and more-expensive alternatives. As a result, increased risk for obesity, hypertension, metabolic syndrome, type 2 diabetes and kidney disease may occur if proteins derived from fish are replaced with energy-dense foods or carbohydrates (Beulens, 2007; Johnson et al., 2007; Ogden, Yanovski, Carroll & Flegal, 2007).

These impact pathways show that changes in dietary practices linked to reduced availability of salmon are more likely to be negative than positive, although there may be some upside in highly contaminated environments. More information is needed to determine which effects are most important and what measures need to be taken to minimize negative effects and maximize positive effects related to dietary practices: i) a thorough understanding of various underlying health indicators (e.g. nutritional status); ii) insight into the socio-cultural factors affecting diet (e.g. composition of diet); and iii) an understanding of the existing environmental conditions (e.g., degree of fish contamination) in the community context (Compher, 2006; Kuhnlein, Receveur, Soueida, & Egeland, 2004).

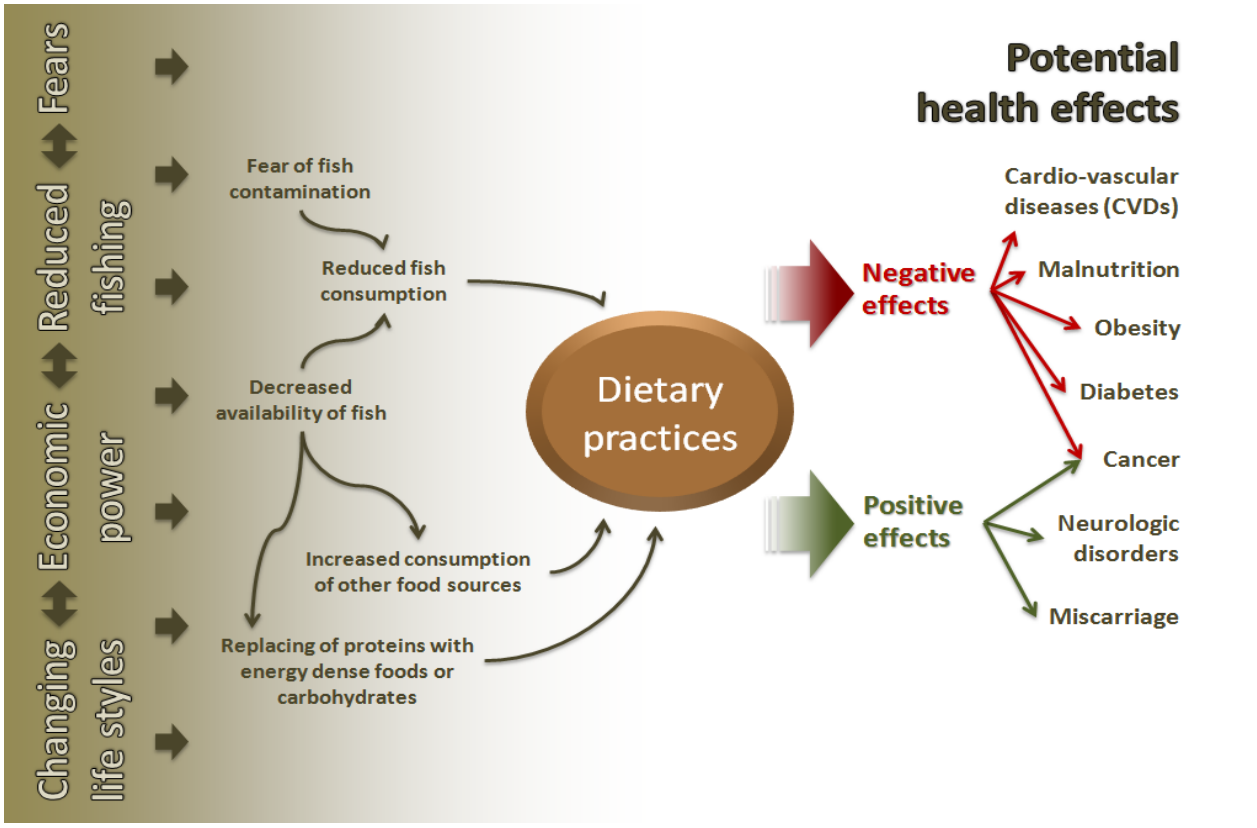


***Figure 7**. Drivers of dietary shifts and associated health outcomes.*

### 3.6.4 FACTORS RESULTING IN ALTERED PHYSICAL ACTIVITY IN RELATION TO TRADITIONAL PRACTICES AND POTENTIAL ASSOCIATED HEALTH OUTCOMES

Fishing, hunting and gathering practices, as well as fish preparation, processing and other cultural and traditional practices related to salmon, all encompass significant physical activity of involved individuals. For example, to walk down to the Fraser River for salmon fishing, which in itself is an intense activity, clearly is a moderate- to high-intensity physical activity that used to be practiced by large numbers of First Nation peoples several times weekly during the salmon fishing season.

