

Community Health and Safety in the Nak'al Bun/Stuart Lake Region During the Construction Phase of the Mount Milligan Mine

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Abbreviations Used In This Report

CVD	Cardiovascular disease
BC EAO	British Columbia Environmental Assessment Office
EA	Environmental Assessment
EPC	Engineering, procurement and construction
FLNRO	Ministry of Forests, Lands and Natural Resource Operations, Province of British Columbia
HIA	Health Impact Assessment
IFC	International Finance Corporation
KT	Knowledge Translation
MoE	Ministry of Environment, Province of British Columbia
MVC	Motor vehicle collision
PS	Performance Standard
SPMS	Social Performance Management System
Thompson Creek Metals	Thompson Creek Metals Company Inc.
WSBC	WorkSafe BC

Executive Summary

This report represents a deliverable associated with a large research project on Aboriginal and northern community health and the extractive sector in British Columbia, Canada. This project originated in partnership with the Nak'azdli and Tl'azt'en First Nations and the municipality of Fort St. James in relation to potential community health risks and impacts associated with the construction and operation of one of BC's newest mines, the Mount Milligan mine. In 2012, a community health and health services baseline study on the three project-associated communities was completed. Based on the baseline and community priorities, the research team and community partners identified a suite of qualitiative and quantitative community determinant of health indicators to track. This second report reports on important data trends and observations associated with these indicators with focus on the construction phase of the Mount Milligan mine. It concludes by providing a suite of leading strategies for consideration in future industry development and planning.

Construction of the Mount Milligan mine began in June of 2010. The mine cost approximately $1.5 billion to build[1] and the construction phase lasted over three and a half years. At the peak of construction there were 1,035 people working at the site, including sub-contractors. The mine maintained a temporary construction camp on site, and workers were bussed from Fort St. James and Mackenzie (another project-associated community). During the construction phase, several alterations to the original mine plan were approved. Each amendment proposal meant significant pressure on local community resources. There was minimal company presence in Fort St. James, Nak'azdli and Tl'azt'en across the construction phase and a readily accessible public grievance mechanism whereby members of the community could raise issues and concerns was not identified.

Four key findings emerged during the construction phase of the Mount Milligan mine, with direct impacts on determinants of health on residents of the the Nak'al Bun/Stuart Lake area.

Loss of land

Traditional land holdings, or Keyoh, in the Nak'al Bun/Stuart Lake area have been directly impacted by the construction of the Mount Milligan mine and associated facilities. The Keyoh system is a traditional system and differs from the registered trapline system imposed by government. The name, property rights and responsibilites of a Keyoh are held by a family as Keyoh holders and are passed down from generation to generation. Several Keyoh have been impacted by the mine development. Locating the mine site on one Nak'azdli family Keyoh has resulted in the loss of access to this land for over 300 people. Other Nak'azdli Keyoh land was impacted or altered by the construction of road facilities. One major pathway for negative health outcomes for Aboriginal people is the loss of access to traditional lands.

Influx of Workers

The influx of workers resulted in strains on existing health services, impacts to health services in relation to an increase in industrial accidents and illness, increased vulnerability for women and youth in the area, increased pressure on a pre-existing housing crisis[2], and increased traffic. Socio-economic issues related to resource development have been identified in the literature as having a negative impact on Aboriginal health, including short-

[1] Thompson Creek Metals Company Inc. Mount Milligan Sustainability and Social Responsibility Report 2012, p. 3. Available online at http://www.Mountmilligan.com/files/documents/MountMilligan2012CSRReport.pdf

[2] Shandro, J., Ostry, A., and Scoble, M. (2012) Meeting the Health Needs of the Stuart Lake-Nak'al Bun Area. A Baseline Study of Community Health, Community Health and Social Services and Reported Impacts from Local Mining Developments, p. 27.

term economic planning which increases economic vulnerability in communities, higher costs of living for residents through increased cost of goods and services, and an increased strain on housing availability and health service providers due to an influx of non-resident workers.

Local employment and income

There were both positive and negative local employment and income impacts observed across the construction phase. For some, large pay cheques increased reckless spending, problematic substance use on days off and family conflict (including violence). During the initial ramp-up of construction, crime rates at the local level increased. For others, employment with the mine offered a tremendous opportunity and positive life style changes. As one of the most widely recognized social determinants of health, level of income can play an important role in shaping general living conditions, affecting psychological functioning and influencing individual health behaviours such as quality of diet, access to physical and recreational activities, tobacco use and excessive substance use.

Education and training

In 2011 and 2012, Thompson Creek Metals Company Inc. (Thompson Creek Metals) provided over $250,000 in funding to the College of New Caledonia in Fort St. James to provide industry-related education and training programs. This included a mine industry certificate course, community continuing education courses, a mill operator course and cultural awareness training sessions. The number of students that graduated, or the number of those who have successfully gained employment in the extractive sector as a result of these training initiatives, is unknown. Thompson Creek Metals did commit to interviewing all graduates of the programs and many are currently employed with the mine or other projects.

Recommendations

The management of community health and safety risks and impacts is expected based upon international best practice. Effective mitigation strategies require a systematic approach and as community health is a complex topic, collaboration between industry, communities and goverments is generally required. To bring a shift in how industry, communities and governments work together in BC towards resource development and managing community health and safety risks and impacts, this report proposes a suite of strategies developed by the research team in collaboration with community partners. The strategies presented are *leading* as they take an active and preventative approach to successfully manage health and safety risks and impacts.

For industry, overarching strategies based on international best practices, and specific to the key findings during the construction phase include the need to:

- Complete an appropriate social assessment that fully captures community-level health and social conditions and considers human health impacts and risks.
- Establish a social performance management system with adequate funding and staffing requirements that includes strong engagement, grievance management and a continuous assessment of project risks ad impacts.
- Assume corporate accountability for contractor and third-party actions.
- Ensure health services are provided on-site to minimize impacts to local services.
- Train staff and employees to recognize the lasting impacts of the Canadian residential school system in support of the Truth and Reconciliation process.

Strategies for government include the need to:

- Ensure that revenue-sharing agreements/financial support are applicable to communities to help them to manage the impacts of infrastructure pressures as a result of industrial development.
- Request a streamlined and/or compensated process for community engagement with multiple proponents.
- Prepare and implement a localized social risk register for new proponents considering development.
- Ensure the management of social risk in a more systematic, actionable fashion is embedded in the approved environmental certificate conditions.

Strategies for communities include the need to:

- Implement a systematic data collection system to reduce burden in responding to multiple projects, clearly identifying priority areas and tracking risks and successes.
- Collaborate with other project-affected communities.
- Take an active and supportive role in developing and implementing community-based monitoring programs.

1. Introduction

1.1 Background

Northern British Columbia (BC) has an active mining and energy sector with 18 proposed mines in the permitting or environmental assessment phase and 9 operating projects.[3] In 2013, gross mining revenues from the mining sector equaled $8.5 billion and 10,720 people were directly employed with an average salary of $114,600. Exploration expenditures totaled $476 million.[4] Northern BC continues to host oil and gas sector developments with a number of producing, processing and pipeline projects.

From a socio-cultural perspective, BC is a diverse and complex landscape. The province is home to approximately one-third of all First Nations in Canada. Of the 198 First Nations communities in BC, approximately 50 are located in the northern part of the province[5]. Many of these communities are directly impacted by mining, oil and gas development.

The Mount Milligan mine is a copper/gold open-pit mine located in north-central BC with a projected life span of 22 years. This mine will produce substantial revenues for BC and company shareholders. Construction of the mine commenced in June 2010 and the first ore was processed in August 2013. As outlined in our first project (baseline) report, concern over potential adverse and unknown impacts from the mine on health/health services resulted in service providers and community leaders from the municipality of Fort St. James and the Nak'azdli and Tl'azt'en First Nations approaching our research team for assistance. Their concern arose, in part, because the Mount Milligan Environmental Assessment (EA), approved in 2009, did not require the management of community health risks nor did it mandate the monitoring of community health conditions within the impact zone of the mine and associated developments.

Community leaders were also interested in exploring how, if adverse impacts were identified, that they might be mitigated. Our partner communities *"want to be ten steps ahead, not ten steps back*" as mining and other extractive resource projects evolve in their region in order to assure that they reap maximum benefits and are alerted to any potential harms to their communities.

1.2 Objectives

This report has two main purposes. Our first objective is to provide research-based evidence on the impacts on community health of the construction phase of the Mount Milligan mine. Our second objective is to present our results in relation to existing international standards on large-scale development projects, risk management and community health and safety.

This project was funded by both the Canadian Institute of Health Research (CIHR) and the Vancouver Foundation. Both institutions have prioritized community-based participative research conducted in close partnership with Aboriginal communities and industry. This project is in partnership with the Nak'azdli and Tl'azt'en First Nations and

[3] Mining Association of British Columbia, 2014
[4] Pricewaterhousecoopers, 2013. Digging Deep: The Mining Industry in British Columbia 2013. Available online at: http://www.pwc.com/ca/en/mining/publications/pwc-mining-industry-british-columbia-2014-05-en.pdf
[5] Aboriginal Affairs and Northern Development Canada, 2013. About British Columbia First Nations. Available online at https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-BC/STAGING/texte-text/inacmp_1100100021016_eng.pdf

the municipality of Fort St. James.[6] This report builds on our previous community health baseline study completed in 2012. We hope the information in this report will inform improved corporate, governmental and community performance in addressing community health risks and impacts.

The report is organized in six chapters. Following our introduction, Chapter 2 outlines the background and context of this report. We first introduce international standards that have evolved over the past decade to manage risks and impacts associated with the building, operation, and wind down of large–scale development projects. This chapter concludes by describing general activities undertaken during the Mount Milligan mine construction phase from 2010 to 2014.

Chapter 3 describes our study methodology which is based on comprehensive research data agreements with Aboriginal and non-Aboriginal communities conducted within the framework of an intensive set of Knowledge Translation activities between researchers and communities and founded on principles of community-based participatory research. In Chapter 4 we present qualitative and quantitative findings on the impacts of the mine construction phase on community health. In Chapter 5 we identify management strategies for community health and safety identified in both the EA and granted certificates for Mount Milligan. We compare known management strategies against international standards. We conclude this chapter with a suite of recommended strategies for managing community health and safety risks and impacts associated with large-scale development projects specific to the Canadian context. Our final chapter (6) outlines next steps for our research project.

1.3 The Research Team

The academic leads include Dr. Janis Shandro and Dr. Aleck Ostry. Janis Shandro is associated with both the University of British Columbia (Research Associate with the Norman B. Keevil Institute of Mining Engineering) and the University of Victoria (Adjunct Professor with the Geography Department) and leads community health and safety management practice with Monkey Forest Consulting Ltd. Aleck Ostry holds a Canada Research Chair in the Social Determinants of Community Health; is Director of the New Emerging Team for Health in Rural and Northern British Columbia, and; is a Professor with the Department of Geography at the University of Victoria. The research team is supported by three community-based research assistants for Fort St. James, Nak'azdli, and Tl'azt'en, a research associate based at the University of Victoria and Dr. Malcolm Scoble also from the Norman B. Keevil Institute of Mining Engineering. The team's work is guided by members of the Nak'al Bun/Stuart Lake Community Research Advisory Board.

1.4 Nak'al Bun/Stuart Lake Community Research Advisory Board

The Nak'al Bun/Stuart Lake Community Research Advisory Board provides oversight to this project and ensures that additional health and sustainability research occurring in the region brings positive health benefits. The Board is comprised of health and social service providers, municipal and First Nations government leaders, and interested community members from the three focus communities. The Board has drafted terms of reference and meets on a regular basis (generally 3 times per year) to review the progress of the project, discuss issues that have developed as a result of the mine, and suggest topics for research. Board members are also invaluable local sources of information and we are indebted to them for their advice, encouragement, and assistance.

[6] See *Appendix A* for a map of the project study area.

A key component of this project is that data-sharing agreements exist between the research team and partner communities. This ensures that all research results generated from this project are first communicated to project communities, and the communities are free to use the information and data in whatever way they choose. This report represents the research team's commitment to meeting these objectives in addition to supporting community ownership, control, access and protection of data, which we feel is essential for health research to bring positive outcomes.

2. Background and Context

This section of the report presents: international standards associated with the management of community health risks and impacts and large-scale development projects; the concept of a Social Performance Management System (SPMS) as a systematic process by which projects can manage risks to affected communities, and; a description of the construction phase of the Mount Milligan mine from 2010 through to 2013.

2.1 International Standards on Managing Community Health Risks from Mining Development

International Standards such as those developed by the International Finance Corporation (IFC) recognize that large-scale development projects such as the construction of mines hold significant risks to associated communities if unmanaged. To help companies identify, manage and mitigate risks, the IFC developed a set of eight Performance Standards on Environmental and Social Sustainability[7], one of which focuses primarily on Community Health and Safety (Performance Standard 4). The aims of this standard are to help projects avoid and prevent health impacts to people within the project's affected area. It involves the identification of potential impacts and the implementation of mitigation measures associated with key community health and safety risks. This requires at minimum the management of risks and impacts associated with:

- Project facilities;
- Environmental issues (air emissions, wastewater, hazardous materials, wastes, dust and noise);
- Traffic;
- Water-borne, water-related, vector-borne, communicable and endemic diseases;
- Temporary and permanent workers; and
- Community health capacity and resources of local governments, institutions and agencies.

The ability to implement this standard effectively hinges on a social performance management system that has, early on, accurately identified potential impacts/risks.

2.2 Managing Social Risks and Impacts

A Social Performance Management System (SPMS) is a systematic approach aimed at managing social risk and meeting social obligations (generally as part of permitting, financing or impact benefit agreements). An SPMS would generally include a dedicated social management team supported by field staff. The size and complexity of an SPMS is entirely dependent on the operating context and can change over the life of an operation. An SPMS to international standards[8] has the following basic requirements:

- A social (including health) assessment that is based on local and up to date baseline data, that considers supply chain, vulnerable persons, the influx of workforce, and communicable and other relevant diseases to adequately address social risks and impacts.

[7] IFC Performance Standards on Environmental and Social Sustainability, 2012. http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/performance+standards/environmental+and+social+performance+standards+and+guidance+notes

[8] Based on the International Finance Corporation's (IFC) Performance Standards for Environmental and Social Sustainability. Available online at http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES

- A risk/impact assessment process analyzed in the context of the project's area of influence and key stages of the project cycle.
- Action and management plans to address the relevant findings, risks and impacts with a hierarchy of avoid, minimize or compensate.
- An established procedure to monitor the effectiveness of management strategies.
- A robust stakeholder engagement program appropriate for the size of development.
- A grievance mechanism to resolve concerns and grievances about the project's social and environmental performance raised by individuals or groups.
- An organizational structure and resources to support the above activities.

