



CANADA NICKEL
COMPANY



Stantec

Crawford Nickel Project Impact Statement

Chapter 21 Assessment of Potential Effects on Health



Prepared for:
Canada Nickel Company

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Acronyms and Abbreviations

2SLGBTQQA+	Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, Asexual plus
CCO	Cancer Care Ontario
CoPC	Contaminant of Potential Concern
EFAP	Employee Family Assistance Program
GBA Plus	Gender-based Analysis Plus
HIA	Health Impact Assessment
HIV	Human Immunodeficiency Virus
HQ	Hazard Quotient
IA	Impact Assessment
IAAC	Impact Assessment Agency of Canada
ILCR	Incremental Lifetime Cancer Risk
LSA	Local Study Area
HHERA	Human Health and Ecological Risk Assessment
HMSP	Health and Medical Services Plan
MECP	Ministry of the Environment, Conservation and Parks
MMIWG	Missing Murdered Indigenous Women and Girls
PA	Project Area
RSA	Regional Study Area
STIs	Sexually Transmitted Infections
TIS Guidelines	Tailored Impact Statement Guidelines
TMF	Tailings Management Facility

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VC	Valued Component
WHO	World Health Organization

Glossary of Technical Terms

Biophysical Determinants of Health	Environmental conditions that can influence health (e.g., air and water quality, noise and vibration, light levels, and quality of country/traditional foods).
Emissions	Technically, all solid, liquid, or gaseous discharges from a processing facility, but normally referring to those released to the atmosphere (with solids referred to as residue and liquids as effluent).
Gender Based Analysis Plus (GBA Plus)	A means of identifying and analyzing the differential impacts of designated projects on diverse population groups. The “plus” in GBA Plus acknowledges that GBA goes beyond biological (sex) and socio-cultural (gender) differences.
Health	A state of complete physical, social and mental wellbeing, and not merely the absence of disease or infirmity. More specifically here, defined as physical health (the state of the human body and how well it functions) and mental health and social wellbeing (which refers to an individual’s psychological and emotional state and how that relates to the ability to communicate with others and build meaningful relationships in a community (i.e., community wellbeing)).
Human Health Risk Assessment	A qualitative and quantitative process to evaluate the interaction amongst hazards (e.g., chemical contaminants of concern), exposures) (e.g., inhalation, ingestion) and human receptors (e.g., people).
Health Impact Assessment	A systematic, objective, and specialized process that can be used to assess the potentially positive and adverse effects of a designated project on well-being and health.
Mitigation	Measures taken to reduce adverse effects on the environment.
Noise	Unwanted sound.
Social Determinants of Health	Social, cultural, and economic conditions associated with the circumstances in which people are born, grow, live, and work that can influence health (e.g., social inclusion/exclusion, housing value and availability, and access to health and social services).

21 Assessment of Potential Effects on Health

In 1948, the World Health Organization (WHO) defined health as “a state of complete physical, social and mental wellbeing, and not merely the absence of disease or infirmity” (WHO 1948). In order to achieve this definition of health, the WHO notes, as defined in the 1st International Conference on Health Promotion, Ottawa, 1986, that “an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment”. The Impact Assessment Agency of Canada (IAAC), in developing the Tailored Impact Statement (TIS) Guidelines for the Project, also recognizes this broad definition of health. As such, assessing Health as a Valued Component (VC) through a holistic lens, and not simply focusing on physical health, is integral to the federal impact assessment process. Accordingly, for this VC, health is defined as:

- physical health, the state of the human body and how well it functions; and
- mental health and social wellbeing, which refers to an individual's psychological and emotional state and how that relates to the ability to communicate with others and build meaningful relationships in a community (i.e., community wellbeing).