Consequently, the reduction and cessation of fishing activities linked to the Mount Polley Mine tailings breach has led to reduced fishing-related physical activity. Similarly, a decrease in fishing and fish-associated cultural/traditional activities such as the use of fish heads and oil in the preparation of animal hides, preservation of fish, and cultural ceremonies also results in decreased physical activity. In some places, interviewees also indicated that reduced fishing activities in combination with fears over contaminated land have interfered with gathering and hunting activities.

The extent of these changes in activity since the Mount Polley Mine spill is not fully understood and appears to vary considerably between different informants and among different First Nation communities. However, based on the assumption that fishing/fish-related activities used to be practiced by more individuals and are more physically demanding than gathering and hunting practices (which have also been negatively affected in some First Nation communities), the scoping study appears to suggest that, overall, people living in the areas affected by the Mount Polley Mine spill have significantly reduced physical activities related to hunting/fishing .

As described in Figure 8, regular physical activity is one of the most important determinants of health: a decrease in physical activity increases the risk of: (i) gaining weight; (ii) CVDs; (iii) type 2 diabetes; (iv) mental health and mood disorders;(v) weakening of muscles and bones; and (vi) cancer (Bassuck & Manson, 2005; Biddle & Asare, 2011; Blair, et al., 1996; Hamer, Stamatakis & Steptoe, 2009; Lee, Djousse, Sesso, Wang & Buring, 2010; Manson et al., 2002; McTiernan, 2008; Monninkhof, et al., 2007; Must & Tybor, 2005; Sigel et al., 2006; Warburton, Nicol & Bredin, 2006).

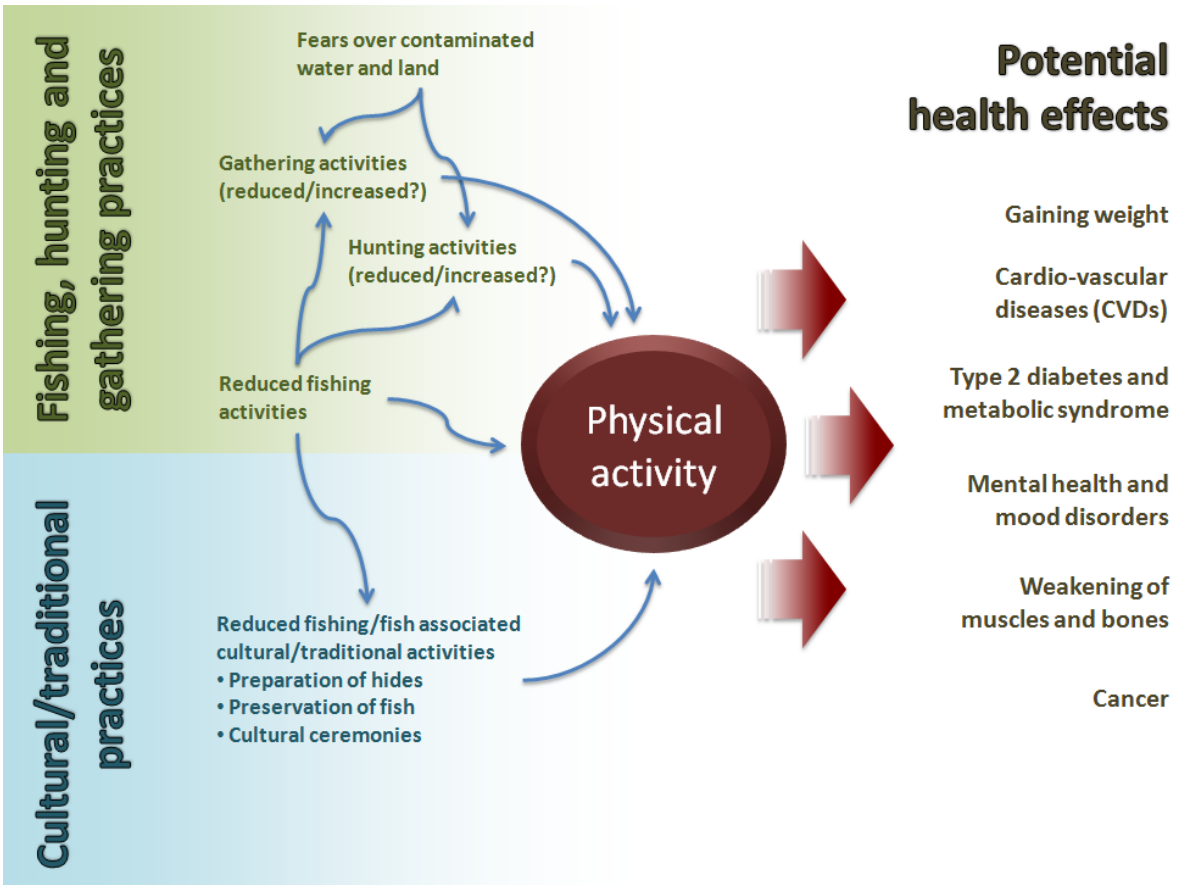


***Figure 8**. Drivers of alteration in physical activity and associated health outcomes.*

### 3.7 **GAP ANALYSIS**

A gap analysis informs whether sufficient data is available to proceed directly with the risk analysis and impact mitigation, or, in case of inadequate or insufficient data, whether the collection of additional health data is recommended (Winkler et al., 2011). This includes critical appraisal of data quality of identified sources. Importantly, data on health determinants and health outcomes of concern require a high level of accuracy for affected population groups allowing for evidence-based risk and impact assessment and subsequent monitoring and surveillance.