2.3 The Mine Construction Phase

Thompson Creek Metals purchased the project from Terrane Metals Corp. in 2010 and began construction in June of that year.[9] The mine cost approximately $1.5 billion to build[10] and the construction phase lasted for approximately 3.5 years. The phased start-up of the mine commenced on August 15, 2013, followed by the first production of copper-gold concentrate in September 2013. The mine was commissioned on October 8th 2013, and achieved commercial production on February 18, 2014.[11]

Primary facilities and infrastructure constructed at the mine included:

- an open pit mine
- the processing plant and associated infrastructure
- an explosives factory
- tailings storage facility and reclaim water ponds
- an administrative building and change house
- a truck shop and warehouse
- first aid station and emergency vehicle storage
- a lab
- sewage and water treatment facilities
- fish recovery habitat
- a 29 kilometre access road and a 92 kilometre power line corridor; and
- a contractor camp.

2.3.1 Workforce

During construction people were employed for work ranging from service and road maintenance, construction, logging and welding, equipment rentals, and security. At the peak of construction in 2011 there were 656 personnel working onsite, including contractors; in 2012 that number had climbed to 1035.[12] The mine maintained a 1,075 person temporary lodging camp on site.[13] As of commissioning (October 2013) there were 350 employees at the

[9] Caledonia Courier, Mine Marks Commissioning, Oct 9 2013
[10] Thompson Creek Metals Mt Milligan Sustainability and Social Responsibility Report 2012, p. 3. Available online at http://www.mtmilligan.com/files/documents/MountMilligan2012CSRReport.pdf
[11] Caledonia Courier, Milligan Reaches Commercial Production, Feb 24 2014
[12] Thompson Creek Metals Mt Milligan Sustainability and Social Responsibility Report 2012, p. 15.
[13] BC Ministry of Energy and Mines, Regional Geologist Summaries, Exploration and Mining in British Columbia 2013, p. 12. Available online at http://www.empr.gov.bc.ca/Mining/Geoscience/PublicationsCatalogue/ExplorationinBC/Documents/2013/Omineca2013.pdf

mine, 80% of whom were from the Prince George, Mackenzie, Fort St. James and Vanderhoof areas (which Thompson Creek Metals refers to as the "local region").[14]

Prior to 2012, mine employees worked a four-day on, four-day off shift schedule, working 12-hour days. In 2012 that changed to a seven-day rotation.[15] For Fort St. James and Nak'azdli employees living in town that meant up to a two-hour commute each way, depending on weather and road conditions, on top of the 12-hour work day. The mine continues to encourage Fort St. James, Nak'azdli and Mackenzie employees to live in town and commute to work each day.

2.3.2 Main transportation corridors

Goods and services for mine construction came in by road via Highway 27, the main arterial road into Fort St. James, BC. From Fort St. James, traffic continued up the North Road, turned east onto the Rainbow Forest Service Road, then north onto a third road leading to the mine site. The North Road is heavily used by industrial traffic (primarily logging), tourist traffic during the summer and fall months, and local residents living in the Pinchi Ranch area and further up to the communities of Nation Lakes and Nation River, Germansen Landing and Manson Creek. While classified as an extension of Highway 27 it is not paved, and road conditions are consistently rough due to heavy industrial activity. In December 2012 the provincial government announced 2.5 million dollars in funding for improvements to the North Road, which were completed during the construction phase; they were primarily repairs, brushing, and ditching.[16]

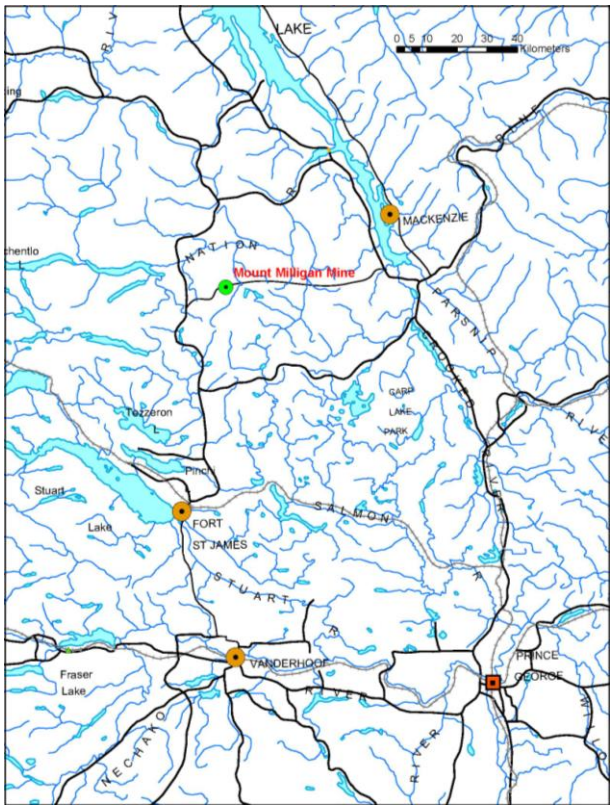

Figure 1: Transportation corridor from Highway 27 to Fort St. James, from Fort St. James to Mount Milligan via the North Road, Rainbow Forest Service Road, and the mine connector road.

Contractors and mine employees also travelled the same route to the mine. Thompson Creek Metals provided daily bus service for employees living in Fort St. James and area during the construction phase, as no private vehicles are allowed on the mine site. Contractors had use of a parking lot in Fort St. James specifically for their vehicles, secure and patrolled, while they were working in camp. In 2012, a second larger parking lot was built in a residential neighbourhood. It is surrounded by security lighting and fencing, and continues to be the daily bus pick-up and drop-off spot for local employees travelling to and from the mine site.

[14] Caledonia Courier, Mine Marks Commissioning, Oct 9 2103
[15] Thompson Creek Metals Mount Milligan Sustainability and Social Responsibility Report 2012, p. 2. Available online at http://www.mtmilligan.com/files/documents/MountMilligan2012CSRReport.pdf
[16] Caledonia Courier, Funding Finalized for North Road, Dec 11, 2012 Available online at http://www.caledoniacourier.com/news/182850301.html

2.3.3 Employee housing

The employee parking lot in town was built on a section of land the mine had acquired for a housing subdivision. The original Environmental Assessment Certificate did not allow for a permanent camp on-site, only a temporary camp during the construction phase, and the mine's original intention was to develop housing in both Fort St. James and Mackenzie for employees. In Fort St. James, the mine built a 12-unit townhouse development and purchased two residences for employees. The mine also purchased land from the District of Fort St. James in 2011, presented plans for a 53-lot subdivision that also included 3 apartment buildings, and began clearing and design work. That land was rezoned in 2012 from Residential to Commercial to facilitate the construction of the employee parking lot. At the time of writing, an on-site residence was under construction. Residence units will connect with a central lodge containing a gymnasium, a dining area, and rooms for other activities. Construction of the on-site residence is expected to be completed by October 2014.[17] This on-site residence was an amended scope to the original worker accommodation strategy.



Figure 2. Mount Milligan employee parking lot in Fort St. James, BC.

2.3.4 Medical services

During the construction phase the mine maintained a medical unit consisting of primary care paramedics, an ambulance, and, at one time, a registered nurse. Emergency service providers reported that members of the Fort St. James and Mackenzie BC Ambulance Service also worked at the mine, providing emergency and paramedic services. Company documentation and emergency service providers indicated that emergency equipment maintained on-site included a fire engine, pumper truck, extrication equipment, an ambulance, and an Emergency Response Team (ERT) Trailer. During construction, an on-site medical doctor was not provided. In case a physician was needed, mine employees were required to access services at the Fort St. James Medical Clinic and the Stuart Lake Hospital in Fort St. James. Fort St. James emergency service providers were also required to respond to incidents at the mine as called upon.

[17] Mount Milligan News, February 2014, p. 2 Available online at http://www.mtmilligan.com/files/pdf_documents/Mt-Milligan-News_February-2014.pdf

3. Methodology

This investigation is founded in the practice of Knowledge Translation (KT), a research strategy that aims to improve the health of people and communities through the transfer of research evidence into action-oriented strategies.[18] This study is the direct result of knowledge sharing between the research team and study communities since 2010. It is grounded in a bi-directional sharing of health knowledge related to mining. Specifically, knowledge sharing activities, shaped and led by Dr. Shandro, focused on an exchange of research evidence stemming from the Mining and Community Health project and the New Emerging Team for Health in Rural and Northern British Columbia (NETHRN-BC; both projects were funded by the Canadian Institutes of Health Research) between the experience of community leaders and health and social service providers in the Nak'al Bun/Stuart Lake area. A key outcome of the KT work, voiced by community partners, was the need to understand the impact of the construction phase of the Mount Milligan mine on community health and to develop a community-based process to track and monitor conditions both during this construction phase (from 2010 to 2013) and once the mine begins to operate. This study focuses on impacts identified during the construction phase only.

3.1 Research Objectives

The focus of this study was to investigate community-level determinant of health impacts (positive and negative) associated with the construction phase of the Mount Milligan mine. This involved a multi-method approach based on research evidence and the perspectives of community health experts. The overarching aim is that this study informs a systematic rigorous process for mitigating negative community health impacts and for the optimizing of health benefits for industry, government and especially for local communities.

3.2 Research Design

An integrated KT approach rooted in the philosophy that ownership, control, access and protection of community health-related data must be upheld for all communities involved in health research. For this to be achieved, KT and community-based participatory methods were adopted from the beginning of this project (2010). Using this overall approach we provided our study participants with information and research evidence based on studies of mine impacts in other communities. The ensuing discussion of this evidence in the context of local feelings and concerns about and experience with the Mount Milligan mine, led to the identification of nine major areas of interest that we have pursued in this investigation.

We have identified several local and regional data sources to develop the quantitative side of this research. As well, qualitative research methods that informed our study are based on the assumption that experiences and perceptions of community leaders and health and social service providers are integral to understanding how mining activities may affect community health issues. While it was guided by a grounded theory approach[19], the final aim of the analysis did not include the development of a theoretical model. Rather, data gathered from interviews was used to generate rich descriptions relating to construction phase impacts to the determinants of community health in the Nak'al

[18] Canadian Institutes for Health Research, More about Knowledge Translation at CIHR. http://www.cihr-irsc.gc.ca/e/39033.html

[19] Glaser, B. G., and Strauss, A. L. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine Publishing Company.
Corbin, J. and Strauss, A. 2008. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory 3rd Edition*. Thousand Oaks, CA: Sage Publications

Bun/Stuart Lake region. Ethics approval for this study was granted by the University of Victoria Behavioural Research Ethics Board.

3.2.1 Identification of community-level impacts

Identification of community-level impacts of the construction phase of the Mount Milligan mine involved identifying and using qualitative and quantitative data within the framework of our integrated KT approach (e.g., in a highly iterative process with study participants). The identification and selection of appropriate determinant of health indicators for tracking occurred through the completion of a community health baseline using a multi-method approach (2012) and through the facilitation of a workshop with our research advisory board. This workshop focused on identifying determinant of health indicators that were priority and relevant for their region. This suite was refined through an in-depth literature review on Aboriginal and northern health and an assessment of data accessibility.

We began this study with a qualitative investigation focused on the positive and negative community health impacts of the construction phase of the mine. This involved interviews with local community leaders and health/social service providers. Interview participants were a purposeful sample[20] and met the following criteria: employed in the community health or social service sector and had worked in their respective position long enough as to have experienced the construction phase of the Mount Milligan mine. These individuals held positions as emergency service providers, police officers, hospital administrators, physicians, nurses, nurse practitioners, health and addictions counselors, women's health counselors, crisis outreach workers, restorative justice workers, youth workers, health consultants, and community policy makers who had strong knowledge of the mining sector and of general community health issues.

Interviews were semi-structured; this style of interviewing elicits participant viewpoints[21], and allows for reliable comparable qualitative data[22]. The interviews consisted of open-ended questions and were of a conversational nature. They focused on general community health issues of concerns as well as health issues and risks associated with the construction of the Mount Milligan mine. Each participant provided informed consent, including permission to audiotape the interview. Interviews took place in the Nak'al Bun/Stuart Lake region. Each interview lasted between 45 and 60 minutes. Observations and additional field notes were recorded during and after the interview. Member checks were conducted in real time (during the interview) and in follow up to ensure accuracy of data and interpretation.

Utilizing grounded theory techniques, this qualitative component of this study involved simultaneous and sequential collection and analysis of data using inductive, constant comparison methods[23]. In following this approach, data analysis began with the completion of the first interview. Interviews were transcribed verbatim and field notes synthesized with transcripts. Interview transcripts were reviewed and data analyzed using open coding and the constant comparison method to identify emergent themes that described community health impacts associated with the construction phase in the Nak'al Bun/Stuart Lake region.

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[20] Corbin, J. and Strauss, A. 2008. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory 3rd Edition*. Thousand Oaks, CA: Sage Publications

[21] Creswell, John W. 2003. *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches, 2nd Edition.* Thousand Oaks, CA: Sage Publications.

[22] Cohen D, and Crabtree B. 2006. *Qualitative Research Guidelines Project*. Princeton, NJ: Robert Woods Johnson Foundation. Available at: http://www.qualres.org/index.html

[23] Corbin, J. and Strauss, A. 2008. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory 3rd Edition*. Thousand Oaks, CA: Sage Publications

The current report builds on previously collected qualitative data described in the 2012 community health and baseline assessment entitled *"Meeting the health needs of the Stuart Lake –Nak'al Bun area: A baseline study of community health, community health and social services and reported impacts from local mining developments"*.

The above interviews resulted in the identification of **nine** main community health themes associated with the mine construction phase and we complemented the qualitative interview data with local and regional quantitative data where possible. For instance, we have accessed census data for three years (2001, 2006, and 2011) to provide a stronger illustration of baseline conditions in our communities (mostly) prior to the commencement of construction on the Mount Milligan mine. Specifically, we have obtained and analyzed census data from Statistics Canada using information on population, household characteristics including housing and families living in the Nak'al Bun/Stuart Lake region for the years 2001, 2006 and 2011.