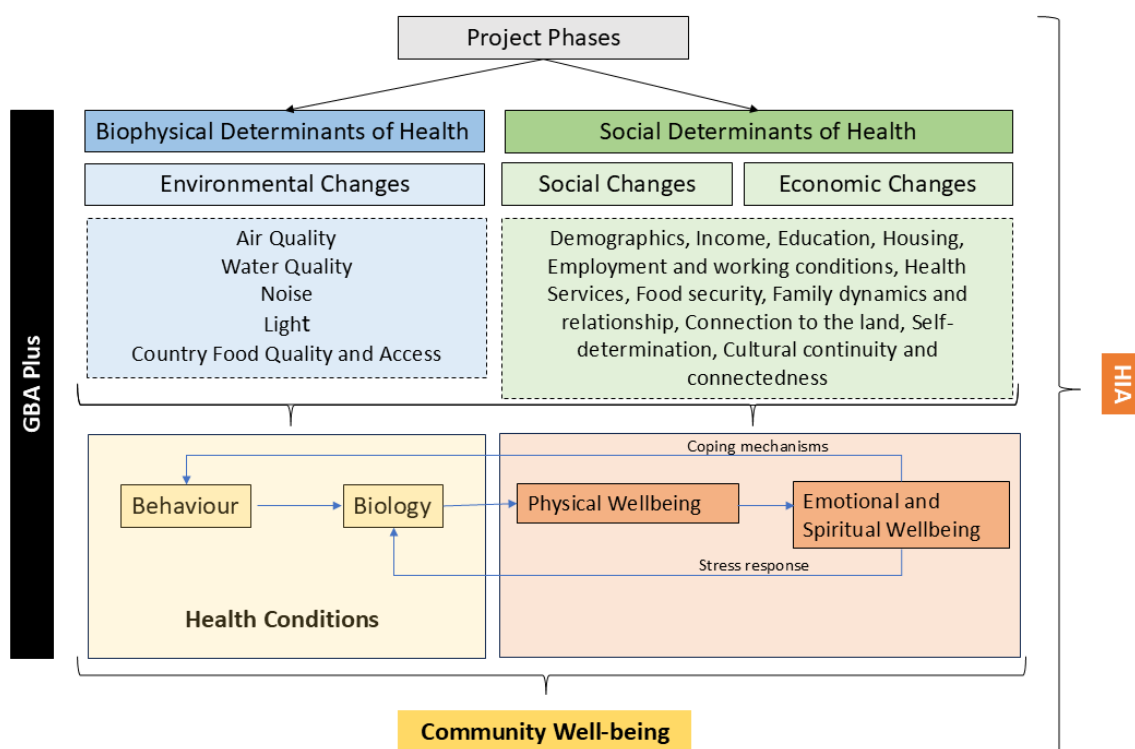
There are numerous factors that affect health, and these factors are commonly referred to as determinants of health (Government of Canada 2024a). In the Tailored Impact Statement Guidelines (TIS Guidelines) (Appendix A.1 of the Impact Statement), IAAC specifically refers to two general determinants of health: biophysical and social. Broadly defined, biophysical determinants of health refer to environmental conditions that can influence health (e.g., air and water quality, noise and vibration, light levels, and quality of country/traditional foods), while social determinants of health refer to social, cultural, and economic conditions associated with the circumstances in which people are born, grow, live, and work that can influence health (e.g., social inclusion/exclusion, housing value and availability, and access to health and social services) (National Collaborating Centre for Determinants of Health 2022, Government of Canada 2024a). Changes in these determinants of health can result in changes to people's behaviours, biology, and wellbeing, each of which are interconnected, and all of which can result in a change to overall health and wellbeing.

As noted in the TIS Guidelines, the potential effects of the Project on the health of Indigenous (and non-Indigenous) people must be assessed and interconnections between Health and other VCs, and the interactions between effects, must be described. As described in Health Canada's interim Health Impact Assessment (HIA) guidance, HIA is a “systematic, objective, and specialized process that can be used to assess the potentially positive and adverse effects of a designated project on wellbeing and health” (Health Canada 2022). As such, an HIA was undertaken to provide an understanding of the potential effects of the Project on the health of people, be it positive or negative, as well as community wellbeing as a whole, based on the evaluation of biophysical and social determinants of health.

Also as noted in the TIS Guidelines, an analytical process called Gender-based Analysis Plus (GBA Plus) should be applied to the assessment of health. Changes to human health conditions can be different for diverse subgroups within the general population and within communities (e.g., by sex, gender, age, ethnicity, Indigeneity). GBA Plus can guide practitioners to identify who is impacted by the Project and assess how they may experience effects differently. Understanding differential effects of the Project is important for understanding how it can lead to health inequities and for making appropriate mitigation or enhancement measures.

The interactions amongst the Project activities, biophysical and social determinants of health, physical, mental and social wellbeing, through the lens of GBA Plus, are illustrated on a generalized HIA diagram (Figure 21.1).

Figure 21.1 HIA Diagram



Health as a VC is linked to other VCs, including:

- Atmospheric Environment (Chapter 12), whereby changes in Project emissions and the associated ambient concentrations may increase the exposure of humans to air contaminants that may affect human health. The deposition of Project emissions to soil may affect soil quality which may, in turn, alter soil-related exposures for human receptors.
- Acoustic Environment (Chapter 13), whereby noise may affect human health by increasing levels of sleep disturbance compared to existing conditions.
- Surface Water (Chapter 15), whereby surface water is a transport pathway to humans through the consumption of surface water and organisms that inhabit and/or use surface water.
- Social Conditions (Chapter 22), whereby changes in the conditions of vegetation, fish, bird and wildlife harvested as country foods may affect the health of human consumers during recreational or commercially based land and resource use.
- Economics (Chapter 23), whereby economic conditions contribute to the well-being of present and future generations.
- Indigenous Interests (Chapters 25-28), whereby changes to the biophysical and social determinants of health may affect Indigenous people.