The gap analysis started from the identification of the key pathways for health impacts identified in Section 3.5. From these pathways the team identified the health determinants (i.e. the range of personal, social, economic and environmental factors which determine the health status of individuals or populations) and health outcomes (a change in the health status of an individual, group or population) of concern, following Quigley et al., 2006. The health determinants and outcomes formed the information requirements for the in-depth HIA. Based on these requirements, the available quantitative and qualitative information was ranked as follows: (i) low accuracy, (ii) moderate accuracy, and (iii) high accuracy. Additional data collection becomes part of the requirements for the overall HIA, when low quality secondary data are available. The findings of this analysis are presented in Table 19, which is an instrument guiding the selection and definition of health indicators to be collected as part of baseline studies and other surveillance systems.

***Table 19**. Health determinants and health outcomes of concern, sources of information, data quality and gap analysis.*

| *Health determinants and health outcomes of concern* | *Sources of information* | *Data quality* | *Data gap* |
|---|---|---|---|
| **Environmental dispossession cluster** | | | |
| Ability to hunt, trap, fish, forage and travel on the land | Key informant interview (KII) and Group Discussions (GD) | Moderate accuracy | Yes |
| Practice of cultural traditions | KII and GD | Moderate accuracy | Yes |
| Access to traditional territory | KII and GD | Moderate accuracy | Yes |
| Composition of diet (source and amount of proteins and other food types) | N.a. | - | Yes |
| Self-esteem | N.a. | - | Yes |
| Physical fitness | N.a. | - | Yes |
| Mental health and mood disorders | Routine health information system RHIS | Accuracy unknown | Yes |
| Substance abuse | N.a. | - | Yes |
| Cardiovascular diseases | Possibly RHIS | Accuracy unknown | Yes |
| Suicide | Possibly RHIS | Accuracy unknown | Yes |
| **Emotional stress cluster** | | | |
| Flow of information | KII and GD | Moderate accuracy | Yes[9] |
| Trust in information | KII and GD | High accuracy | No |
| Food security | KII and GD | Moderate accuracy | Yes |
| Personal fishing practices | KII and GD | Moderate accuracy | Yes |
| Commercial fishing practices | KII and GD | Moderate accuracy | Yes |
| Cultural/traditional practices related to fish(ing) | KII and GD | Moderate accuracy | Yes |
| Type and level of conflicts | KII and GD | Moderate accuracy | Yes |
| Violation of rights | None available (N.a.) | - | Yes |
| Health of Fraser River system | MacDonald, 2011 | Moderate accuracy | Yes |
| Unhealthy behaviour (e.g. alcohol, smoking, over-eating) | N.a. | - | Yes |
| Emotional/psychological trauma | Possibly RHIS | Accuracy unknown | Yes |
| Depression and anxiety disorders | Possibly RHIS | Accuracy unknown | Yes |

*[9] A retrospective review of information flow should incorporate all involved, not just the receivers of information.*

| *Health determinants and health outcomes of concern* | *Sources of information* | *Data quality* | *Data gap* |
|---|---|---|---|
| Cardiovascular diseases | Possibly RHIS | Accuracy unknown | Yes |
| Cancer | Possibly RHIS | Accuracy unknown | Yes |
| Diabetes | Possibly RHIS | Accuracy unknown | Yes |
| Obesity | Possibly RHIS | Accuracy unknown | Yes |
| **Dietary practices cluster** | | | |
| Availability of fish | KII and GD | Moderate accuracy | Yes |
| Fears of fish contamination | KII and GD | Moderate accuracy | Yes |
| Economic power | KII and GD | Moderate accuracy | Yes |
| Dietary practices-related life style changes | N.a. | - | Yes |
| Composition of diet (source and amount of proteins and other food types) | N.a. | - | Yes |
| Cardio-vascular diseases | Possibly RHIS | Accuracy unknown | Yes |
| Malnutrition | Possibly RHIS | Accuracy unknown | Yes |
| Obesity | Possibly RHIS | Accuracy unknown | Yes |
| Diabetes | Possibly RHIS | Accuracy unknown | Yes |
| Cancer | Possibly RHIS | Accuracy unknown | Yes |
| Neurologic disorders | Possibly RHIS | Accuracy unknown | Yes |
| Miscarriage | Possibly RHIS | Accuracy unknown | Yes |
| **Physical activity cluster** | | | |
| Fears over contaminated water and land | KII and GD | Moderate accuracy | Yes |
| Personal fishing practices | KII and GD | Moderate accuracy | Yes |
| Commercial fishing practices | KII and GD | Moderate accuracy | Yes |
| Hunting activities | KII and GD | Moderate accuracy | Yes |
| Gathering activities | KII and GD | Moderate accuracy | Yes |
| Cultural/traditional practices related to fish(ing) | KII and GD | Moderate | Yes |

| *Health determinants and health outcomes of concern* | *Sources of information* | *Data quality* | *Data gap* |
|---|---|---|---|
| | | accuracy | |
| Cardio-vascular diseases | Possibly RHIS | Accuracy unknown | Yes |
| Cancer | Possibly RHIS | Accuracy unknown | Yes |
| Diabetes | Possibly RHIS | Accuracy unknown | Yes |
| Overweight and obesity | Possibly RHIS | Accuracy unknown | Yes |
| Mental health and mood disorders | Possibly RHIS | Accuracy unknown | Yes |

# 4. RECOMMENDATIONS

The screening and scoping stage HIA serves primarily as a guide for framing the full HIA in an effective and efficient manner. However, the screening and scoping activities also identified continuing impacts to First Nations health, linked to real and perceived impacts that could be significantly reduced through actions in the near future. For this reason, this section includes a series of recommendations for immediate actions. This work also provides insight into the field of HIA with First Nations communities and so the project team includes some tentative potential policy and practice recommendations.