Many local health care providers were convinced that increased local industrial activity and employment during the construction of the mine had led to greater pressure on local health care providers, especially on emergency rooms in local hospitals. Some concern was evinced that increased employment (a positive outcome from increased mine activity) had led to increases in industrial accidents and increased attendance of both local and non-local workers at local emergency rooms. In order to investigate this possibility we obtained from the Northern Health Authority anonymous data on WorkSafe BC (WSBC) emergency visits at the Stuart Lake Hospital as well as at other hospitals in the north. Specifically we obtained data on hospital visits arising from WorkSafe BC incidents at five health facilities in northern hospitals between 2008 and 2013. The hospitals for which we were able to obtain these data and the years in which we had data were:

- Lakes District Hospital and Health Centre, Burns Lake, BC, 2010-2013
- St. John Hospital, Vanderhoof, BC, 2010-2013
- Stuart Lake Hospital, Fort St. James, BC, 2010-2013
- Mackenzie District Hospital and Health Centre, Mackenzie, BC, 2009-2013
- University Hospital of Northern British Columbia, Prince George, BC, 2008-2013

The WSBC dataset provides information on the number of visits by health facility, date of visit, gender of worker, their location of residence, employer, and employment type. In total, we obtained data on 31,797 WSBC visits. Descriptive statistics were used to examine raw data and summarize any emerging patterns by measuring both central tendencies and spread of data. A chi-square test was performed to assess significant relationships between variables (e.g., WSBC visits and health facilities) when appropriate. An alpha level of 0.05 was set for all inferential analyses.

Community leaders and health and social service providers were also concerned about the potential impact of mine development on local crime rates. The concern here was to determine if crime rates had in fact changed since the beginning of mine construction activity. Informants were aware of evidence in the health literature that an influx of mainly male single workers into small geographically remote places, such as our study area, may increase rates of alcohol, drug, sex, and violence-related crime. Accordingly, the Fort St. James detachment of the Royal Canadian Mounted Policy (RCMP) provided us with local crime statistics from 2008 to 2012. We focused on identifying changing patterns of crime for years that best characterized the construction phase of Mount Milligan (e.g., in 2010-2011). Descriptive statistics were used to describe and summarize basic features of the following crime data:

- Assault
- Assault with a weapon

- Aggravated assault
- Sexual assault
- Missing persons
- Traffic violations
- Fatal collisions

There was also great uncertainty about the extent to which the mine would be using local workers versus workers brought in temporarily from outside the community. Because of a lack of information on mine plans in relation both to the number of workers they planned to import into the region and the extent to which they would engage in building housing for these workers, local leaders felt it important to better characterize the local housing stock. Accordingly, we obtained local economic and housing data from the Economic Development Office at the District of Fort St. James.

Finally, it was clear from our discussions with local leaders that the extent to which the mine might use local workers (to presumably generate positive local social, economic, and health benefits) in both the construction and subsequent phases of mine development would be, at least in part, related to availability of local skilled labour. Thus an estimate of the commitment to training of local workers, by both government and the company, was seen as key to estimating potential long-term employment and educational benefits from mine development for local workers. Accordingly, we were able to obtain some information on local training opportunities from publicly available reports from Thompson Creek Metals. [24]

3.2.2 Scientific evidence that links identified community-level impacts to health outcomes

Evidence-based linkages between impacts to determinants of health as identified through the above investigation and resultant health outcomes were provided through an in-depth literature review on the impacts identified as they relate to health outcomes. Peer-reviewed academic/scientific literature sources were used.

3.3 Sharing of Raw Data

As part of the Knowledge Translation strategy embedded in this project, initial results from our data gathering and interviews were presented to various representatives from the three study communities for their feedback. This sharing of research findings occurred through presentations that were made to the research advisory board and community leaders. A draft of this report was also shared. Feedback from these knowledge-sharing strategies was incorporated and resulted in the development of recommendations and the finalization of the report.

[24] Thompson Creek Metals Company Inc. Mount Milligan Social Responsibility Report 2011. Available online at http://www.mtmilligan.com/files/documents/MtMilligan2011_CSRReportFinalWeb.pdf
Thompson Creek Metals Company Inc. Mount Milligan Sustainability and Social Responsibility Report 2012. Available online at http://www.mtmilligan.com/files/documents/MountMilligan2012CSRReport.pdf
Thompson Creek Metals Company Inc. Mount Milligan External ENews Jan – August 2013. Available online at http://www.mtmilligan.com/files/news.php
Thompson Creek Metals Company Inc. Mount Milligan News November-December 2013, January-February 2014. available online at http://www.mtmilligan.com/files/news.php

4. Findings: Linking Construction Phase Impacts to Health Outcomes

4.1 Construction Phase Impacts on Community Health

This section focuses on nine main issues identified by interviewees and for which we have gathered, in some cases, local data in order to attempt to generate objective evidence. Key among these is that development of the mine and mine infrastructure has resulted in loss of access to traditional lands for many Aboriginal families. Related to this issue was the use of land for road building and associated increases in industrial traffic. The remaining key issues identified in our study of impacts of the construction phase can be roughly divided into issues related to rapid influx of a temporary workforce and issues related to impacts of the mine development on the existing/local workforce.

It is clear from our interviewees and limited population data that there was a large influx of temporary workers during the construction phase of the mine. Although we cannot obviously determine causation, interviews and limited local data sets suggest an association between this influx and 1) loss of access for local residents to housing and increased rents, 2) increased vulnerability of women and youth through increased demand for local sexual services, 3) increased crime rates, 4) and greater pressure on local medical resources.

In turn, interviewees (all local residents) reported (and we have limited local data) on impacts on the influx of workers on the availability of jobs and on the labour market for local residents in relation to the mine construction and any benefits available in terms of local housing initiatives and education and training.

In summary, our presentation of results is based around the following nine themes:

- Loss of land
- Increases in industrial traffic
- Extent of in-migration of (mainly) transient workers
- Loss of access to housing and increased rents
- Increased impact on local medical resources
- Increased vulnerability for women and youth
- Increased crime
- Impacts on employment and income for local residents
- Availability of education and training for local residents

4.1.1 Loss of land

One major pathway for negative health outcomes specific to Aboriginal people is the loss of access to traditional land. This is also known as environmental dispossession. Environmental dispossession is defined as the processes through which Aboriginal people's access to the resources of their traditional environments is reduced[25]. First Nations' "*identity, conceptions of the self, and mental wellness is directly and intimately linked to the environment,*

[25] Richmond, C. and Ross, N. (2009). The determinants of First Nation and Inuit health: A critical population health approach. *Journal of Health and Place*, 15, 403-411.

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' ".[26]

In a study conducted in New Zealand and Australia, positive health outcomes (e.g., improved diet, exercise, increased self-esteem, improved mental health) were reported when individuals engaged in traditional land-based activities.[27] In our 2012 baseline study, we found that improved access to land helped individuals heal from the trauma associated with residential schools.[28] On the other hand, several negative health outcomes (e.g., increases in mental health stressors, family stress, substance use, suicidal ideation, and prevalence of cardiovascular disease) were observed among Aboriginal people when access to land was restricted.[29]

Studies on this topic have highlighted that restricted access to land may have adverse health impacts by reducing access to traditional food. For Aboriginal peoples, 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, but traditional practices of food collection provide social and cultural benefits for individuals, families and communities.[30] Limited access to the physical environment and decreased personal knowledge/skills related to food harvesting reduces consumption of traditional food, leading to more individuals relying on store-bought food or government-sponsored food programs. Greater reliance on store-bought foods leads to diets that are high in fat and calories, which increases the risk for cardiovascular disease (CVD) development.[3132]

Traditional land holdings in the Nak'al Bun/Stuart Lake area are referred to as Keyoh. The existence of Keyoh predates the arrival of non-Aboriginal people. The name, property, rights and responsibilities of a Keyoh belong to the heads of each family as Keyoh holders and are passed down from generation to generation. Keyoh in the Nak'al Bun/Stuart Lake area have been directly impacted by the construction of the Mount Milligan mine and associated facilities. For example, the mine site is located on one Nak'azdli family Keyoh, which has directly impacted over 300 people. Other Nak'azdli Keyoh land has been impacted/altered by the construction of road facilities resulting in loss of access for family members.

At present, there has been no impact benefit agreement finalized between Thompson Creek Metals and the Nak'azdli First Nation over loss of land.

4.1.2 Traffic

According to health researchers in Canada, individuals who live within 500 metres of a highway are at higher risk for being exposed to traffic-related air pollutants. Health impacts associated with prolonged exposure to traffic-related air pollutants can include increases in the development of asthma in children, premature and low birth weight of

[26] Cunsulo-Wilcox, A. et al. (2013). Climate change and mental health: An exploratory case study from Rigolet, Nunatsiavut, Canada. Climatic Change, 121(2), p. 260
[27] Burgess, C., Johnson, F., Bowman, D., & Whitehead, P. (2004). Healthy country: health people? Exploring the benefits of Indigenous natural resource management. Australian and New Zealand Journal of Public Health, 29(2), 117-122.
[28] Shandro, J., Ostry, A. and Scoble, M. (2012). Opportunities to meet the health needs of Stuart Lake-Nak'al Bun area. UBC/UVIC publication.
[29] Dillard, D., Smith, J., Ferucci, E. and Lanier, A. (2012). Depression prevalence and associated factors among Alaska Native people: The Alaska education and research toward health (EARTH) study. Psychiatric Clinics in North America, 35(1), 15-36.
[30] Nagy, M. (2010). Climate change, oil and gas development, and Inupiat whaling in northwest Alaska. (2010). Inuit Studies, 34(1), 91-107.
[31] Mitchell, F. (2012). Reframing diabetes in American Indian communities: A social determinants of health perspective. Health and Social Work, 37(2), 71-79.
[32] Richmond, C. and Ross, N. (2009). The determinants of First Nation and Inuit health: A critical population health approach. Health and Place, 15, 403-411.

children, heart disease and hospitalization due to pneumonia among the elderly.[33] In addition, motor-vehicle collisions (MVCs) are the leading cause of injury-related death in Canada. It is estimated that each year, 68 children aged 14 years and under are killed by MVCs and another 880 are seriously injured. When considering causal factors, driving speed continues to be the number one predictor of MVCs.[34] During the construction phase of the Mount Milligan mine increases in the volume of industrial traffic may have increased the risk of exposure to higher levels of traffic-related air pollution among those individuals living in close proximity to Highway 27. Additionally, industrial traffic travelling through residential areas led to increases in environmental noise and concerns about pedestrian safety. During the qualitative interviews, a number of participants reported industry vehicles speeding through residential areas.

An increase of industrial traffic travelling through the Nak'al Bun/Stuart Lake area was identified by all service providers interviewed as a major impact associated with the construction phase. As the primary access route for the Mount Milligan mine site, Highway 27 runs directly through the Nak'azdli community and the community of Fort St. James. Approximately 3 kilometres north of Fort St. James, the paved highway turns into a dirt road, which is referred to locally as the North Road. During the interviews, service providers described the traffic conditions in and around the Nak'al Bun/Stuart Lake area as a public safety issue. The road quality north of Fort St. James was described as 'treacherous' and service providers questioned why no initiatives have been made to improve this unpaved stretch of road.

"But is that related to where we are located geographically? We're this little community in the middle of nowhere. If we were near Kamloops, that road would be paved; there'd be no question about it. If we were near Vancouver that road would be paved. And if we were closer to Prince George that road would be paved. I think it's because we're, we're, we're here."

In 2011, an eleven-year-old boy was fatally struck by a pick-up truck driven by a mine contractor travelling south along Highway 27 through a Nak'azdli residential area. This incident prompted community-led initiatives, such as the 'Be Seen, Be Safe' reflective armband campaign that raised awareness about pedestrian safety and the 'Common Code of Courtesy' document that encouraged domestic and industry drivers to respect one another when traveling along the North Road.

In response to what they felt was a lack of response after the young boy was killed, Nak'azdli community members blockaded Highway 27 for three days, preventing commercial traffic from going into the community. A Regional Transportation Committee formed as a pro-active response to dangerous road conditions and continues to meet at the time of writing of this report. The Committee has had success working collaboratively with the provincial Ministry of Transport on building local traffic infrastructure, including repairs to the North Road. Despite these initiatives, service providers reported that the impact of traffic continued to be an issue for community members. These concerns were amplified by drivers not abiding by posted speed limits.

"I've noticed a lot more traffic in town…Um, we've got, uh, I, like I said I live by the parking lot there. I've got speeders, I see dead cats, like, animals that, that I never seen before and it makes me wonder 'Is it those speeders kind of, maybe?' you know, they want to get home; they'll get off the bus and zing. And you know they get out of town

[33] Brauer, M., Reynolds, C., Hystad, P. (2012). Traffic-Related Air Pollution and Health: A Canadian Perspective on Scientific Evidence and Potential Exposure-Mitigation Strategies. Prepared for: *Health Canada*.
[34] Yanchar, N., Warda, L., and Fuselli, P. (2012). Child and youth injury prevention: A public health approach. Journal of Paediatrics and Child Health. 17, 9, 511.

or wherever they're going and it's troubling because in Fort you're out of town anywhere in five minutes, right? Like, you don't have to speed through our communities."

The local police detachment in Fort St James handled numerous complaints from local community members concerned about the impact on public safety from the increase of industrial traffic travelling through their communities. Service providers noted that large commercial vehicles were not necessarily the issue, and added that it was private contractors who typically were not abiding by posted speed limits.

"The perception is that all the commercial vehicles, logging trucks, and you know, the flat beds, everybody's speeding through town. The reality is that they're not ….and it's rare that you will have a big commercial vehicle speeding through the community. But it's the size and the noise that makes people think that they are. And like if you have an increase in the amount of traffic that's going through town, not just the big, big vehicles but you have all the service vehicles that are going up there, you know, the mechanics, um, those kind of vehicles. Uh, those are the ones that are causing the problems, as far as, you know, speeding through town, stuff like that."

4.1.3 In-migration (primarily) of temporary workers

Internationally, it is well recognized that a sudden influx of a migratory workforce often holds serious community health risks in terms of influencing local illness patterns, overburdening health care systems, inflating local housing and food costs, altering the balance in local labour markets, and increasing vehicle traffic on local roadways, especially in isolated rural places.[35]

The construction phase of the Mount Milligan mine resulted in the in-migration of workers supporting the construction phase of the mine in addition to those simply looking for associated job opportunities likely to arise from increased industrial development in the region. It should be noted that influx of workers from outside the community remains a key issue today for the Nak'al Bun/Stuart Lake region as there are numerous extractive and other industrial development projects occurring in the area. Interviewees identified several key impacts associated with the influx of workers associated particularly with Mount Milligan's construction phase. These included strains on existing health services, increased vulnerability for women and youth in the area, increased pressure on a pre-existing housing crisis, and increased traffic.