For example, in terms of biophysical determinants of health, Project-related changes to chemical concentrations in air may affect people's health by increasing the amount of chemicals inhaled compared to existing conditions. Project-related changes to noise may affect people's health by increasing levels of sleep disturbance compared to existing conditions. In terms of social determinants of health, Project-related changes to the land may affect people's health due to perceived (or actual) changes in environmental quality and tranquillity, and Project-related changes to community structure may affect people's health due to access to health and social services and community cohesion. A detailed list of possible Project interactions on health is provided below in 21.3.

21.1 Scope of Assessment

Based on the TIS Guidelines, it is understood that the Impact Statement must:

- "be sufficient to provide a comprehensive understanding of the state of health of Indigenous Peoples
- provide information that is sufficiently detailed to describe the pathways by which the project's influence on the determinants of health may affect health risks for potentially affected Indigenous Peoples
- provide a comparison of data at the provincial, regional, or national level, if possible, to better interpret baseline conditions for the health of potentially affected Indigenous Peoples
- identify the social area of influence of the Project
- describe how Indigenous Knowledge from relevant Indigenous communities was used in establishing baseline conditions, including input from diverse subgroups

- describe baseline conditions using disaggregated data for diverse subgroups and their different access to resources, opportunities, and services within the community to support GBA Plus
- apply an HIA approach

While guidance documents from various regions exhibit minor variations in the steps of HIA, the underlying process remains consistent. Health Canada's interim HIA guidance (2022) outlines a seven-step process, paraphrased below, that begins with screening and culminates in evaluation.

- **Screening:** The purpose of the screening step is to explore a range of health determinants from both the biophysical and social determinant category for their relevance to the health and well-being of potentially affected people, in relation to the designated project.
- **Scoping:** The purpose of the scoping step is to plan the overall approach to the HIA including methods, contents, and logistics.
- **Assessment:** This purpose of this step is to ascertain through qualitative and quantitative ways whether the project's components and activities could have direct or indirect effects on the selected health determinants. In this step, project interactions, effects pathways, measurable qualitative and quantitative metrics, and significance criteria are defined and assessed.
- **Recommendations:** Based on the findings of the prior steps, recommendations are made with respect to potential adverse and positive health effects of the project.
- **Reporting:** The documentation of the HIA process.
- **Monitoring:** Monitoring may be recommended as part of an HIA to track the identified determinant(s) of health, and potentially, the health-related effects of the project and the effectiveness of proposed recommendations and mitigation measures. Monitoring generally involves data collection over time by the proponent or other interested parties.
- **Evaluation:** A retrospective lessons-learned step that can be used (but is not required) to demonstrate the effectiveness of HIA in the planning process by showing what the HIA achieved.

This VC chapter has been developed as the HIA for this Project. The scope of the HIA starts with the screening step and ends with the reporting step. Should monitoring be required, results should be incorporated into any follow-up reports on matters relied on to conduct the HIA, and the HIA implications should be updated accordingly.

Consistent with interim Health Canada guidance (2022), a checklist of the key activities for each step outlined above and references where the key activities have been included in this VC are provided in Table 21.1 below. If an activity has not been completed, a rationale explaining why it was not completed has been included.