## 4.1 RECOMMENDATIONS FOR FURTHER HIA WORK SPECIFIC TO THE MOUNT POLLEY TAILINGS BREACH

The next step in completing the HIA process is the collection and participatory analysis of the data, specific to the impacted First Nations, that are identified in the gaps table (Table 19). In view of the data gaps identified this will require primary data collection in the affected First Nations, as well as an assessment and analysis of the data that is available through the routine health information system.

Overall, the additional data collection will aim to:

- Add to and amend information at a local level to describe the current status of health determinants and outcomes in affected communities fully. Researchers will also include analysis of retrospective components in the data collection, to support the modelling of health impacts and associated management/mitigation measures; and
- Establish a solid health, environmental and socio/cultural baseline as part of an overarching surveillance and response mechanism to identify potential long/term impacts and monitor change over time. First Nations participating in the study viewed this as particularly important in light of the fact that Mount Polley is currently operating again and has recently received approval for tailings water discharge into Quesnel Lake.

The research team anticipates that the data collection at community level will include the survey modules outlined in Table 20.[10] The team will produce a detailed methodology for collecting the required data and will subsequently develop and implement the study protocol. The project will require support and participation from First Nation communities and local health authorities to meet ownership, control, access and possession (OCAP) principles, and it will require engagement and financial support from the BC mining industry and provincial authorities. HIA is founded on requirements to foster the partnerships at an early stage in the data collection that will be critical to acceptance of the results. Importantly, it will also strengthen the implementation and management of the recommendations that the HIA will produce.

*[10] Although the project team have included all of the affected communities within the full HIA research, it is clear that the most directly impacted areas will require more intensive data collection for environmental and toxicological impacts, while some of the health baseline data will be required at similar levels for all communities.*

***Table 20**. Health determinants and health outcomes of concern, sources of information, data quality and gap analysis.*

| Survey module | Data needs to address data gaps and concerns of First Nation communities |
|---|---|
| **Cultural determinants of health**<br><br>(Questionnaire survey will assess current and past practice/ behaviour) | • Personal fishing practices<br>• Ability to hunt, trap, fish, forage and travel on the land<br>• Access to traditional territory<br>• Fears over contaminated fish, land and water<br>• Economic power<br>• Cultural/traditional practices<br>• Food security<br>• Hunting and gathering activities<br>• Conflict and violation of rights<br>• Unhealthy behaviours<br>• Dietary practices<br>• Composition of diet<br>• Self-esteem |
| **Clinical Health Assessment** | • Self-reported health status<br>• Self-reported physical fitness<br>• Mental health status<br>• Systolic blood pressure<br>• Fast Plasma Glucose Test (diabetes type 2; feasibility needs to be assessed)<br>• Body mass index<br>• Hair sampling for heavy metal analysis |
| **Assessment and analysis of routine health information system data**<br><br>(data needs to be specific for First Nations and might be compared to other population groups) | • Cardiovascular disease diagnostic rates<br>• Cancer diagnostic rates<br>• Diabetes diagnostic rates<br>• Mental disorder diagnostic rates<br>• Neurologic disorders diagnostic rates<br>• Nutritional disorders diagnostic rates<br>• Miscarriages<br>• Suicide |
| **Environmental data collection** | • Longitudinal, systematic sampling of fish and plankton for heavy metal analysis<br>• Systematic and longitudinal monitoring of wildlife health<br>• Potential additional environmental data required as important to those First Nations whose traditional territories have been directly impacted. |
| **Economic data related to commercial fisheries** | • Fish catch and fisheries economic data |

## 4.2 **IMMEDIATE ACTIONS**

The scoping and screening findings identify ongoing health impacts and risks for First Nations communities that could be significantly reduced through urgent intervention. Chronic emotional stress is known to be detrimental to health and there appear to be some fairly simple strategies that could be implemented in the short term to reduce the drivers of stress and to mitigate its symptoms and physiological impacts. These actions are justifiable in the short term, without determining whether or not there are physical factors that conclusively justify community actions, because social impacts can result from perceptions, whether or not they are based on reality. It is clear to the researchers that many communities continue to be emotionally distressed by the consequences of the Mount Polley tailings spill on their communities. These actions include:

1. **Improve access to emotional counselling and cultural healing processes**: One approach to reducing this distress would be to create access to emotional counselling for affected community members and to develop and implement an appropriate cultural healing process. This could be initially targeted for people who are particularly seriously affected by the additional stress (e.g., those who have returned to or adopted unhealthy coping behaviours).
2. **Improve access to trusted information on an appropriate range of issues**: Residents desperately needed – and still need – information that adequately addresses their concerns regarding the safe consumption of fish and other wild foods, the safety of water, and the health of the ecosystems that they depend on for their traditional foods and livelihoods. It is clear that the lack of trusted sources of information has exacerbated emotional stress. Finding appropriate channels for providing credible information to impacted First Nations and working with them to access data to address their concerns could alleviate the uncertainty and distrust. It is the project team's experience that First Nation participation in guiding study design, data collection, analysis and reporting is integral to trusting data. Participatory, transparent independent processes have demonstrated great success in bring trust in data. The FNHA also appear to be in a strong position to facilitate the identification and delivery of trusted information, as many interviewees mentioned the study that they undertook of the toxicological safety of salmon for eating, as a positive action.
3. **Address ongoing constraints to accessing traditional diets and medicine**: Fear and lack of trusted information play key roles in the ongoing reticence of First Nations communities to fish, hunt and harvest and this in turn impacts their diet. It will take time to restore trust in the safety of consuming wild food or to identify prudent alternatives that take into consideration the unique concerns of First Nations. In the interim, fishing restrictions and de–facto reductions in fishing have led to significant changes in diet, which are probably contributing to current and future health problems. Although there has been some replacement of salmon in the most affected communities, it has not been to the level of the losses sustained. Replacing the salmon losses with equivalent healthy foods (preferably salmon, hunted meat and gathered foods and medicines from sources that communities trust to be safe) appears to be indicated in the short term.
4. **Instigate a grievance process for use by affected individuals and communities**: Many First Nations communities and individual households in Likely have suffered demonstrable losses as a result of the Mount Polley tailings spill. These losses have not yet been adequately compensated and, even though there are ongoing forums discussing impacts, only limited and partial remedies have been provided so far and little, if any, compensation has been provided by MPMC, which has the ultimate responsibility for the dam breach. Developing a grievance process acceptable to the affected First Nations would provide a channel for

affected households and First Nations to begin to seek redress. In addition, while the overall compensation processes are being developed and in the interest of limiting ongoing and further damage an interim compensation fund could be established by MPMC to fund the urgent measures identified in this section.

Another specific urgent recommendation is for advocacy support to be provided to the Lhtako Dene so that there is no cost for them to attend meetings to determine appropriate actions for the BC MoE and MPMC to the tailings spill that directly impacted part of their traditional territory. This would assist them to participate in and better understand remediation efforts that are to the project's team knowledge potentially occurring on their traditional territory.

## 4.3 **POLICY AND PRACTICE RECOMMENDATIONS TO MANAGE FUTURE RISKS AND IMPACTS**

### 4.3.1 FNHA TO CONSIDER SALMON AS A KEY DETERMINANT OF FRASER RIVER FIRST NATIONS COMMUNITY HEALTH

The First Nation communities that participated in this research, reported overwhelmingly negative impacts on fishing practices and access to traditional food sources (i.e., salmon) following the Mount Polley Mine tailings dam breach. Researchers had posited that this would influence community health primarily through changes to dietary patterns; however, in the course of the research it became clear that there are broader consequences that require consideration. Project findings indicate the central role that salmon fishing plays in a wide variety of determinants of health ranging from physical exercise to social cohesion, learning and sharing cultural identity and a wide range of factors affecting emotional health. Inclusion of the environmental dispossession pathway as one that is critical to preventing health impacts points to the particular importance of this array of drivers to the overall health of First Nations communities.

It also highlights the importance of building a holistic understanding of the environment, including the regional water systems, for First Nation communities, if they are to improve their health status, to one that is more aligned with the broader Canadian status. International standards recognize the importance of ecosystem health and ecosystem services (i.e., the production of food and water) as a key factor to consider in relation to projects and their potential impacts and risks on community health and safety. According to the International Finance Corporation (IFC), the "project's direct impacts on priority ecosystem services may result in adverse health and safety risks and impacts to affected communities" (2012, p. 2). Project proponents must identify and avoid potential risks/impacts. When unavoidable, mitigation measures based on best practice are to be implemented (IFC, 2012).

In the course of the research, First Nations communities repeatedly expressed concerns over the health of the Fraser River system in general and its salmon in particular, in the context of the cumulative impacts from multiple sources (e.g., tailings dam breaches and the direct discharge of tailings waste through permit approval, point source discharges, organic pollutants, fish farming impacts, etc.). Figure 9 provides a graphic representation of these impacts (MacDonald, 2011). Based on the principle of intuitive toxicology (the process by which lay people rely on their senses to detect unsafe water, food or air, and distrust information from experts that contradicts their experience) First Nations communities observe negative changes in salmon populations and salmon health and distrust information provided by experts claiming that all is well (Neil, Malmfors & Slovic, 1994). These concerns lead to a sense of environmental dispossession among First Nations communities throughout the region, which has been identified as an important ecosystem

service and determinant of Aboriginal Health (Cunsolo et al., 2013; IFC, 2012).