The total population of Fort St. James increased 25% between 2006 and 2011 (from 1,350 to 1,691) just prior to and in the initial years of the construction phase of the mine. [36] This was the second largest population increase in BC for that time period, making Fort St. James the province's second fastest growing community. This major local population boom is likely an underestimate as it does not account for transient workers who only remained in the area temporarily. Interviewees were concerned about potential impacts associated with this influx of workers. They were concerned in particular about increased burdens on the local health service system, increases in industrial accidents, increasing risk and impacts to women and youth, housing, and traffic.

Rapid influx of a migratory work force into a rural area will likely impact the availability of local medical services, especially general services such as hospital emergency rooms and will likely have a major impact on the availability

[35] IFC, Projects and People: A Handbook for Addressing Project-Induced In-migration. The annex to this publication specifically focuses on health issues and is available online at: http://www.ifc.org/wps/wcm/connect/737cf500488554abb3b4f36a6515bb18/Influx_Annexes.pdf?MOD=AJPERES&CACHEID=737cf500488554abb3b4f36a6515bb18

[36] Terra Housing Consultants and Cooper Planning Consultants. (2014). Fort St. James District: Housing background report and housing strategy. Retrieved May 1, 2013 from https://fortstjames.civicweb.net/Documents/DocumentDisplay.aspx?Id=19701

of housing and on rents. This latter factor can create problems for the local resident population, especially renters. In the next section we discuss impacts on local housing. This is followed in the subsequent section by a description of impacts on local health services including observations on the direct impact of increased industrial accidents on local health services.

4.1.4 Housing

Housing has a profound impact on health. The ability to access safe, secure and affordable housing over time is essential for a healthy life. However, when people are precariously housed or homeless, housing-related health risks increase substantially.[37] For example, the National Alliance for Canadian Homelessness, Housing and Health reports that people who are inadequately housed are more likely to have physical and mental health problems, poor access to health care services, be physically assaulted and experience higher rates of food insecurity when compared to people who have stable housing (2010). To examine the impact of housing on mortality, a national study analyzed rates and causes of death of 15,000 people who were precariously housed and homeless (e.g., reported living in shelters, rooming houses and hotels/motels). The study found that people who are vulnerably housed or homeless have a lifespan that is 7-10 years shorter when compared to the general population in Canada. For example, the chance of surviving to age 75 for men and women who are vulnerably housed or homeless is only 32% and 60%, respectively. Additionally, causes of death among this group are increasingly attributed to mental disorders and suicide. When compared to the general population in Canada, homeless and vulnerably housed men are twice as likely to commit suicide. The likelihood increases for women within this group. According to the study, they are almost six times as likely to commit suicide when vulnerably housed or homeless.[38]

High housing costs not only create homelessness, but also force people to spend a large proportion of their incomes on housing. As a result, fewer resources are available for things that promote health and well-being (e.g., nutritious food, medication and recreational activities). High housing costs may also force people with limited financial resources to live in overcrowded conditions. Living within an overcrowded environment leads to increases in exposure to and spread of respiratory and other illnesses. Overcrowded housing conditions are also associated with increased stress and do not provide a healthy environment for coping with mental health and addiction-related issues. Furthermore, the quality of housing is also an important factor for health. In addition to overcrowding, exposure to mould and lead, poor ventilation, and animals, insects and vermin have also been shown to negatively impact health. In particular, children who grow up in these types of environments are more likely to experience poor health outcomes as both children and later on, during adulthood. Although the relationship between housing and health is complex and contains multiple, overlapping factors, health researchers have routinely demonstrated that housing is an independent factor associated with individual health outcomes.[39]

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[37] World Health Organization (2014). Health Impact Assessment: Healthy Housing. Accessed July 7th, 2014 from http://www.who.int/hia/housing/en/

[38] Hwang SW, Wilkins R, Tjepkema M, O'Campo PJ, Dunn JR. Mortality among residents of shelters, rooming houses and hotels in Canada: An 11-year follow-up study. BMJ. 2009 Oct 26;339:b4036.

[39] Bryant, T. (2009). 'Housing and Health: More than Bricks and Mortar'. In D. Raphael (Ed.), Social Determinants of Health: Canadian Perspectives (pp.235-249). 2nd edition. Toronto: Canadian Scholars' Press

Dunn, J. (2000). 'Housing and Health Inequalities: Review and Prospects for Research.' Housing Studies, 15(3), 341-366.

Hulchanski, D. (2007). The Three Cities within Toronto: Income Polarization among Toronto's Neighbourhoods, 1970–2000. Toronto: Centre for Urban and Community Studies, University of Toronto.

Hwang SW, Wilkins R, Tjepkema M, O'Campo PJ, Dunn JR. Mortality among residents of shelters, rooming houses and hotels in Canada: An 11-year follow-up study. BMJ. 2009 Oct 26;339:b4036.

Access to safe and affordable housing is a major issue for individuals and families living in the Nak'al Bun/Stuart Lake area. Although there was an increase in population of the Nak'al Bun/Stuart Lake area just prior to and during the first year or so of the construction phase of the Mount Milligan mine, access to housing appears not to have improved. Service providers noted that many individuals looking for housing were new to the area and therefore, a greater burden was placed on the current rental market.

"I mean, we have 130-some people who have registered on our database looking for housing and maybe one-third of those have either found housing or stopped looking. And so I would say certainly a large portion of those, about 70% of those, are newcomers to the community."

During the construction phase of Mount Milligan, it was observed that a substantial proportion of individuals trying to access safe and affordable housing were women with children.

According the Fort St. James Housing Report (2014)[40], operations at the Mount Milligan mine have the potential to be directly responsible for an influx of 300 new residents moving into the community. An assessment of the required housing needed to support the current population and potential new residents of Fort St. James indicates that approximately 134 new residential housing units are needed.

One issue that was raised includes the lack of commitment demonstrated by Thompson Creek Metals to build housing on the land they purchased from the District of Fort St. James. The company had presented preliminary plans for the development of market housing (53 houses and three apartment buildings) which would have been available for both mine employees and the general population. The company did survey and site-prep work, including the building of an access road. But these plans were later shelved, the company applied to the BC Environmental Assessment Office for an on-site accommodations camp (which was approved), and the housing was never built. The land, originally zoned as R1 and R2 (Residential), was rezoned as C1 (Commercial) to allow for construction of an employee parking lot. The parking lot now sits on a portion of the land where housing was intended to go.

"I wish council had said no to the stupid parking lot or put covenants on the land set and say 'You have to construct on it, you have so many years'."

"…… so far there's been no interest from industry's side to develop the land that they were sold for housing… It even has a road built that's grown over from one of the subdivisions that could go through that, it's serviced to that point. Kind of a waste…it's hard for everyone to see it just sitting there, it's very hard."

Interviewees also reported a zero to negative vacancy rate in the District of Fort St. James. They described long waitlists, a limited number of rental units and high monthly rent prices. Over the construction period rental prices ranged between $1,300-1,500 per month for a three bedroom house (not including utilities), which was higher than the average in BC ($1,153 per month in 2012).[41]

Mikkonen, J., & Raphael, D. (2010). Social Determinants of Health: The Canadian Facts.
Toronto: York University School of Health Policy and Management.
Shapcott, M. (2009). 'Housing'. In D. Raphael (Ed.), Social Determinants of Health: Canadian Perspectives
(pp. 221-234). 2nd edition. Toronto: Canadian Scholars' Press.

[40] Terra Housing Consultants and Cooper Planning Consultants. (2014). Fort St. James District: Housing background report and housing strategy. Retrieved May 1, 2013 from https://fortstjames.civicweb.net/Documents/DocumentDisplay.aspx?Id=19701

[41] CMHC. (2012). BC Rental Market Report.
http://www.cmhc-schl.gc.ca/odpub/esub/64487/64487_2012_B01.pdf

In addition, renters also faced several other challenges when trying to access safe and affordable housing. Systematic discrimination was described, with interviewees reporting that some landlords routinely considered gender, age, ethnicity and occupation when selecting tenants.

"*Unfortunately there's a large number that don't want to have um, single women with children. They would prefer not to have First Nations or young males. Um, with some of the industry in, you know, with some of the industry projects that have happened that brings a lot of young, single males into the community and, you know, if they can't find a place to live where do they go. I'm not exactly certain what people are doing because the way I, I see it, you know, it sounds a bit, it seems very desperate when they call in and if I don't get back to them right away or if I have nothing, then I'm wondering what they're doing. I don't know where they're going."*

4.1.5 Impacts to health services

During the construction phase, the community of Fort St. James was served by only one physician and a series of rotating locums. The Stuart Lake Hospital emergency room was frequently on diversion, with patients being sent to Vanderhoof or Prince George for emergency services. In 2012, after our community health baseline and needs assessment was completed, a coordinated recruiting drive brought three more doctors to town, and two more have subsequently relocated to the community, along with a nurse-practitioner. Despite the recruitment of these much needed health practitioners, service providers who were interviewed continue to describe a healthcare system that is overburdened. In order to meet the health needs of the local population, and migrant workers, they maintained that the recruitment and retention of at least one more physician was critically necessary. This physician was very recently recruited.

During the construction phase, health and social services were both directly and indirectly impacted. It was reported that some emergency health professionals left their community posts for employment with the mine, leaving the Nak'al Bun/Stuart Lake area particularly vulnerable as these positions are difficult to recruit for and the salaries provided at the mine were higher than provincial salaries for healthcare jobs.

Of course, impacts on availability and cost of housing (as described in Section 4.1.4) continued to undermine the recruitment of professionals to the region. Another consequence of reduced access to housing was the difficulty in hosting and facilitating health conferences and meetings in the region.

The demand for health services is substantial in the region, with community members echoing feelings of frustration when describing lengthy waitlists for primary care appointments. At the time of this study, service providers were working towards eliminating a two-year appointment backlog that accumulated when the area was severely underserviced.

"So as far as our population, I know that the community is still feeling like they can't get an appointment and it's true. They're struggling to do that. The reason for that would be that they [new physicians] *walked into a very, very sick community with lots of chronic disease."*

Finally, service providers reported that there was a progressive increase in volume from mine-related health issues (e.g., through both acute WorkSafeBC [WSBC] claims as well as from non-WSBC health incidents).

"It [Mount Milligan construction phase] *definitely placed some pressures on the physicians at the hospital. And I guess it would flow down to the clinic, and that was a lot of non-emerge patients were coming out of Mount Milligan through the contractors, um, and just showing up at ten o'clock at night for a return to work slip, you know, those kinds of things… Just hurt themselves, has been off for four days and needs to go back in the morning to work and*

needs a return to work and shows up at the ER department. Or being brought down by the safety committee, sent down by the safety team at Mount Milligan to the ER department when they should be sent to the clinic, it's not an emergency."

"I have to say that the other aspect I see is when I'm working in the emergency room, when all of the mine workers come down because, you know, they've had a rampant conjunctivitis going around and around and around, or, you know, an injury or something like that, so our, it has greatly affected, I think, the entire emergency room, right? They have first aiders there but they don't have a nurse or an occupational health nurse or a nurse practitioner or anything there."

4.1.6 Impact of industrial accidents and illness on health services

The ability to access high quality health care services is widely regarded as an essential component for health and well-being. Although access to health care has been deemed 'universal' in Canada, major disparities in access continue to exist. In particular, researchers have identified that Aboriginal peoples and remote and rural communities are more likely to be underserved. Several barriers to health service access have been identified and include low socioeconomic status, geographical location, lack of transportation, language, lack of culturally relevant services, and limited infrastructure and staff to support the surrounding population. When health service access is restricted, poor health outcomes are more likely.[42] This can be complicated by new poorly planned local economic development.

The following section describes findings from a number of analyses that examined WSBC data obtained from the Northern Health Authority. Data availability differed by health facility. When comparing records between facilities, the research team analyzed full year datasets. For example, five years of data for the University Hospital of Northern British Columbia in Prince George was obtained, yet only three years were available for Lakes District Hospital and Health Centre in Burns Lake. When these two facilities were included in the same analyses, only three years of records were assessed. The following list provides the name of each health facility, location and data availability by year:

- Lakes District Hospital and Health Centre, Burns Lake, BC, 2010-2013
- St. John Hospital, Vanderhoof, BC, 2010-2013
- Stuart Lake Hospital, Fort St. James, BC, 2010-2013
- Mackenzie District Hospital and Health Centre, Mackenzie, BC, 2009-2013
- University Hospital of Northern British Columbia, Prince George, BC, 2008-2013

As this report highlights the impact of the construction phase of Mount Milligan mine on the Stuart Lake/Na'kal Bun region, particular consideration was given to the Stuart Lake Hospital given that it serves this specific area. Overall, an increase in absolute WSBC visits was recorded in 2011. This time period marked the height of the construction phase of the mine and these records include, but are not limited to, mining activity in the region.

[42] Public Health Agency of Canada (2013). What makes Canadians Healthy or Unhealthy? Retrieved July 7, 2014 from http://www.phac-aspc.gc.ca/ph-sp/determinants/determinants-eng.php
Mikkonen, J., & Raphael, D. (2010). Social Determinants of Health: The Canadian Facts. Toronto: York University School of Health Policy and Management
National Collaboration Centre for Aboriginal Health. (2001). Access to health services as a social determinant of First Nations, Inuit and Metis Health. Retrieved July 7, 2014 from http://www.nccah-ccnsa.ca/Publications/Lists/Publications/Attachments/22/Access%20to%20Health%20Services%20(English).pdf

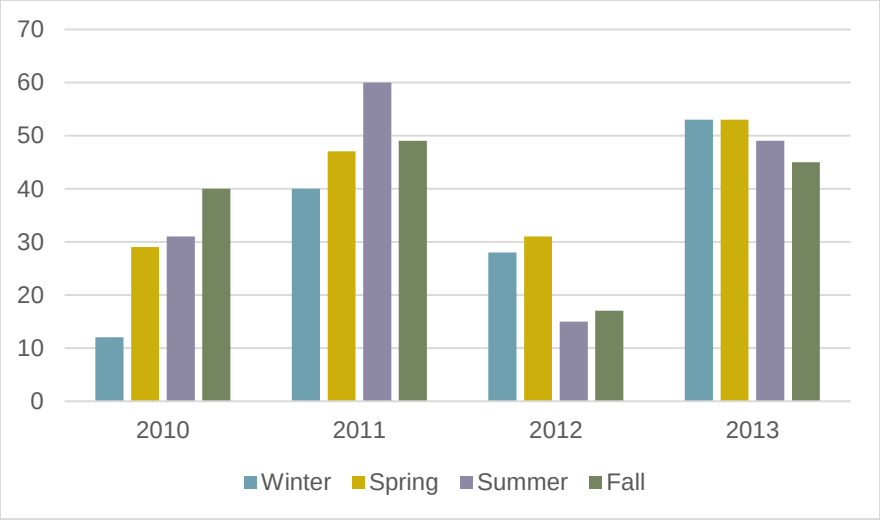

Figure 3. WSBC visits by year and season at Stuart Lake Hospital (2010 - 2013), BC.