Table 21.1 Key Activity Checklist for the HIA

Key Activities	Reference to Application where information is located
Step 1 Screening	
Provide appropriate context on the project type and a summary of background information.	Project background information is presented in Chapter 3 of the Impact Statement
Explore determinants of health to identify specific health determinants and corresponding indicators that could be of relevance to the health and well-being of potentially affected people in relation to the designated project. Consider where Indigenous-specific determinants of health and corresponding indicators are located within these general categories.	The determinants of health relevant to the Project are described in Section 21.2 and potential effects, measurable parameters and pathways are described in Table 21.3. These pathways describe how the determinants of health influence measurable parameters.
Discuss opinions and concerns raised by local Indigenous nations, the general public; political interests; and/or media coverage about the designated project as this may reinforce the value of conducting an HIA	The influence of consultation and engagement is described in Section 21.1.2. Chapter 6 and 7 of the Impact Statement describe public participation and view and engagement with Indigenous nations respectively.
Identify subpopulation(s) that may be disproportionately affected by the designated project (e.g., certain age groups, visible minorities, socially isolated groups, and people with diverse identities to be addressed).	An approach for GBA Plus is described in 21.2.1 and pathways are described in Table 21.5.
Step 2 Scoping	
Define temporal and spatial boundaries of the HIA.	Temporal and spatial boundaries are defined in Section 21.1.4
Engage with potentially affected communities, Indigenous nations, other stakeholders and decision-makers, and incorporate feedback.	Potentially affected Indigenous nations provided Traditional Knowledge Land Use Studies and Socioeconomic Studies. Information from these studies were integrated in this chapter. A description of how consultation and engagement has been incorporated into the VC is provided in Section 21.1.2.
Select all determinants of health relevant to the project.	Biophysical and social determinants of health relevant to the Project are described in Section 21.2.
Prioritize determinants of health using transparent methods.	Determinants of health relevant to the Project were based on the potential effects, pathways and measurable parameters described in Table 21.3 and further described in Section 21.2. A description of where the determinant of health is assessed in other locations in the Application are below.
Identify the type of data that will be required to conduct the HIA. Identify constraints in data collection (e.g., timing, resources).	Methods are described in Section 21.2.1
Provide a rationale for included determinants as well as a rationale for those determinants that are being excluded from further assessment.	Determinants of health have been selected based on identified potential effects, pathways and measurable parameters described in Table 21.3. Determinants of health are described in Section 21.2.2

Key Activities	Reference to Application where information is located
Summarize the scope of work, while defining roles and responsibilities.	The scope of the assessment is described in Section 21.1. Chapter 1 to 4 of the Impact Statement describe the introduction, proponent information, project description and project purpose and need respectively.
Step 3 Assessment	
Compile a Baseline Community Health Profile that includes adequate demographic and health-related data specific to each potentially affected community and appropriately scoped to the project context.	Baseline community health data are presented in Section 21.2.2.
Include baseline information on health conditions and a summary of baseline information on social, economic, and environmental conditions from more detailed assessment reports.	Baseline community health data are presented in Section 21.2.2. Determinants of health relevant to the Project are described in Section 21.1.
Define the decision-support tool that will ensure transparency within the HIA process.	A specific decision support tool has not been included as part of this assessment of health. A rationale has been provided for the selection of determinants of health and indicators and for the scope of the assessment herein.
Assess separately each determinant of health identified in the scoping step as to whether it may be affected directly or indirectly by the designated project in a positive or adverse manner, taking into consideration its relative position along pathways of health effects.	Potential effects, pathways and measurable parameters are described in Table 21.3. Determinants of health relevant to the Project are described in Section 21.2.2.
Illustrate cause-effect relationships and their interactions (effect pathways).	Effect pathways are described in Section 21.1.3
Describe project effects, using standard effect characterization criteria (e.g., magnitude, likelihood).	Potential effects are identified in Section 21.1.3. Residual effects characterization is defined in Section 21.1.5 and effects are assessed in Section 21.4
Document how the assessment is based on sound evidence, relevant data, and professional judgement.	Effects are assessed in Section 21.4. These sections document the use of evidence, relevant data and professional judgement in characterizing the effects.
Consider the information and data available in other sections of an impact assessment, or in any other applicable legislative instrument or regulatory requirement.	The effects assessment relies on findings from other sections of the Application as identified in Section 21.1.
Identify uncertainties and limitations and discuss their relevance to the overall findings.	Uncertainties and limitations are described in Section 21.1, 21.1.5, 21.5, 21.7.
Consider cumulative effects and intend to provide additional recommendations where potential cumulative effects are moderate or severe.	Cumulative Effects are described in Chapter 29 of the Impact Statement,