Communities are not only losing access to the environment, but also the traditional practices associated with catching, preserving and consuming salmon that the environment hosts. Given the complexity of the relationship between First Nation communities in BC and salmon, the project team concludes that the loss of salmon, or the continued distrust in the health of salmon in the Fraser River system will result in devastating cultural impacts to First Nation communities throughout BC. Therefore we recommend that FNHA consider promoting an understanding of salmon health, as a key determinant of First Nation health for BC communities and find ways to advocate for studies and mitigation actions that will protect the river ecosystem and identify the causes of the observed impacts on salmon populations and health. While studies to date have focused on the immediate safety of salmon for eating and more often focus on whether contaminant levels exceed legally recognized threshold levels, the First Nations have a more nuanced understanding of their environment and ask questions about the impacts on spawn and juvenile fish of hatching and growing in lakes lined by tailings sediment, and the potential impacts of this on the return rate after three years at sea. They also recognize that levels of toxins that have no significant impact on human health, may make fish more susceptible to illness, or simply make them less resilient to surviving through their lifecycle. Together these factors point to an urgent need to protect the health of the Fraser River system in an integrated manner as the health of the river, its salmon and the health of BC First Nations are intrinsically linked, and are perceived by many First Nations people interviewed to be at risk (Figure 9).

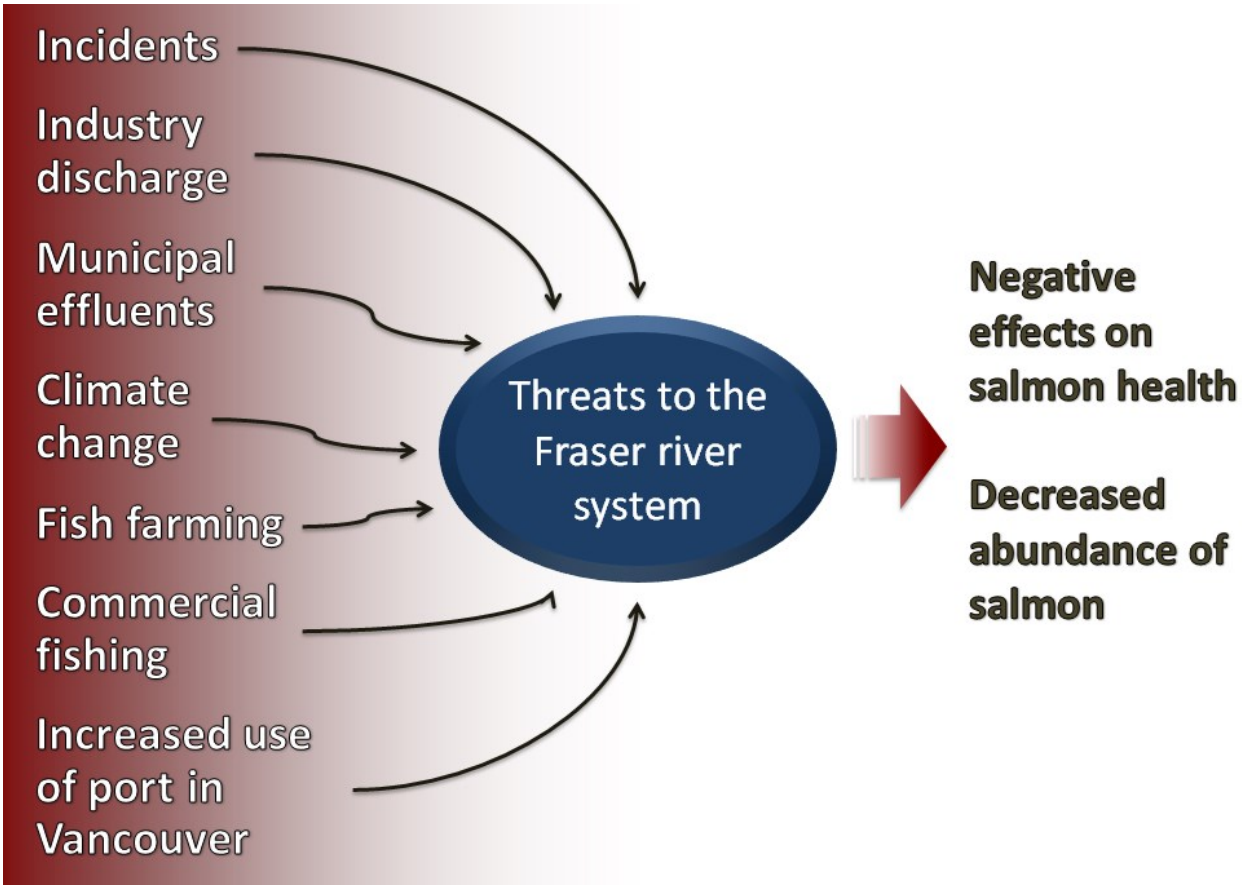


***Figure 9**. Threats to the Fraser River watershed and implications for salmon.*

### 4.3.2 IMPROVED ENGAGEMENT AND ACCESS TO REMEDY TO MITIGATE IMPACTS

It is clear from the information provided in the scoping study by the participating First Nations communities that limited access to trusted and clearly comprehensible sources of information has significantly exacerbated the impacts of the Mount Polley tailings breach for communities.