Stuart Lake Hospital also had the largest proportion (approximately 50%) of WSBC visits made by non-local workers when compared to the other four health facilities. When compared with five other health facilities in north-central British Columbia, the Fort St. James hospital experienced higher rates of WSBC visits by individuals who reside outside of the Local Health Authority (LHA) area. This includes, but is not limited to, the mining industry.

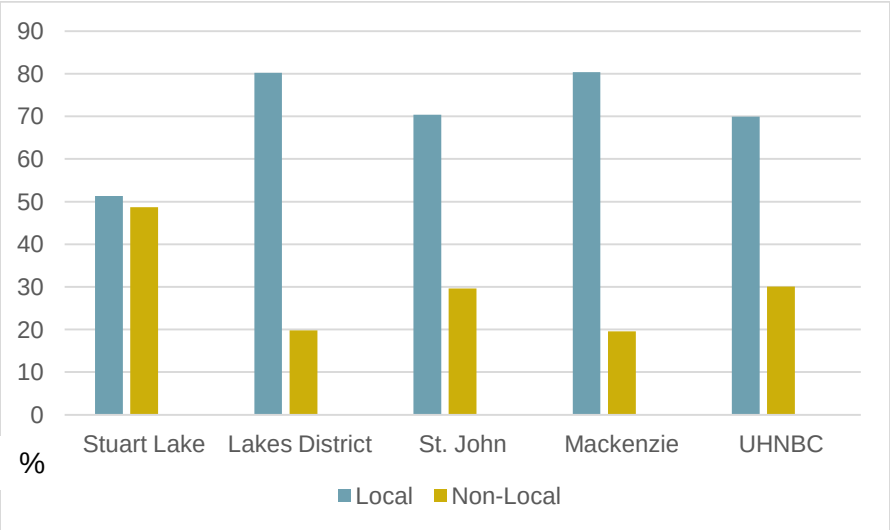

Figure 4. Proportion (%) of WSBC visits by place of residence for each health facility (2008-2013).

When further examining area of residence in relation to recorded WSBC visits at the Stuart Lake Hospital in Fort St. James, 51% of workers were local residents or living within the Local Health Authority region, 28% were residents of BC, 8% resided outside of BC but within Canada and 1% resided outside of Canada. Furthermore, it was unknown where 13% of the total cases resided. These figures indicate that a large proportion of WSBC visits recorded for the Stuart Lake Hospital were made by individuals who had migrated to the Nak'al Bun/Stuart Lake to work. The burden

placed on local health services to meet the needs of non-local workers becomes a complex issue, since these services have been described by health and social service providers as underfunded, strained and sometimes unable to meet the needs of the local community.

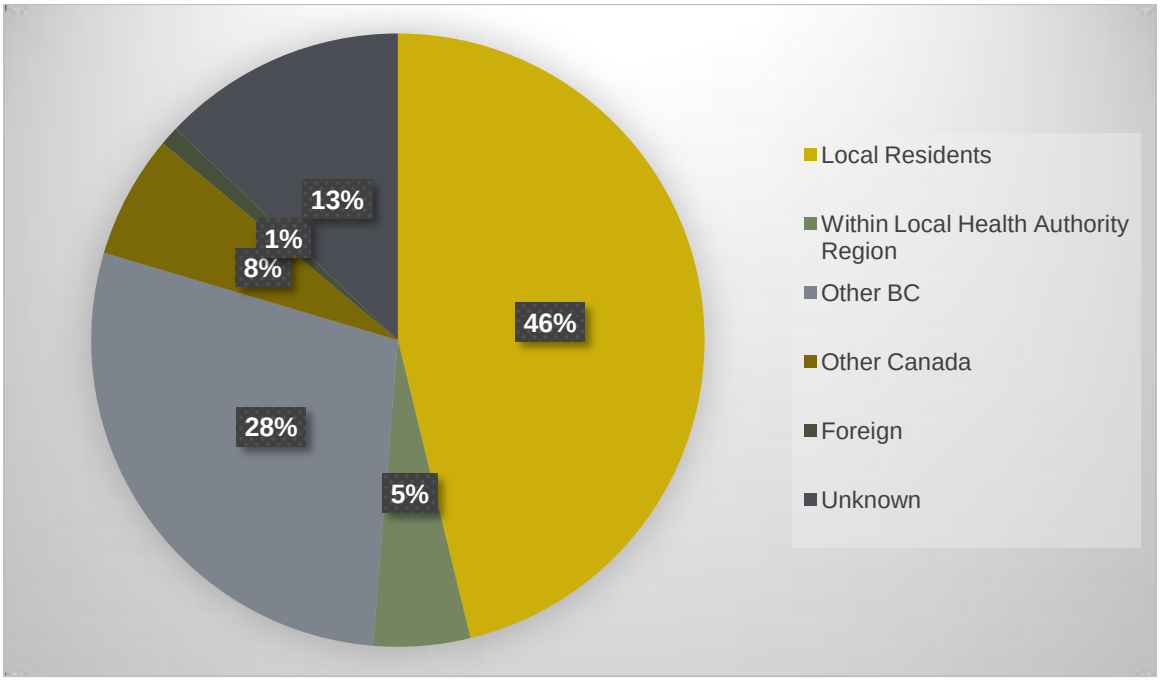

Figure 5. WSBC visits by place of residence - Stuart Lake Hospital (2008-2013).

The added burden of delivering health services to meet the needs of mine employees and contractors was described as unfeasible without direct collaboration with the resource extraction industry. At the time of interviews local physicians were attempting deeper collaboration with Mount Milligan to address their concerns.

"It is difficult to accommodate these people as they [temporary workers] *are usually here for short blocks of time, two, three, four weeks at a time, and then they are off again because they are contract workers. And then they go back to their own communities where they have their own responsible physician, but in the meantime they are here, they show up in emergency, or they show up in the walk-in clinics."*

4.1.7 Vulnerability of women and youth

Over the last decade, increasing attention has been directed towards the distressing number of missing and murdered women across the nation. In particular, one of the largest serial murder cases in North America, involving highly vulnerable female victims from both Vancouver and Seattle, went to trial and further attention was addressed towards the "Highway of Tears", where at least 18 (and potentially up to 43) women went missing between 1969 and 2011.[43] Within BC, these events have had a substantial impact on northern communities and provide a glimpse of the devastating violence directed towards women.[44] Sadly, street-involved sex trade workers are increasingly

[43] Globe and Mail. (2012). Key dates in the Pickton Case. Retrieved July 1, 2014 from http://www.theglobeandmail.com/news/british-columbia/key-dates-in-the-pickton-case/article6504398/
[44] Shannon, K. (2010). The hypocrisy of Canada's prostitution legislation. CMAJ. 182, 12, 1388.

vulnerable and experience some of the worst health outcomes reported by any group in society. One major health risk associated with sex trade work is premature death. According to a US study that followed approximately 2000 sex trade workers over a 30-year time period, the most common causes of death, from most to least prevalent, were homicide, suicide, substance use related problems, HIV infection and accidents. Among active female sex trade workers, the rate of homicide was 17 times greater when compared to age-matched females from the general population.[45] Additionally, this highly vulnerable group is more likely to experience chronic health problems, addiction, sexual abuse and sexually transmitted infections. [46]

Sex trade work is not merely a woman's issue. Research has estimated that approximately 10-15% of street sex trade workers are under the age of 18 and between 70-80% of adults entered the sex trade as children. Females are disproportionately represented within the sex trade. Approximately 75% of the youth sex trade population is female. Research on youth sexual exploitation has highlighted a number of factors that cause youth to become involved in the sex industry. These factors include poverty, history of abuse, dysfunctional and fragmented families, low self-esteem and conflict regarding sexual orientation. Sexual exploitation of youth is also associated with poor health outcomes such as substance use, HIV and AIDS, unplanned pregnancy, exposure to violence, and suicide. For example, according to a recent study approximately 90% of sexually exploited youth reported using illegal substances. Additionally, the school drop-out age is substantially lower for this group of youth when compared to the general youth population in Canada.[47]

Several service providers described observing an increase in prostitution in the Nak'al Bun/Stuart Lake area that includes both women and youth. These observations have been noted in areas where there is an increase in industrial traffic. In particular, this includes a local gas station that has enough room for larger-sized industrial vehicles to park.

"The prostitutes are having more clientele with the miners coming or even their, the truckers. Cause that's what they're doing, they're stopping the trucks and say "Can I service you" right? They either do that at Cottonwood Beach, they go down there or, um, Petro-Canada…they'll solicit their services there."

"Here's something I haven't mentioned though, and it has come up fair, more so in the last couple of months. But I didn't know when I got here, or maybe I was oblivious to it, but there's been increase of complaints of prostitution. There were some of our, uh, more enterprising young ladies… they're down there when the commercial traffic is coming through…. you know, truck comes in, they leave for a little bit, and they come back again in a short time."

[45] Potterat JJ, Brewer DD, Muth SQ, Rothenberg RB, Woodhouse DE, Muth JB, et al. Mortality in a long-term open cohort of prostitute women. Am J Epidemiol 2004;159:778-85.
[46] Jeal, N. & Salisbury, C. (2004). A health needs assessment of street-based prostitutes: cross-sectional survey. Journal of Public Health, 26 (2), 147-151
[47] The Justice Institute of British Colombia (2002). *Commercial Sexual Exploitation: Innovative Ideas for Working with Children and Youth.* B. C. Canada: Social Services and Community Safety Division Justice Institute of British Columbia
UNBC Task Force. (2003). Research Brief – Sexual exploitation of youth. Retrieved July 7, 2014 from http://www.unbc.ca/assets/centreca/english/research_brief_sexual_exploitation_of_youth.pdf
Public Health Agency of Canada. (2006). Street youth in Canada. Retrieved July 7, 2014 from http://www.phac-aspc.gc.ca/std-mts/reports_06/pdf/street_youth_e.pdf

While unrelated to the mine, during the construction phase, (2010) a young man from Fort St. James was arrested and later charged with the murders of three women and a young girl in the Fort St. James-Prince George area. In September of 2014 he was convicted and is considered one of Canada's youngest serial killers.

4.1.8 Crime

There is some indication, according to data obtained from the Fort St. James RCMP, prior to and during the first year or so of the construction phase that local crime rates increased. (These data are not definitive first because commencement of construction was in June 2010 so data from this year covers pre-construction and construction phase and, second, because of the relatively small numbers of incidents involved.) However, they indicate that compared to this "mixed" year (2010), during 2011 the local community experienced a 48% increase in assaults with a weapon, 50% increase in aggravated assaults, 38% increase in sexual assaults, and 37% increase in missing people reports.

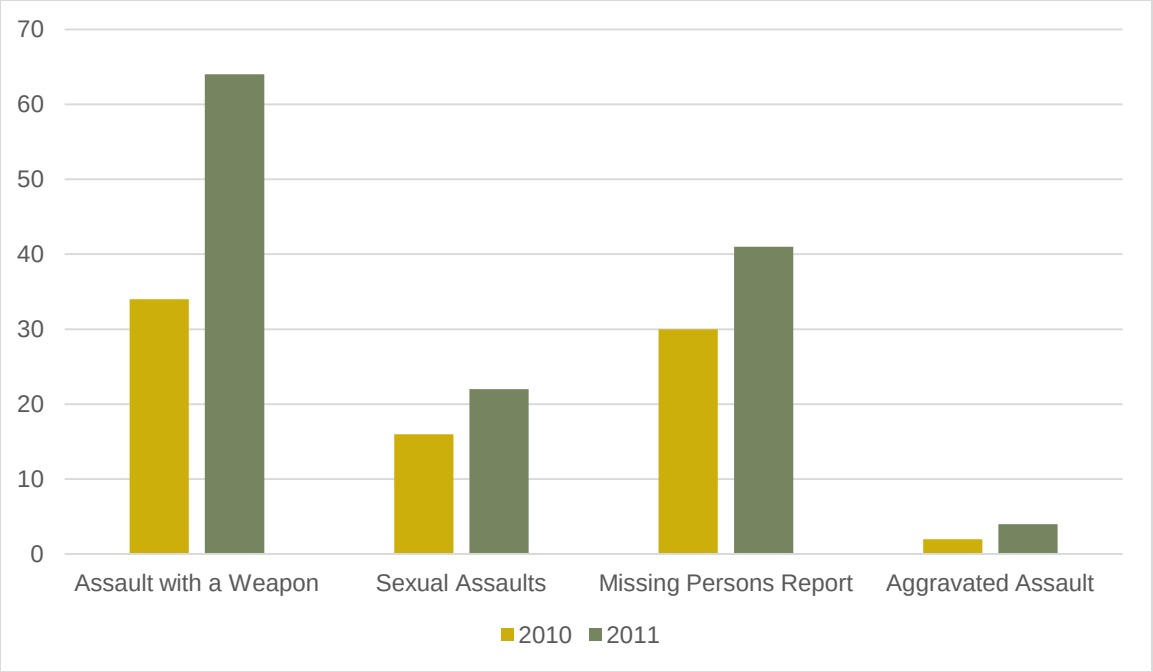

Figure 6. Incidents of crime by type of crime in Nak'al Bun/Stuart Lake region (2010-2011).

Additionally, increased employment with Thompson Creek Metals did not necessarily result in improved quality of life. It was reported that for some, large cheque amounts increased reckless spending, problematic substance use on days off and family conflict (including violence). This issue was reported as a major concern in the 2012 baseline report that identified a 21.8% increase in violent crimes during a period marked by large cash settlements associated with residential school impacts.[48]

"You know, with the, even the situation that I was saying, like, uh, with the one young girl that gets a pay cheque and they're out partying and, those are the things that we end up having to deal with. Right? So when she's got the

[48] Shandro, J., Ostry, A., and Scoble, M. (2012) Meeting the Health Needs of the Stuart Lake-Nak'al Bun Area. A Baseline Study of Community Health, Community Health and Social Services and Reported Impacts from Local Mining Developments. p. 11.

addiction issue and when, you know, all of that stuff, those are the health impacts that we're going to have to deal with because they've got these big massive pay cheques".