Key Activities	Reference to Application where information is located
Step 4 Recommendations	
Link the recommendations to the findings in the assessment section	Recommendations (mitigation/enhancement measures) are described in Sections 21.4.2.2, 21.4.3.2, and 21.4.4.2.
Provide recommendations to both enhance positive effects and mitigate adverse effects, as applicable.	Recommendations (mitigation/enhancement measures) are described in Sections 21.4.2.3, 21.4.2.3.3 and 21.4.4.3.
Engage key stakeholders and Indigenous nations to ensure the proposed measures are socially acceptable and technically feasible.	Chapters 6, 7 and 25-28 of the Impact Statement describe public participation and view and engagement with potentially affected Indigenous nations, respectively.
Consider the context of the recommendations and mitigation measures proposed throughout the broader impact assessment.	Recommendations (mitigation/enhancement measures) are described in Sections 21.4.2.3, 21.4.2.3.3 and 21.4.4.3.
Describe the recommendations in enough detail, identify priority actions and propose timelines for implementation.	Recommendations (mitigation/enhancement measures) are described in Sections 21.4.2.3, 21.4.2.3.3 and 21.4.4.3.
Assign each recommendation to a responsible party who has agreed to ensure it is implemented.	Recommendations (mitigation/enhancement measures) are described in Sections 21.4.2.3, 21.4.2.3.3 and 21.4.4.3.
Step 5 Reporting	
The HIA includes appropriate reporting format(s) based on the intended audience.	This VC will be filed as part of a larger Application to the Impact Agency of Canada. While language in the VC is technical, the HIA is formatted to a VC template to maintain consistency among the Chapters of the Impact Statement. This VC provides a description of a transparent approach to data collection and assessment and where feasible, graphics have been included. As per the Impact Assessment (IA) process, this Application will be appropriately disseminated to rights holders, stakeholders and general public.
Translation of plain language summaries has been considered for potentially affected communities.	
The reporting includes all seven steps of the HIA process in adequate detail.	
A summary of engagement with key stakeholders and Indigenous nations is provided, if applicable.	
The report includes a section that describes the uncertainties and limitations of the HIA.	
A communications plan is developed to disseminate the HIA in a way that is accessible to all rights holders, stakeholders, and the general public (as necessary).	

21.1.1 Regulatory and Policy Setting

As noted in the TIS Guidelines, an HIA supported by a human health risk assessment (HHRA) is required to address the aforementioned requirements, both of which require input from many technical disciplines. Health Canada has been working with key partners and rights holders, including Indigenous organizations, federal partners, provinces/territories, and other key stakeholders, to develop HIA guidance and tools for a more comprehensive assessment of potential health effects of proposed projects. As a result of the *Impact Assessment Act* coming into effect, Health Canada released its interim guidance document (2022), which was prepared to support the use of HIA in Impact Assessment (IA):

- Interim Guidance Document for the Health Impact Assessment of Designated Projects under the Impact Assessment Act. (Health Canada 2022)

Health Canada also provides general guidance for conducting a HHRA and assessing human health effects in IA, namely:

- Guidance for Evaluating Human Health Effects in Impact Assessment: Human Health Risk Assessment (Health Canada 2023a)
- Guidance for Evaluating Human Health Effects in Impact Assessment: Country Foods (Health Canada 2023b)
- Guidance for Evaluating Human Health Effects in Impact Assessment: Noise (Health Canada 2023c)
- Guidance for Evaluating Human Health Effects in Impact Assessment: Air Quality (Health Canada 2023d)
- Guidance for Evaluation Human Health Effects in Impact Assessment: Drinking and Recreational Water Quality (Health Canada 2023e)

Additional guidance to support the HIA includes:

- Analyzing Health, Social and Economical Effects under the *Impact Assessment Act* (IAAC 2020)
- Guidance: Gender-based Analysis Plus in Impact Assessment (IAAC 2021)
- Indigenous Mental Wellness and Major Project Development: Guidance for Impact Assessment Professionals and Indigenous Communities (Salerno et al. 2021)

21.1.2 The Influence of Consultation and Engagement on the Assessment

The Canada Nickel Company (Canada Nickel) has engaged with potentially affected Indigenous nations, regulators, the public, and other stakeholders. Information presented in Table 21.2 provides a summary of the topics, key information including Indigenous knowledge, suggested mitigation measures and concerns that Canada Nickel identified as part of their engagement efforts (e.g., Public Engagement meetings) that relate to health, as well as a summary of the influence that the outcomes of this engagement had on the assessment.

Table 21.2 Summary of Key Information, Indigenous Knowledge, and Concerns for the Project Related to Health