For Canadian extractive companies operating abroad, the Government of Canada announced an 'enhanced corporate social responsibility (CSR) strategy' on November 14, 2014, that includes an expectation that Canadian companies will align their practices abroad with a series of internationally recognized frameworks including:

- The UN Guiding Principles on Business and Human Rights (added to the strategy in 2014); and
- International Finance Corporation's (IFC's) Performance Standards on Social & Environmental Sustainability.

Failure to conform to the guidelines or to participate in the National Contact Point dispute resolution process disqualifies companies from enhanced Government of Canada (GoC) support in foreign markets (Global Affairs Canada, 2015).

Clearly, as a project operating within Canada, the Mount Polley Mine is not required to follow the enhanced CSR strategy; however, the adoption of these standards by the GoC for operations abroad, suggests that these standards are recognized as benchmarks for extractive company performance. Further, the failure to adopt these standards within the country suggests that existing Canadian legal frameworks are seen as offering the same or better guidance to companies operating nationally and so these standards can also be seen as a floor for in-country CSR performance. As the project team has been informed that First Nation communities themselves, rather than Mount Polley, have funded many of the remediation measures (including distribution of limited replacement salmon to communities), this could be seen as the equivalent of communities paying for the impacts of a privately operating company or in other words, the externalization of costs.

**Engagement with Indigenous Peoples**

The IFC standards include requirements for engagement with 'affected communities' under Performance Standard 1. The requirements for engagement state (paragraph 27) that it be scaled to the project risks and impacts and development stage and that engagement should be a two-way process that continue[s] on an ongoing basis as risks and impacts arise. In addition it should be based on the prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information which is in a culturally appropriate local language(s) and format and is understandable to affected communities. At paragraph 31, the IFC require engagement to constitute an "informed consultation and participation" process involving an "in-depth exchange of views and information, and an organized and iterative consultation, leading to the client's incorporating into their decision-making process the views of the affected communities on matters that affect them directly, such as the proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues, in cases where there are 'significant adverse impacts'. Additional requirements related to indigenous peoples and the definition of the special circumstances requiring free, prior and informed consent (FPIC) are described in Performance Standard 7.

**Commentary**: From the comments received from the directly impacted First Nations communities, it is clear that social impacts and risks from the tailings breach have been significant, and yet, it also appears that the engagement process has fallen considerably short of the requirements of PS 1. For example, the Lhtako Dene have not been brought into the process, despite being

directly impacted and carrying significant risks from the project. Also, processes have focused overly on representatives of First Nations communities and have been at distant locations, rather than being easily accessible and have lacked aspects of cultural appropriateness and inclusiveness. In addition, there is limited evidence that, in the case of the spill, "the views of the affected communities on matters that affect them directly, such as the proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues" have been adequately acknowledged and acted upon.

**Recommendations**: While at this point, only the views of the First Nations communities have been provided, it appears that there need to be changes made to the communication mechanisms being used by the government ministries and by Mount Polley, in their engagement with affected communities to create a more accessible, comprehensible, trusted and inclusive process for managing the impacts and risks that they communities have faced and continue to face in relation to the Mount Polley tailings breach. The process should also seek to demonstrate how First Nations views have been incorporated into mitigation measures, etc.

4.3.3 TIMELY AND ADEQUATE RESPONSE TO GRIEVANCES / REMEDY FOR FAILURE TO RESPECT / PROTECT HUMAN RIGHTS:

This section considers the rights of the affected First Nations to timely, appropriate and adequate redress and resolution of grievances or abuse of individual and/or collective rights under UNDRIP, the UN Guiding Principles on Business and Human Rights, and through the IFC Performance Standards.

UNDRIP Article 28 (1): Indigenous peoples have the right to redress, by means that can include restitution or, when this is not possible, just, fair and equitable compensation, for the lands, territories and resources which they have traditionally owned or otherwise occupied or used, and which have been confiscated, taken, occupied, used or damaged without their free, prior and informed consent (United Nations, 2008).

The UN Guiding Principles on Business and Human Rights is founded on three pillars;

- The state duty to protect against human rights abuses by third parties, including business;
- The corporate responsibility to respect human rights; and
- Greater access by victims to effective remedy, both judicial and non-judicial (United Nations, 2011)

The IFC Performance Standards require companies to have a grievance mechanism "to receive and facilitate resolution of affected communities' concerns and grievances about the client's environmental and social performance." It should be: "scaled to the risks and adverse impacts of the project … have affected communities as its primary user … seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies." (IFC, 2012, PS1, p. 9).

**Commentary**: Given that, all parties appear to recognize that there have been clear impacts on food security and Aboriginal rights, and that the extent of mitigation one and a half years after the spill has consisted of a partial replacement of salmon to the most vulnerable households (paid for by First Nations) and remediation activities that are not fully understood or trusted, leaving many households still avoiding fishing, effective remedy (under the UN Guiding Principles) and the right to redress (under UNDRIP) do not yet appear to have been achieved in this case. The extent and scale of the gap will be identified in the full HIA.

In addition, the response process around the spill does not appear to comply with the grievance management requirements in that: concerns are far from resolved 16 months after the incident, and there appear also to be gaps in the requirements in terms of the comprehensibility, transparency, cultural appropriateness and access to the mechanism. At least for the Lhtako Dene, whose traditional lands include the remediation area, the mechanism has not been without cost. Again, the scale of health impacts and losses, will not be clear until the full HIA is complete.