4.1.9 Impacts on employment and income for local residents

Not only do employment and job security provide people with a source of income, but they also help strengthen personal identity, facilitate personal growth and provide a pathway for enhancing social networks. As one of the most widely recognized social determinants of health, income can play an important role in shaping general living conditions, affecting psychological functioning and influencing individual health behaviours such as quality of diet, access to physical and recreational activities, tobacco use and excessive substance use. Additionally, income levels directly impact other determinants of health, such as housing, food security and health service access. At first glance, any efforts that improve individual income appear to enhance overall health and quality of life. The reality is more complex however.

Working conditions (both physical and psychosocial) also influence health and emotional well-being, due to the amount of time people spend at work. Researchers have identified that the most important factors that relate working conditions to health outcomes include job insecurity, physical conditions and stress in the workplace, working hours and shift schedules. Job insecurity refers to the threat of unemployment. People who have insecure jobs may face unemployment in weeks, months or years. A number of participants interviewed described concerns about sustainable employment once the construction phase of the mine came to an end. Low job security has been linked to psychiatric morbidity, poor self-rated health, and increased onset of coronary heart disease, high cholesterol, hypertension and obesity.[49] Additionally, stressful work environments predispose workers to poor health outcomes such as cardiovascular disease, high blood pressure, stress and depression[50]. Shift schedules and rotations also impact personal relationships and family dynamics. Long work hours and shift rotations that remove a person from family life for long periods of time, have been shown to increase the likelihood of family tension and conflict.

Although increased earning potential becomes available during resource development projects, unequal distribution of income and resources can prevent socioeconomic (and subsequent health) benefits from being experienced evenly across a community. The following socioeconomic issues related to resource development have been identified in the literature as having a negative impact on Aboriginal health: short-term economic planning increasing economic vulnerability in communities, higher costs of living for residents through increased pressure on local goods and services, and an increased strain on housing availability and health service providers due to an influx of non-resident workers[51]

When it comes to local employment, interviewees report both positive and negative impacts associated with the construction phase of the Mount Milligan mine. According to Thompson Creek Metals, approximately 74 individuals from the Nak'al Bun/Stuart Lake area had gained permanent full-time employment at the mine as of July 2014. This number does not include local contractors hired by the company during the construction phase. For many, these employment opportunities were regarded as having a positive impact on local individuals, their families and surrounding community.

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[49] Laszlo, K., Pikhart, H., Kopp, M., Bobak, M., Pajak, A., Malyutina, S., Salavecz, S. and Marmot, M. (2010). Job insecurity and health: A study of 16 European countries. Soc Sci Med. 70, 6-3, 867-874.

[50] Mikkonen**, J.,** & Raphael, D. (2010)**.** Social Determinants of Health: The Canadian Facts. Toronto: York University School of Health Policy and Management.

[51] Loppie Reading, C. and Wien, F. (2009). Health inequalities and social determinant of Aboriginal Peoples' health. Retrieved May 1, 2014 from http://www.nccah-ccnsa.ca/docs/social%20determinates/nccah-loppie-wien_report.pdf

"They had guys working up there all day shoveling snow, who had no option to get work anywhere else, ever, being paid good dollars, a decent wage, they had good hot meals in their belly, they had a place to go to bed at night, yeah. So it's been, it's been a benefit, um. That doesn't mean that lifestyle has changed, no, because it's gone but it's opened up a door to offer them that opportunity, if you want to change this, here's your first try."

"I've seen some of the young people that I've picked up on ambulance chronically, working up there, bright and shiny as new pennies. Totally enriched in themselves, totally believing in themselves, totally convinced that they can do this."

Additionally, several interviewees reported that a number of local contractors had benefitted directly during the construction phase of Mount Milligan mine. In light of these mine contractors experiencing economic benefits, they in turn, shared these benefits with the community.

"Um, you know, the awards, the opportunities for business, and they've really diversified, right? They've taken the bull by the horns, they've hired professional people to help them do it, right, and fortunately they were in a position of being able to hire some of those expert people to bring them into the mining division and, um, shared their learning on a regular basis and shifting and all of that stuff. Um, so yeah, for them it's, it's been huge. Wonderful. Thank you very much mine for coming in".

"And I think too some of those companies that did well through the contracting of services during the construction phase gave back to the community, we saw in the form of community donations."

However, some interviewees highlighted negative impacts of local employment during the construction phase of Mount Milligan by describing inadequate local hiring practices of both employees and private contractors.

"They just say 'We've got four hundred jobs' so everybody gets excited but the reality is maybe only ten percent of those jobs are relevant to the population that is here."

Unclear or vague procurement processes were also described for local contractors who were trying to provide services during the construction phase. Although interviewees reported that a number of local companies who diversified benefited from the initial stages of the project, some service providers felt the process was not specific enough to what services local contractors could offer.

"To get on the list, to get on the list, you submit through online, and they don't even confirm that they've received it. So those are some of the challenges that they've had and you don't know what procurement opportunities are out there, so you're applying generally rather than specifically to things that you think are targeted to what you could offer."

Based on limited and rather crude income data from the census, in spite of mine development and an increase in job opportunities within the area, relative to 2001 and 2006 periods, median income levels declined in 2011 (as demonstrated in Figure 7.). However, this data does not cover the spectrum of the construction period and it is hypothesized that if local level data were available for this entire period, an increase in income levels may have been observed.

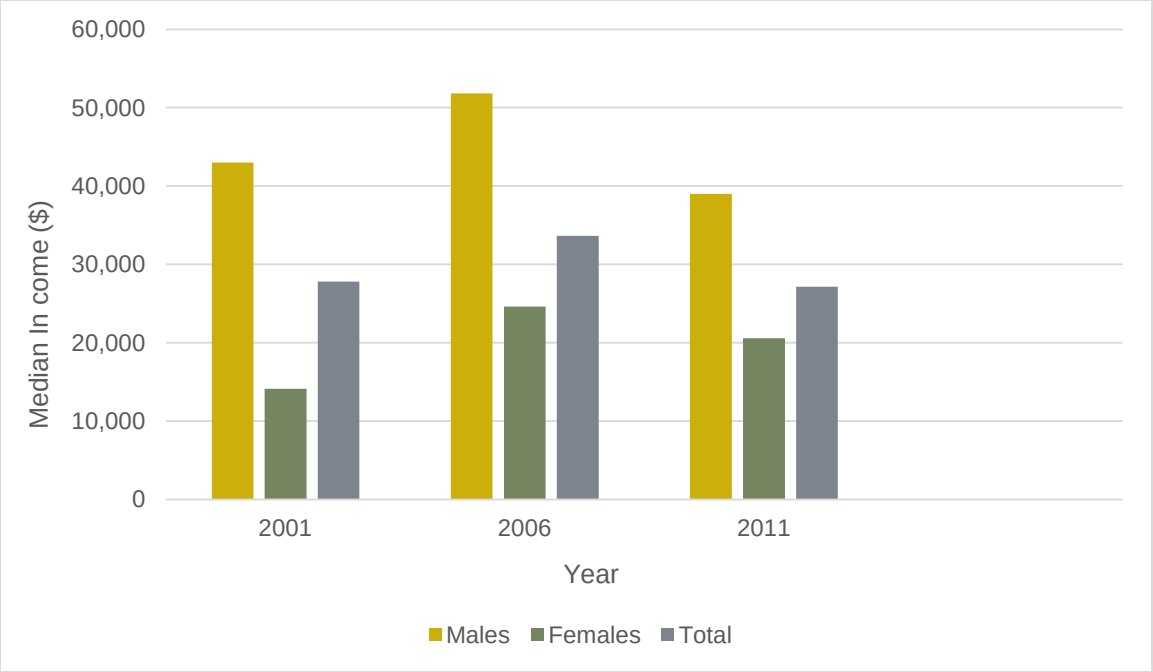

Figure 7. Median income levels for residents of Fort St. James, BC (2001, 2006 and 2011, Statistics Canada).

From the perspective of many interviewees, the Nak'al Bun/Stuart Lake area relies heavily on volunteerism. One impact of the construction phase of the Mount Milligan mine highlights that the volunteer base within the community has decreased. Primarily, it was reported that this is due to shift schedules, greater time spent up at the mine site, and an increase in the number of holidays that people are booking.

"The group of people that you normally would be able to access aren't here, they're at the mine. The group of people that you would normally think 'Okay, they're going to come to this event', they're not here, they're at the mine. 'Love to come, but I gotta work that week. Love to come, oh sorry, we're gone on holidays that week'."

When examining the median income levels of families in Fort St. James over a ten-year time period, the financial benefits for local families has been minimal at least up to the period for which we have the latest data (e.g., 2011). Census data indicates that while median family income went up in 2006 relative to 2001 it then decreased by almost 25% in 2011. While it is clear that data gathered by census in 2011 may refer mainly to 2010 and given that construction was not fully ramped up in this year, one might expect some improvement in incomes from these beginnings of industrial activity and employment in the region. This is a major decrease in family income and bears follow-up study as it is essential to be able to objectively understand the impacts of resource development on local family incomes.

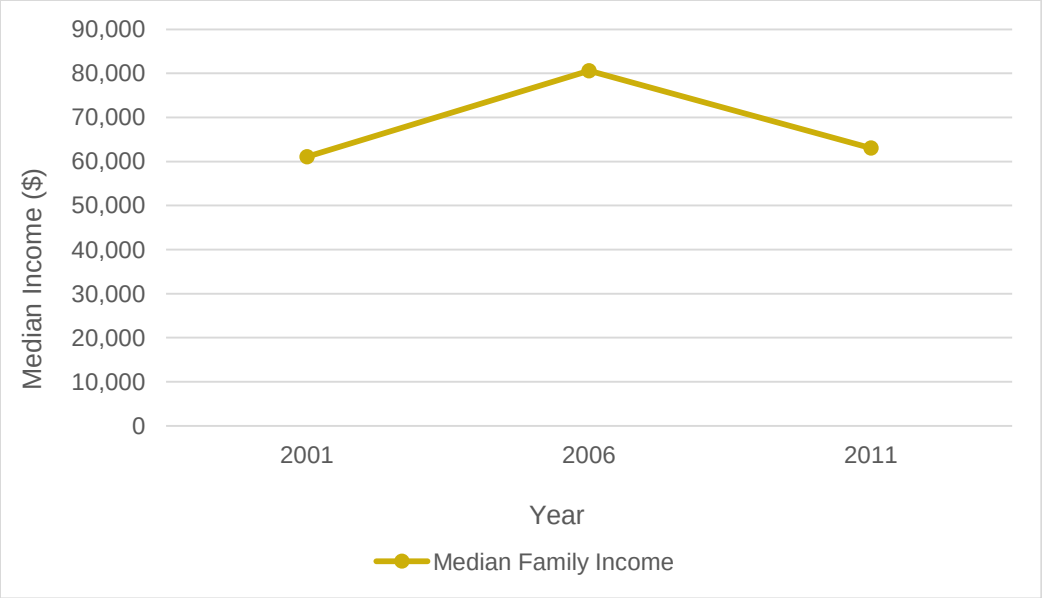

Figure 8. Median family income in Fort St. James, BC (2001, 2006, 2011, Statistics Canada).

During the construction phase, individuals who were interviewed reported that the family dynamics of mine workers were being impacted by the nature of work (e.g., long work hours and shift rotations). Local employees had to commute over a long distance to reach the work site, worked long hours and had rotating shift schedules. This in turn, limited the amount of time that was available for socializing (including spending time with family). When on break, it was reported that workers were often tired, which impacted their ability to spend quality time with their families.

"So then, for, for some of the other stuff that I'm hearing, people that, you know, had their husband's doing shift work, um, that shift of not seeing them for a week, and they're coming home, they're extremely tired and grouchy, and, they're kind of getting the brunt of all of that."

"For one of them, who's still in an extremely abusive relationship, um, having that kind of money, and it, the violence for her isn't, um, just partner, it's his entire family that's abusive. Um, so her, having that kind of money puts her at greater risk when she gets out. Um, and often is back in camp with bruises all over her face and, and I don't believe it's being addressed up there, as to what's going on and why do you have, you know, bruises every time you get back? So her having that kind of money is not safe. Right? She's better off to have a small SA [social assistance] *cheque."*

4.1.10 Availability of education and training for local residents

Education and training is an important determinant of health because people with more education tend to be healthier than those with less education. This is primarily due to the relationship between education and other determinants of health. For example, education and training is associated with higher income levels, increased job security and improved work environment conditions. Education also helps people build skills related to problem-solving and

influences their ability to access, understand and retain information related to health. As a result, this information can be applied to their life and help influence individual health behaviours.[52]

In 2011 and 2012, Thompson Creek Metals provided over $250,000 in funding to the College of New Caledonia in Fort St. James to provide industry-related education and training programs[53]. This included a mine industry certificate course, continuing education courses and an employee orientation session in 2011. In 2012, a mine certificate course, continuing education, mill operator course and 16 cultural awareness training sessions. The number of graduated students that have successfully gained employment in the extractive sector as a result of these training initiatives is unknown at the time of writing this report.

"There was an expectation that if you got trained you're gonna get a job. …. 'And, uh, okay, I've done the training so hopefully I can get an interview and hopefully I'll get a job'. And that doesn't happen for everybody. I mean….a number of students have gone out, started out at the groundwork so to speak, and are advancing. And that's fabulous. And it may have to do with your aptitude once you get out there, the reality of what you're doing versus what you were doing in theory, and everybody goes through that, it either works for you or it doesn't. "

One additional issue raised by service providers focused on community education. It was felt that although there were employment opportunities for local residents and contractors, the community lacked the specific knowledge and skills required to meet the needs of Thompson Creek Metals during the construction phase. It was reported that community members were not aware of what services a mine needed and therefore, these services were often outsourced.

[52] Mikkonen, J., & Raphael, D. (2010). Social Determinants of Health: The Canadian Facts. Toronto: York University School of Health Policy and Management

[53] Thompson Creek Metals Company Inc. Mount Milligan Social Responsibility Report 2011, p. 8. Available online at http://www.mtmilligan.com/files/documents/MtMilligan2011_CSRReportFinalWeb.pdf
Thompson Creek Metals Company Inc. Mount Milligan Sustainability and Social Responsibility Report 2012, p. 13. Available online at http://www.mtmilligan.com/files/documents/MountMilligan2012CSRReport.pdf

5. Managing Community Health and Safety Impacts

To bring about a shift in how industry, communities and governments work together towards resource development and managing community health and safety risks and impacts to communities, this section of the report:

- Identifies management measures associated with community health and safety impacts identified in this report required by the BCEAO as part of the permitting certificate.
- Elaborates on how Mount Milligan's approach to managing social risk compares to international standards.
- Proposes a suite of leading strategies developed by the research team in collaboration with community partners. This approach mirrors an already well-established occupational health and safety practice culture that is deeply embedded within the mining sector.[54]

5.1 Current Management of Community Health and Safety Risks/Impacts

Table 1 highlights the identified community health impacts identified during the construction phase of Mount Milligan from this research project, the identified risks elaborated on in the submitted environmental assessments (original and amendment) for the project, and conditions associated with the EA certificates as prescribed out by the BCEAO. Of the major impacts identified by this research, only three were identified in the EA, and the conditions required by the BCEAO were less rigorous than mitigation strategies identified in the submitted EA.