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
Physical Health	<ul style="list-style-type: none"> • Members of the public and/or stakeholders expressed concern regarding: <ul style="list-style-type: none"> – impacts on human health from Project emissions – biophysical pathways of exposure such as air, water, food, and noise – health impacts of effluent discharge to Mattagami River upstream of water intake structures for the town of Smooth Rock Falls – potential effects on human health from accidents and malfunctions such as spills and accidental releases – impacts of health outbreaks at the Project site on limited medical capacity in the region • Apitipi Anicinapek Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, Métis Nation of Ontario, and Taykwa Tagamou Nation expressed concern regarding impacts to human health, including actual and perceived risks at key receptors due to changes to noise levels, air quality, and proximity to transmission lines. • Apitipi Anicinapek Nation expressed concern regarding impacts from accidents and malfunctions during the life of the Project that could affect the natural environment and physical health of its members. • Flying Post First Nation expressed concern regarding increased traffic resulting in increased potential for pedestrian collisions, longer emergency response times, and a 	<p>Toxicological risks associated with changes to air quality have been assessed in the HHRA.</p> <p>Changes in biophysical pathways like air, water, food and noise have been assessed in the HHRA and in Chapter 13 of the Impact Statement (Acoustic Environment).</p> <p>The effects of accidents and malfunctions on health are addressed in Chapter 31 of the Impact Statement.</p> <p>The concern about impacts of health outbreaks at the Project site on limited medical capacity in the region and addressed in this VC.</p> <p>The results of the assessment completed in this Chapter informed the assessment on Indigenous interests in Chapters 25 to 28 of the Impact Statement.</p> <p>Canada Nickel's responses to mitigation recommendations made by the Indigenous nations are provided in</p>	<p>Chapter 21 of the Impact Statement [Assessment of Potential Effects on Health].</p> <p>Chapters 25 to 28 [Assessment of Potential Effects on Indigenous Interests], and Chapter 31 of the Impact Statement [Assessment of Potential Effects of Potential Accidents or Malfunctions].</p>

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
	<p>general decline in road safety due to an increase in non-local drivers.</p> <ul style="list-style-type: none"> • Apitipi Anicinapek Nation, Flying Post First Nation and Taykwa Tagamou Nation recommend specific engagement opportunities with Canada Nickel, such as, leading studies to support the development of the Impact Statement, including Indigenous-led evaluations of effects on health and socio-economic conditions. • Taykwa Tagamou Nation recommends outlining Canada Nickel’s mitigation measures to reduce risk to human health for collisions associated with increased traffic, and to reduce impacts on local and regional services/resources. 	<p>Chapters 25 to 28 of the Impact Statement.</p>	
<p>Country Foods</p>	<ul style="list-style-type: none"> • Apitipi Anicinapek Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, Métis Nation of Ontario, and Taykwa Tagamou Nation expressed concern regarding impacts to human health, including actual and perceived risks at key receptors due to changes to recreational and drinking water quality, and accessibility and contamination of country foods. • Apitipi Anicinapek Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Métis Nation of Ontario expressed concern regarding disease and parasites in wildlife, including moose. • Flying Post First Nation, Matachewan First Nation and Mattagami First Nation expressed concern regarding: <ul style="list-style-type: none"> – pesticides and herbicide spraying in areas where wildlife is harvested as it has been associated with instances of cancer and general bioaccumulation – how the introduction and dispersal of sprays in the natural environment affects members’ confidence that wild game is safe to consume – pesticides, chemicals, gasses, and other contaminants from the mining and forestry industries leaking into streams and groundwater supplies in the area and effects on local fish species (walleye health changes; abnormal colouring and growths on fish) • Matachewan First Nation and Mattagami First Nation expressed concern regarding 	<p>An HHRA and HIA focused on biophysical and social determinants on health (this VC) have been conducted that address these concerns. In the HHRA an Indigenous receptor was used in modeling to account for Local Study Area and Regional Study Area nation-specific usage (e.g., country and medicinal foods and areas of use as identified by potentially affected Indigenous nations).</p> <p>Chemicals associated with the construction, operations, and closure of the mine have been assessed qualitatively and/or quantitatively in the HHRA.</p> <p>Toxicological risks associated with changes to air quality, recreational and quality have been assessed in the HHRA and perceived risks associated with these potential changes are addressed in this VC.</p>	<p>Chapter 21 of the Impact Statement [Assessment of Potential Effects on Health].</p> <p>Chapters 25 to 28 [Assessment of Potential Effects on Indigenous Interests].</p>