**Recommendations**: Even without completing the full HIA, it is apparent that a gap exists between today's situation in the breach-affected communities and their right to an effective grievance mechanism as outlined in PS 1, paragraph 35, and also their rights under the UN Guiding Principles on Business and Human Rights. Closing this gap would enable improved management of future incidents and could be recommended not only to Mount Polley, but also to all other natural resource projects with potentially serious impacts for Aboriginal People. The ongoing impacts of delay in providing an adequate resolution to concerns and grievances and remedy for breaches to First Nations human rights should be recognized in mitigation actions and compensation. It is recommended this include support for actions listed in section 4.2.

#### 4.3.4 IMPLEMENT FREE PRIOR AND INFORMED CONSENT PRACTICE

Canada prides itself on its leading role as one of the architects of the Universal Charter on Human Rights in 1947-48 (Global Affairs Canada, 2015) and is a signatory to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). UNDRIP requires states to "consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources" (United Nations, 2008 p. 12). While participation agreements, and an ongoing series of committees exist for the Xat'sull First Nation and Williams Lake Indian Band, on whose land the Mount Polley operation is located, which arguably constitute the outcomes and ongoing implementation of a free, prior and informed consent (FPIC) process, the Lhtako Dene First Nation currently has no agreements with Mount Polley, despite the tailings dam breach affecting their "lands, territories and other resources". In addition, at present no forum exists for ensuring that FPIC of all affected indigenous groups is provided for mine approvals, expansions (even those not triggering ESIA requirements), full and restricted restarts and effluent release permits. Recently, on November 30, 2015, the Ministry of Environment approved a two-year water discharge permit to treat and discharge water from the temporary tailings management facility on the Mount Polley Mine site. Tailings are currently being stored in the Springer Pit, an inactive open pit on the mine site, which is expected to reach capacity by April 2016. Treated water from the site, which is required by law to meet Ministry of Environment water quality guidelines for wildlife and public health, will be discharged untreated into Hazeltine Creek where it will flow into a sediment pond and ultimately to a pipeline that will discharge into Quesnel Lake, 30-40m below the surface (BC Ministry of Environment, 2015). Despite undergoing a 30-day consultation period, this decision did not obtain the FPIC of all impacted communities.

**Recommendation**: Implement FPIC for mine approvals and expansions (even those not triggering ESIA requirements) full and restricted restarts and release permits in BC. While the Cariboo Mine Development Review incorporates some functions of a consultation forum, it doesn't include all affected First Nations and, as First Nations groups are outnumbered on the Review, it cannot be considered to provide First Nations FPIC.

# 5. CONCLUSION

The key objectives of the screening and scoping phase were to identify communities potentially impacted by the Mount Polley disaster; review existing health and environmental data; identify community-level health and social impacts; and complete a gap analysis of the information needed to support a full HIA. The research team contacted 46 First Nation and 1 non-First Nation communities based on geographical location, recommendations of FNHA, and recommendations made by screening and scoping phase participants. The findings of this work are summarized below:

- Past and continued experiences with emotional stress are the key impacts shared among all communities in relation to the incident. The level of emotional stress is linked to the severity of potential impacts and risks perceived by the community and the level of uncertainty and lack of trust in the information provided.
- In general, First Nations communities experienced a decrease in subsistence (and at times, also commercial) fishing practices that resulted in shifts in dietary, physical activity, and cultural practices; lost income from commercial fisheries; and increased stress on administrators.
- Communities of Xat'sull, T'exelcemc and Lhatko Dene reported more direct impacts to their traditional territories, located close to the Mount Polley Mine.
- Similar impacts were observed between nations located closest and furthest from the spill. The project team speculates that this is explained by salmon heath as an important determinant of health among Fraser River First Nations.
- Non-First Nations respondents in Likely raised concerns over increased community conflict linked to the incident and safety of water for drinking, domestic, and recreational use.

Based on these results, the project team identifies four interrelated pathways of existing and potential health impacts. These themes provide a coherent framework for further analysis:

1. Environmental dispossession
2. Emotional stress
3. Altered dietary patterns with associated health impacts and risks
4. Changes to physical activity with associated impacts and risks

This work also creates a path forward for further investigation. The screening and scoping phase identifies information requirements for a full HIA on the impacts of the Mount Polley spill on First Nations communities. In addition, it also identifies ongoing health impacts and risks for communities and recommends interventions that could significantly reduce them. These recommendations include:

- Improve access to emotional counselling and cultural healing processes
- Improve access to trusted information on an appropriate range of issues
- Address ongoing constraints on access to traditional diets and medicine
- Instigate a grievance process for use by affected individuals and communities

Finally, the project team recommends that FNHA play an advocacy role in explaining the central role that salmon fishing plays in the wide variety of determinants of First Nations health. In addition, we recommend that FNHA advocate for studies and mitigation actions that protect the river ecosystem and investigate the causes of observed impacts on salmon populations and health. As the health of First Nations involved in this study is intrinsically linked to the health of the Fraser River, it is essential to take action on reducing these environmental health risks.

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