[54] International Council on Mining and Metals, 2013. 2012 Health and Safety Conference Report. http://www.icmm.com/document/5341

Table 1. Management/Mitigation requirements for identified health impacts in EA certificates.

Impact Identified by Research Team	Impact included in Human Health Effects Section of EA	Mitigation Measures recommended by proponent in EA	Condition prescribed in EA Certificate (O = Original; A=Amended)
Loss of Land	No[55]	Work with concerned communities to better understand the impacts of mining to reduce the potential for emotional stress and a decline in traditional land use activities in the area close to the mine site.	O: Re-establish during construction, access to Heidi Lake for fishing.[56]
Traffic Safety	Yes	Prohibit personal vehicles on-site. Participate in local traffic safety programs. Inform contractors of road protocols. Maintain effective communications with FLNRO[57] re: road use. Coordinate with RCMP re traffic enforcement. Implement certification program for transport employees/contractors. Encourage employees to bike/walk to bus pickup. Inform communities re: periods of unusually high traffic volumes.	O: Advise people adjacent to the affected roadways of any plans to extend concentrate hauling hours outside those proposed in the EA Application, and consult with residents regarding any concerns with concentrate transport. A: By March 31, 2013, the Holder must designate a representative to sit on and actively participate in the North Road Users Committee. As requested by the communities, the Holder must maintain representation on this committee. By July 1, 2013, unless otherwise agreed to by EAO, the Holder must prepare a draft Road Use Monitoring and Emergency Response Plan (RU Plan) for the Haul route for review by MoE[58], FLNR, and EAO.
Influx of Workers	No	No	None
Increased Pressure on Housing	No[59]	No	None
Increased Pressure on Local Medical Services	No[60]	Develop a Pandemic Influenza Preparedness Plan in coordination with the Northern Health Authority.	A: By July 1, 2013, unless otherwise agreed to by EAO, the Holder must provide a draft Social Effects Monitoring and Adaptive Management Plan (SE Plan) for EAO to review. A: The SE Plan must:

[55] Potential environmental impacts on country foods and drinking water identified, and it was concluded there were no residual effects.
[56] Also commitments under Traditional Knowledge to Continue to seek and use Traditional Knowledge (TK) throughout the life of the project, and to Incorporate TK into the environmental assessment review and permitting process.
[57] Ministry of Forests Lands and Natural Resource Operations, Province of British Columbia
[58] Ministry of the Environment, Province of British Columbia
[59] Not identified as an impact during the construction phrase as all workers were anticipated to live in camp.
[60] Influenza pandemic identified as an impact.

Impact Identified by Research Team	Impact included in Human Health Effects Section of EA	Mitigation Measures recommended by proponent in EA	Condition prescribed in EA Certificate (O = Original; A=Amended)
			(a) Identify potential Effects including pressures on community services, which includes social, medical, and emergency services), use or availability of community
Impact of industrial accidents and illness on Medical Services	No	No	None
Increased vulnerability for women and youth	No[61]	No	None
Increased Crime	No[62]	No	None[63]
Employment and Income	Yes	Actively work with contractors so that they are able to hire locally and provide advice about hiring and training to any contractors looking for guidance. Work with women in the potentially affected communities to optimize the distribution of benefits through the sustainability development framework.	O: Maximize employee recruiting from the north and the RSA
Availability and effectiveness of education and training for Local Residents	No[64]	No	O: Work closely with the employment and training officers in First Nations communities and Band Councils to establish conditions at the operation that supports a multi-cultural workforce and encourages their participation in the labour pool. O: Develop collaborative training programs in employment readiness with government and community groups for members of local communities. The College of New Caledonia to complete a skills and training gap analysis for Fort St. James and Mackenzie.

[61] Binge drinking and sexual activity identified as an impact, with youth identified as the primary affected population.
[62] Mentioned as a health effect in a table of Valued Health Components for Social Determinants of Health, but described under Socio-Economic Effects.
[63] Commitment under Work Place Conditions to Prohibit alcohol, drugs, and firearms at the workplace except firearms to be kept by the Safety and Security Department to protect human safety during any serious wildlife confrontations.
[64] Mitigation measure included under Occupational Hazards and Exposures to Implement stringent certification and training requirements for plant construction contractors during the construction phase.

Impact Identified by Research Team	Impact included in Human Health Effects Section of EA	Mitigation Measures recommended by proponent in EA	Condition prescribed in EA Certificate (O = Original; A=Amended)
			Establish a collaborative site-wide training program with contractors to focus on equitable work and training standards so workers from different contractors are able to work safely together. Implement a collaborative project-wide orientation program to ensure all on-site workers are aware of operational practices, policies, conditions of employment and health and safety

5.2 International Standards for Managing Community Health and Safety Risks

International standards associated with large-scale development projects recognize and address risks and impacts to community health and safety. The International Finance Corporation (IFC) Performance Standards can be used as a benchmark to managing social/community health risks and impacts. These standards were developed primarily to manage social and environmental risks associated with development projects including community health, safety and security risks (Performance Standard [PS] 4).[65]

Using publically available information along with qualitative data collected as part of this investigation (elaborated on in sections 3 and 4 of this report), the following summary provides a brief analysis as to how Mount Milligan's approach to managing social risk and impacts compares to international standards:

- There was a **social assessment** completed but it did not consider supply chain, human rights, vulnerable persons, and communicable and other relevant diseases to adequately address social risks and impacts. The Tl'azt'en First Nation was not included as an affected community although they rely primarily on the municipality of Fort St. James for all services. Baseline social data relied primarily on secondary publically available data (as compared to primary data collection specific to the affected communities).
- A **risk/impact assessment process** analyzed in the context of the project's area of influence and key stages of the project cycle was completed, however, risks and impacts to community health and safety were limited to those in Appendix E which included physical environment, employment and working conditions, income and social status, and personal health practices and coping skills, and were not community-specific.
- **Social Action, management and monitoring plans** to address the relevant findings risks and impacts with a hierarchy of avoid, minimize or compensate were not required as part of permitting to manage risk and activities generally required to manage major construction phase impacts associated with large-scale development projects, such as traffic safety awareness campaigns, were reported to not be initiated by the project. A traffic safety awareness campaign was initiated by concerned community members however, in response to increased industrial traffic, speed and the death of a child who was hit by a Mount Milligan subcontractor vehicle.[66]
- There had been a **robust stakeholder engagement program** prior to the construction phase. In terms of **organization and structure**, Terrane Metals Corp. had a full-time community relations officer located in Fort St. James.[67] The company, and thus the mine, had a strong community presence and participated actively in community events.[68] Shortly after Thompson Creek Metals aquired the project, this position was eliminated and during peak construction the company lacked a permanent community relations officer located in the Nak'al Bun/Stuart Lake area. The company did maintain a local office with office staff,[69] however it was observed by the research team and reported by study participants to be not consistently

[65] IFC Performance Standard 4: Community Health, Safety and Security. http://www.ifc.org/wps/wcm/connect/a40bc60049a78f49b80efaa8c6a8312a/PS4_English_2012.pdf?MOD=AJPERES
[66] Putting it on Paper – Concerned Citizen Helps Develop a Drivers Code for the Area, Caledonia Courier, June 6 2012. Available online at http://www.caledoniacourier.com/news/157335815.html?c=n
[67] Mount Milligan, Community Partnerships. Available online at http://www.Mountmilligan.com/files/documents/January2012.pdf
[68] BC Local News, There's Something Fishy Going On Here, July 30 2011 Available online at http://www.bclocalnews.com/lifestyles/tourism/126076773.html?mobile=true
[69] Contact Us. Available online at http://www.Mountmilligan.com/files/contact.php

open during regular business hours. Corporate officials based in either Vancouver, BC or Denver, USA are now primarily responsible for managing social risk.[70]

- No **grievance mechanism** was reported by community members during the construction period. The function of this mechanism would be to resolve concerns and grievances about the project's social and environmental performance raised by individuals or groups. At the time of writing, no information was available about a grievance process on either Thompson Creek Metals' or Mount Milligan's websites. Both websites do contain a Community Policy, which speaks to providing information to communities in a meaningful manner and to engaging communities in an ongoing basis.[71] When community members were asked about what they do if they have a concern, the response was that they would either call the mine manager, send an e-mail to a corporate director, or wait until the next Community Sustainability Committee meeting (these meetings are held quarterly) to raise a concern. Service providers reported that the company does, however, have an internal employee grievance procedure.

5.3 Recommended Risk/Impact Management Strategies

In combining research findings, professional experience in international standards that address community health and safety and an approach that mirrors an already established occupational health and safety practice, the following leading, active strategies for industry, government and communities have been developed.

5.3.1 Leading strategies for managing community health and safety risks and impacts: Extractive companies operating in Canada

Recommended overarching leading management strategies include the need to:

- Ensure the project has conducted an appropriate social assessment that fully captures community-level social and health conditions (based on disaggregated primary data collection, in other words, regional level data is not appropriate).
- Consider supply chain, third party and human health impacts and risks as part of the assessment.
- Assess impacts and risks to community health with attention to communicable diseases, traffic and safety, the vulnerability of women, youth and families, housing, and health services.
- Establish a Social Performance Management System with adequate budget and staffing requirements to mitigate identified project risks and impacts to communities. The Social Performance Management System includes continuous assessment of project risks and impacts, the development and implementation of management plans, the establishment of a stakeholder engagement program and plan, reporting and monitoring, and the implementation of a culturally appropriate grievance mechanism.
- Develop action/management plans to address the relevant findings of the assessment of impacts and risks. These management plans have established procedures for monitoring the effectiveness of mitigation measures. For instance, a community health and safety management plan has been developed that addresses the potential for community exposure to increased traffic risks and communicable diseases (including STI's) that could result from project activities (including primary and subcontractor activities). Management plans that address traffic, emergency response, worker accommodation, workers' health, and community health, safety and security are also developed.

[70] In October 2014, Thompson Creek Metals gave notice that they were closing both the Fort St. James and Mackenzie community offices and moving those services to Prince George.
[71] Mount Milligan, Community Policy. Available online at http://www.Mountmilligan.com/files/documents/CommunityRelationsPolicy.pdf

- Be accountable through the social management system for contractor, sub-contractor, and third-party actions.
- Ensure all company staff and employees are trained and recognize the lasting impacts of the residential school system in support of the Canadian Truth and Reconciliation process

Leading strategies to manage impacts associated with the loss of land include:

- Engage and support Aboriginal Peoples to identify areas of traditional use and importance if this has not yet been accomplished.
- Incorporate traditional land use areas into mine planning and design to minimize impacts.
- Incorporate a mitigation hierarchy of avoidance, minimization and compensation for impacts associated with loss of land and Indigenous peoples.
- Where significant impacts and losses are unavoidable, ensure impacted Aboriginal peoples have provided their free, prior and informed consent.

Leading strategies to manage impacts associated with the influx of workers include:

- The development and implementation of a standard operating procedure for supervising the implementation of management strategies across primary and subcontractors.
- Ensuring medical services are provided on-site that meet workforce needs and that meet Canadian physician to population standards of care.
- Providing budget and staff resourcing with the function of managing the relationship and consistency of management procedures between the company and the EPC (engineering, procurement and construction) and sub-contractors, with due attention to health and safety processes.

Leading strategies to manage impacts associated with employment and increased income include:

- The development and implementation of wellness plans prior to education, training and employment programs in collaboration with communities.
- The provision of financial planning training as part of training initiatives to minimize negative impacts associated with cash influx.
- The provision of culturally appropriate support for mental health and addiction issues at work sites.
- Active communication with communities to help them prepare in advance to take advantage of subcontractor opportunities is provided.

Leading strategies to manage education and training strategies include:

- The assessment of local skills and education levels and needs.
- The evaluation of educational training program outcomes to ensure appropriate allocation of community investment funds are tracked and monitored.

5.3.2 Recommended strategies to mitigate community health and safety risks/impacts for the BCEAO

Leading strategies for the BCEAO to support the improved performance of the extractive sector in BC and to mitigate risks to communities include the need to:

- Develop guidelines for proponents in line with international standards to identify, mitigate and manage general social risks for projects.

- Ensure municipalities are financially supported during industrial development to manage impacts associated with infrastructure pressures.
- Develop and implement a streamlined and/or compensated process for engagement with multiple proponents to avoid burnout of community staff.
- Ensure mitigation measures are actionable in that they have budget, timeline and resources identified.
- Include EA recommended mitigation measures offered by proponents as conditions within a granted EA certificate.
- Ensure mitigation measures include the continuous monitoring of social conditions, at the very least across major phases of development where the highest impact is anticipated.
- Allocate a dedicated BCEAO social specialist team for following up on and monitoring EA certificate conditions.
- Assist communities to implement systematic data collection processes to reduce burden in responding to multiple projects, clearly identify priority areas, track risks and successes.

5.3.3 Strategies to mitigate community health and safety risks/impacts for communities

Communities also need to take an active collaborative approach to assist in the management of community health risks and impacts. Leading strategies communities can take include the need to:

- Implement a systematic data collection process to:
    - reduce burden in responding to multiple projects
    - clearly identify priority areas
    - track risks and successes.
- Continue and strengthen collaborative efforts around data collection and in negotiating through key risk and impact priorities.
- Collaborate with other project-affected communities.
- Coordinate service delivery to mobilize each community's social assets and to connect the capital each community has across the region.
- Fund a municipal position that is responsible solely for overseeing local resource development projects (e.g., including providing review and feedback on applications).
- Actively educate community leadership on impacts and mitigation strategies associated with large-scale development projects.
- Develop and implement community-based monitoring programs.
- Develop a community-based standard of practice/code of conduct to pass to development proponents as project proposals are made

6. Next Steps

The next steps for our research project are focused on meeting the needs of our partner communities. Through this project we have observed that extractive resource development places a significant demand on administrative and community functions. Communities are expected to review plans, submit comments, and follow developments as they may directly impact the communities' residents and ways of life. Many communities do not have the administrative capacity or infrastructure to be able to respond within regulatory timeframes, and run the risk of not being able to review and respond thoroughly because there isn't enough staff, time or knowledge to do the work that is required. Alteration of plans further complicates that burden, as now communities must review and respond to *changes* in proposals that they have already reviewed and responded to.