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
	<p>animal health and quality due to ingestion of airborne contaminants from mine tailings.</p> <ul style="list-style-type: none"> • Flying Post First Nation expressed concern regarding: <ul style="list-style-type: none"> – health of wildlife and fear of consuming contaminated wildlife. – pollution and contamination from the Project would limit the areas to hunt and harvest due to fear of bioaccumulation in the hunted and harvested game meat. • Matachewan First Nation expressed concern regarding impacts to food and medicine plant quality, availability and usability from mine dust and air pollution, affecting moth medicine quality and safety for community members who use those plants. • Taykwa Tagamou Nation recommends Canada Nickel provide assurances that toxic substances associated with the Project are well managed and wild foods will be safe to consume. • Matachewan First Nation, Mattagami First Nation, and Flying Post First Nation recommend support for diet and harvest studies to adequately understand community contexts and baseline health profiles. 	<p>The assessment of toxic substances and how they can potentially affect wild foods is addressed in the HHRA and in this VC.</p> <p>The assessment of toxic substances and how they can potentially affect food and medicinal plant quality, availability and usability is addressed in the HHRA and in this VC.</p> <p>The results of the assessment completed in this VC (Chapter 21 of the Impact Statement) informed the assessment on Indigenous interests in Chapters 25 to 28 of the Impact Statement.</p> <p>Canada Nickel's responses to mitigation recommendations made by the Indigenous nations are provided in Chapters 25 to 28 of the Impact Statement.</p>	
Mental Health and Social Wellbeing	<ul style="list-style-type: none"> • Apitipi Anicinapek Nation expressed concern regarding impacts from accidents and malfunctions during the life of the Project that could affect the natural environment and mental health of its members. • Taykwa Tagamou Nation expressed concern regarding: <ul style="list-style-type: none"> – increased risk to community members due to influx of workers, as increased population growth may affect services related to health, safety, mental health, addiction and well-being. – psychological health due to fear of consuming contaminated wildlife and fish. • Flying Post First Nation expressed concern regarding a lack of dedicated health care centres that results in an insufficient understanding about mental and chronic 	<p>The effects of accidents and malfunctions on health are addressed in Chapter 31 of the Impact Statement.</p> <p>These effects regarding increased risk to community members due to influx of workers, as increased population growth may affect services related to health, safety, mental health, addiction and well-being are addressed in this VC and in Chapter 22 of the Impact Statement.</p> <p>Concerns regarding psychological health are assessed in this VC.</p>	<p>Chapter 21 of the Impact Statement [Assessment of Potential Effects on Health].</p> <p>Chapters 22 [Assessment of Potential Effects on Social Conditions], 25 to 28 [Assessment of Potential Effects on Indigenous Interests], and 31 of the Impact Statement [Assessment of Potential Effects of Potential Accidents or Malfunctions].</p>

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
	<p>health issues, as well as safety and security of members.</p> <ul style="list-style-type: none"> Métis Nation of Ontario expressed concern regarding increased traffic from road, rail, and air and the effects to health and safety to citizens. 	<p>The results of the assessment completed in this VC (Chapter 21) informed the assessment on Indigenous interests in Chapters 25 to 28 of the Impact Statement.</p>	
Community Safety	<ul style="list-style-type: none"> Apitipi Anicinapek Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation and expressed concern regarding impacts on social well-being from in and out migrations, including crime rates, addiction, mental health, impacts to women, girls, and 2SLGBTQQIA+, and discrimination and violence towards Indigenous peoples. Mattagami First Nation expressed concern regarding human trafficking, especially as it is amplified by the presence of mining activities. Flying Post First Nation recommends increased public awareness of Flying Post First Nation's rights and presence at Flying Post IR 73, and in the region more broadly, to improve safe access in this area. Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation expressed concerns about traffic safety and Big Water Campground. 	<p>These concerns of in and out migrations, including crime rates, addiction, mental health, impacts to women, girls, and 2SLGBTQQIA+, and discrimination and violence towards Indigenous peoples are addressed in this VC.</p> <p>Concerns regarding human trafficking are assessed in this VC.</p> <p>The results of the assessment completed in this VC (Chapter 21 of the Impact Statement) informed the assessment on Indigenous interests in Chapters 25 to 28 of the Impact Statement.</p> <p>Canada Nickel's responses to mitigation recommendations made by the Indigenous nations are provided in Chapters 25 to 28 of the Impact Statement.</p> <p>Concerns regarding traffic safety are assessed in this VC.</p>	<p>Chapter 21 of the Impact Statement [Assessment of Potential Effects on Health].</p> <p>Chapters 25 to 28 of the Impact Statement [Assessment of Potential Effects on Indigenous Interests],</p>

Where made available by Indigenous nations through engagement, information gathering, and voluntary information sharing, Indigenous knowledge has been considered and incorporated into the Impact Statement, as applicable. Refer to Chapter 7 of the Impact Statement (Description of Engagement with Indigenous Peoples) for detailed methods regarding the incorporation of Indigenous knowledge to the Impact Statement.

21.1.3 Potential Effects, Pathways and Measurable Parameters

As noted before, changes in determinants of health can result in changes to people's behaviours, biology, and wellbeing, each of which are interconnected, and all of which can result in a change to health. To be consistent with the WHO definition of health, as well as to account for concerns raised by Indigenous nations and statements in the TIS Guidelines, three potential effects of the Project on Health will be assessed in the VC:

- change in physical health
- change in mental health and social wellbeing
- change in community safety.