In the focus communities there are a growing number of extractive resource proposals that are requiring community review and response. Each phase of a project requires scrutiny. Fort St. James, Nak'azdli and Tl'azt'en all are faced with a mountain of paperwork needing review and response, and always by a deadline. Companies needing to meet community consultation regulatory requirements continue to demand active local participation on committees, and often it's the same people at every committee table, risking burnout and exhaustion. None of the three communities have adequate staff to meet the increasing demand, and some staff juggle multiple projects at once, sometimes at the expense of their own priorities. What this means is that communities and administrators end up focusing on meeting external regulatory time frames and requirements to meet industry priorities for development, with little time to spend on their own community priorities, including community health. We would like to encourage industry and government to find a solution to these administrative burdens and while government may wish to mandate collaborative processes for the monitoring of social effects or for sustainability planning, they need to realize this comes at an expense for communities, and this should be compensated for.

In addition to administrative burdens, an unfair system is in place in the province of BC where revenues associated with large-scale extractive projects are not shared with municipalities, many of whom provide infrastructure support for such developments. Revenue-sharing agreements are signed with Aboriginal communities but the agreement amount is set by the province and is not specific to each project. Payments are predetermined fixed amounts usually paid annually, and they do not fluctuate with the profitability of the project. This fails to recognize that costs might be higher in rural and remote communities in the north and agreement amounts should reflect that. To date less than 10 BC First Nations communities have negotiated resource-sharing agreements with the province. On the other hand, "Fair Share" agreements for oil and gas revenue have been signed with local governments in the Peace region of the province. These are multi-year agreements, and are based on a distribution formula which considers, on an annual basis, population, municipal assessment, and unincorporated assessment. The formula provides economic flexibility from year to year as populations and industrial activities change.

The Union of BC Municipalities (UBCM) has called on the province to negotiate resource extraction revenue-sharing agreements with local governments as far back as 2003. The District of Fort St. James put forward a resolution at the 2014 UBCM annual convention to request that the Province of BC enter into fair agreements with municipalities to share resource taxation revenues. That resolution was endorsed by delegates at the convention. This is highlighted as a leading strategy for governments to consider.

Specific next steps of this research project are to:

- Develop an interactive website, with the aim of providing community residents with an easily accessible portal to information about extractive projects, and enabling the tracking of selected indicators about community health, well-being and sustainability.
- Continue to share experiences and findings associated with this study with other communities facing extractive development in BC, nationally and internationally.
- Support communities by organizing public presentations of research findings.
- Continue to support more focused priority research on topics stemming from the research findings, including the vulnerability of women, children and families, loss of land, impacts to health services, and the current environmental assessment process.
- Continue to highlight the need to incorporate international standards as a benchmark for BC and Canadian operations.
- Initiate a Health Impact Assessment for the ?Esdilagh First Nation in relation to the Gibraltar Mine.

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Appendix A – Map of Project Study Area



Appendix B – Mount Milligan Select Commitments and Conditions – Social Issues

This table lists select commitments from the original Mount Milligan Environmental Assessment Certificate (2009) and select conditions from the Amendment Certificate (2012) focusing on social issues.[72]

Table 5. Commitments from Mount Milligan Environmental Assessment Certificate (2009)

Sustainability Area/Component	Commitment
Sustainability Management Plan	• Develop a Sustainability Management Plan (SMP) that includes guidelines on community participation, means to address issues, complaints, criticisms, commendations or constructive advice and ways to build and support community organizations. This SMP will address First Nations and non-First Nation communities and will be developed in consultation with local communities.
Economic Conditions - Employment	• Maximize employee recruitment from Northern BC, particularly from the communities within the Regional Study Area. • Work closely with the employment and training officers in First Nations communities and Band Councils to establish conditions at the operation that support a multi-cultural workforce and encourages their participation in the labour pool.
Economic Conditions - Training and Development	• Develop collaborative training programs in employment readiness with government and community groups for members of local communities. • Continue to work with the College of New Caledonia to complete a skills gap analysis for Fort St. James and Mackenzie. • Establish a collaborative site-wide training program with contractors to focus on equitable work and training standards so that workers from different contractors are able to work safely together. • Implement a collaborative project-wide orientation program with contractors to ensure all on-site workers are aware of operational practices, policies, conditions of employment, and health and safety issues.
Economic Conditions - Business Development	• Use local and regional suppliers when those suppliers can provide products and services at a competitive price and timeframe. • Work with First Nations groups to increase the participation of First Nation-owned businesses in providing goods and services to the project. Develop a business policy including processes to assist First Nations businesses in bidding contracts, and a published list of project requirements for goods and services.

[72] A full listing of all commitments included in the Environmental Assessment Certificate is available online at http://a100.gov.bc.ca/appsdata/epic/documents/p285/1237403247586_286469e2062a9eff93eeb05dbbaf5feb44436a0a2dce54b6eef3ef5cdccfb280.pdf
A full listing of all conditions included in the Amendment Certificate is available online at http://a100.gov.bc.ca/appsdata/epic/documents/p285/d35402/1362418953776_7663b740436f6524ba2a1c5cf145e0cee79912c6feb99d7932b630eaeaf6fae0.pdf

Table 5. Commitments from Mount Milligan Environmental Assessment Certificate (2009)

Sustainability Area/Component	Commitment
Social Development - Health and Safety	• Implement a comprehensive health and safety program that includes safety leadership by mine management, risk and harm reduction, health and safety systems and safe work behaviour programs. • Support employees and their families in practicing healthy and safe activities. This may include, for example, smoking cessation and healthy eating campaigns. • Ensure the health and safety program for the project conforms to the OHSAS 18001 standard. • Implement a program of continuous improvement for health and safety. • Advise people residing adjacent to the affected roadways of any plans to extend concentrate hauling hours outside those proposed in the EA application, and consult with residents regarding any concerns with concentrate transport.
Social Development - Traditional Knowledge	• Continue to seek and use Traditional Knowledge (TK) throughout the life of the project. • Incorporate TK into the environmental assessment review and permitting processes.
Social Development - Work Place Conditions	• Prohibit alcohol, drugs and firearms at the workplace except firearms to be kept by the Safety and Security Department to protect human safety during any serious wildlife confrontations. • Encourage non-smoking as a good life-choice. • Foster management styles that create a positive work environment for workers. • Implement workplace harassment policies and practices to ensure the absence of any harassment between persons in the workplace.
Social Development - Worker Orientation Training	• Develop and deliver a comprehensive employee orientation program that will be mandatory for all employees. The program will include information on: o company organization and mandate o occupational health and safety and first aid o emergency response o company policies and procedures o cross cultural awareness and sensitivity o job specific orientation and job expectation o training programs available to employees o site orientation o employee assistance program o benefits, pensions and savings plans o wildlife encounter and harassment policies

Table 5. Commitments from Mount Milligan Environmental Assessment Certificate (2009)

Sustainability Area/Component	Commitment
Land Use	• Re-establish during construction, access to Heidi Lake for fishing.

Table 6. Conditions from Mount Milligan Amendment Certificate (2012)

Number	Conditions
2	**Social Effects Monitoring and Mitigation:** By July 1, 2013, unless otherwise agreed to by EAO, the Holder must provide a draft Social Effects Monitoring and Adaptive Management Plan (SE Plan) to EAO for review. The Holder must revise the SE Plan in the time required and to the satisfaction of EAO. The Holder must implement the SE Plan. The SE Plan must set out how the Holder will monitor any adverse social effects related to the effects on Workers of living in a camp environment, and any adverse effects on communities from the long or short term presence of Workers who stay in the Camp during their shift rotations living in, or moving through local communities (the Effects). The SE Plan must set out an approach to address Effects when they are identified, focusing on, in priority order, avoidance, mitigation and compensation measures. The SE Plan must: a) Identify potential Effects including pressures on community services (which includes social, medical, and emergency services), use or availability of community infrastructure (which includes accommodations and roads), substance abuse and related issues, and family and community safety and well being; b) Be drafted in consultation with the Districts of Fort St. James and Mackenzie, the Nak'azdli First Nation and the McLeod Lake Indian Band, document the issues and concerns raised by these communities and First Nations, and whether and how the SE Plan incorporates those issues. The Holder must provide a reasonable amount of time for input, and must consider all comments received within that time; c) Include provisions for the formation of a Social Effects Advisory Committee (Committee). The Holder must invite representatives from the District of Fort St. James, District of Mackenzie, Nak'azdli First Nation, McLeod Lake Indian Band, and EAO to participate on the Committee. If directed by EAO, the Holder must retain an independent monitor, reporting to EAO, to participate in the Committee in lieu of EAO; d) Include provisions for the consideration of membership in the Committee of other communities in the Socio-economic Regional Study Area defined in the Certificate that can demonstrate Effects (Other Communities), and the roles of representatives from organizations with knowledge or expertise in areas relevant to the mandate of the Committee; e) Include provisions for establishing baseline information and indicators needed to identify, assess, address and report the Effects;

Table 6. Conditions from Mount Milligan Amendment Certificate (2012)

Number	Conditions
2 *(cont'd)*	f) Include provisions for considering how Effects and the potential measures or approaches to address those may differ between communities; g) Include provisions for reasonable financial assistance for community services for the Districts of Fort St. James and Mackenzie, the Nak'azdli First Nation, McLeod Lake Indian Band, and Other Communities, for Effects that have been identified by the Committee; h) Include provisions for counseling services to be offered to Workers and community members to address identified Effects; i) Set out Committee terms of reference, including frequency, timing and location of meetings, documentation of Committee meetings, methods for the Committee to obtain advice and expertise on Effects, and periodic reviews of the ongoing need for the Committee; j) Consider existing community committees dealing with the same or similar issues and how the Committee can coordinate with or build from existing initiatives; k) Include provisions for a mediation or an arbitration process, agreeable to all parties and to EAO in the case of disagreements among the members of the Committee, to resolve the disagreements; and l) Include provisions for submitting regular status reports, developed in consultation with the Committee, to EAO.
3	By March 31, 2013, the Holder must designate a representative to sit on and actively participate in the North Road Users Committee. As requested by the communities, the Holder must maintain representation on this committee.
4	**Camp:**
4.1	The Holder must restrict residence and occupancy of the Camp to Workers only.
4.2	The Holder must ensure that each Worker staying at the Camp, who is a permanent employee working on the operations of the Project (Operations Worker) is provided his or her own room in the Dwellings, which may not be used by any other Worker, except under emergency circumstances where Workers are not able to leave the site.
4.4	The Holder must give Workers the option to commute daily from the communities of Fort St. James or Mackenzie to the mine site, or stay at the Camp during their shift rotations (i.e., when they are working on-site).
4.5	The Holder must provide transportation service between the mine site and the communities of Fort St. James and Mackenzie for Workers. The transportation service must accommodate Workers who choose to return to those communities at the end of their daily shift.
4.8	The Holder must ensure that Workers do not engage in hunting, fishing or gathering activities while residing at the Camp.
4.9	The Holder must ensure that Workers do not have personal motorized recreational equipment, including motor homes, trailers, campers, motor bikes, all-terrain vehicles, snowmobiles, and watercraft at the Camp or located elsewhere at or near the mine site.

Table 6. Conditions from Mount Milligan Amendment Certificate (2012)

Number	Conditions
5	**Haul Route:**
5.1	By July 1, 2013, unless otherwise agreed to by EAO, the Holder must prepare a draft Road Use Monitoring and Emergency Response Plan (RU Plan) for the Haul Route for review by MoE, FLNR, and EAO. The Holder will make changes to the RU Plan as required by EAO. The RU Plan must set out requirements for the Holder to monitor and report any adverse effects of Project-related transportation along the Haul Route. The RU Plan must: a) Include details on the number, location, and fish bearing status of watercourses or water bodies crossed or paralleled by the Haul Route; b) Identify locations of increased potential for vehicle collisions with wildlife and mitigation measures to reduce the likelihood of such collisions; c) Identify potential adverse effects (including threats to public safety, and noise and visual disturbance) to members of the public using forest recreation sites and other sites of First Nations or public interest along the Haul Route, and provide mitigation measures to avoid or reduce these effects; d) Identify potential safety issues or hazards along the Haul Route, and identify mitigation measures to address these potential issues or hazards, including reporting and communication protocols and procedures; e) Identify specific safety measures to be followed by drivers of Project vehicles and measures to be incorporated into Project vehicles; f) Identify spill reporting, response, and monitoring procedures and the location and type of spill response materials; g) Identify measures for monitoring dust generated by Project vehicles, areas of specific concern for dust, including areas adjacent to forest recreation sites, and specific methods for dust control on the Haul Route; and h) Identify measures to ensure that haul trucks are clean and free from accumulations of ore concentrate that could be deposited along the Haul Route
5.2	In developing the RU Plan, the Holder must invite and consider input from the First Nations consulted by EAO on this Amendment, and identify to EAO and to the First Nations how those comments were considered and whether and how they have been addressed. The Holder must provide the First Nations a reasonable amount of time to provide input, and must consider all comments received within the time provided.

Appendix C – Summary of Residual Effects for the Construction Phase – Mount Milligan Environmental Assessment Human Health Effects Assessment

Table 5.14.21 Summary of Residual Effects for Construction Phase[73]

VHC	Health Factor	Residual Effect	Direction
Biophysical determinants of health			
Physical environment	Traffic on rural roads	Not significant (negligible)	Negative
	Residential traffic	Not significant (negligible)	Negative
Employment and working conditions	Occupational hazards and exposures	Not significant (minor)	Negative
Social determinants of health			
Employment and working conditions	Workers' control over work circumstances	Not significant (negligible to moderate)	Negative
Employment and working conditions and income and social status	Employment	Not significant (negligible)	Positive
Income and social status	Income and income distribution	Not significant (negligible)	Positive and Negative
Income and social status, personal health practices and coping skills	Binge drinking and sexual behaviour	Not significant (negligible to minor)	Negative

Note: See Table 5.14-6 for criteria definitions

[73] From the Terrane Metals Corp. Mt. Milligan Copper-Gold Project Environmental Assessment, Volume 5 Effects Assessment, Section 5.14, Volume 5-p 722, (Adobe p. 46) Version 2.0 July 2008. Available online at http://a100.gov.bc.ca/appsdata/epic/documents/p285/d26336/1316646872924_c11e7ccaf7cd362b9f71268a5a444a52f0f27a69e8486a6876e8f8529a0997c2.pdf