There are a number of pathways that link Project activities to each of these potential effects, and each effect has its own set of measurable parameters, some of which are health factors of interest or health outcomes of interest, which will be used in the characterization of residual effects with respect to direction, magnitude, geographic extent, duration, frequency and reversibility (Section 21.1.5). These potential effects are anticipated to maintain relevant throughout all phases of the project (i.e., construction through to decommissioning and closure) and interact with specific project activities during these phases (Section 21.3). While each potential effect will be separately assessed, each is intrinsically linked and influence one another. For example, a potential change in physical health refers to changes to the human body that consist of infectious diseases, chronic diseases, toxicological effects, injuries, and suicides. These changes are directly influenced by factors such as diet/nutrition, food insecurity, physical activity and exposure to contaminants, that are influenced by the determinants of health and by other potential effects (e.g., change in mental health and social wellbeing).

Table 21.3 summarizes the potential environmental effects of the Project on Health, effect pathways, and measurable parameters. These potential effects and measurable parameters were selected based on professional judgement, understanding of the Project, recent environmental assessments for mining projects in Canada, and comments provided during engagement.

Where feasible, the assessment of the three potential effects will be quantitative based on measurable parameters and their units of measure, but not all parameters can be quantified given the following reasons:

- social indicators may be informed by subjective information, perceptions, or opinions
- health conditions and outcomes have confounding factors (e.g., genetics, other social issues), and
- data limitations (e.g., not recent data, data isn't specific to the assessment area, data may not be disaggregated for GBA Plus considerations) (further described in Section 21.2.1).

Table 21.3 Potential Effects, Effect Pathways and Measurable Parameters for Health

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in physical health	<p><u>Change in environmental quality:</u> Actual or perceived Project-related changes in environmental quality (air, water, soil, country foods, noise, light) that people may encounter that may affect physical health through biological changes (from chemical, noise and light exposure) and behavioural changes.</p>	<ul style="list-style-type: none"> • Health Risk (hazard quotients [HQs] and incremental lifetime cancer risks [ILCRs]) • Food security (harvesting practices) • Sleep disturbance (noise levels) • Light trespass (sky glow and light trespass limits)
	<p><u>Change in land use:</u> Physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect physical health through biological changes from diet and nutritional changes.</p>	<ul style="list-style-type: none"> • Food security (harvesting practices)
	<p><u>Change in population dynamics:</u> Project-related population growth and employment of temporary workers from out of region may increase competition for food harvesting, increase rates of infectious diseases, and change the cost of living. These effects may affect physical health through changes in food security and increased rates of disease.</p>	<ul style="list-style-type: none"> • Food security (country food and market food availability) • Housing (availability) • Chronic illness (rates) • High risk behaviours (rates) • Infectious disease rates (sexually transmitted [STIs])
	<p><u>Change in employment conditions:</u> Temporary and permanent employment conditions may have a positive or negative effect on physical health</p>	<ul style="list-style-type: none"> • Housing (availability) • High risk behaviours (rates of smoking, substance use) • Injuries • Chronic illness (rates)
Change in mental health and social wellbeing	<p><u>Change in environmental quality:</u> Actual or perceived Project-related changes in environmental quality (air, water, soil, country foods, noise, light) that people may encounter that may affect mental health and social wellbeing through behavioural changes, stress responses and coping mechanisms.</p>	<ul style="list-style-type: none"> • Annoyance (% Highly Annoyed [HA]) • Sleep disturbance (noise levels) • Light trespass (sky glow and trespass) • Food security (harvesting practices)
	<p><u>Change in land use:</u> Physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect mental health and social wellbeing through behavioural changes, stress responses and coping mechanisms. and coping mechanisms.</p>	<ul style="list-style-type: none"> • Food security (harvesting practices) • Sense of belonging to a community
	<p><u>Change in population dynamics:</u> Project-related population growth and employment of temporary workers from out of region may lead to increased competition for food harvesting, changes in cost of living, and changes to the family unit that may affect mental health and social wellbeing through</p>	<ul style="list-style-type: none"> • Food security (country food and market food availability) • Housing (availability) • Family and relationship dynamics

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
	behavioural changes, stress responses and coping mechanisms.	<ul style="list-style-type: none"> • Sense of belonging to a community • Substance use (rates)
	<u>Change in employment conditions:</u> Temporary and permanent employment conditions may have a positive or negative effect on mental health and social wellbeing through behavioural changes and coping mechanisms.	<ul style="list-style-type: none"> • Food security (country food and market food availability) • Housing (availability) • Family and relationship dynamics • Sense of belonging to a community • Substance use (rates)
Change in community safety	<u>Change in population dynamics:</u> Project-related population growth and employment of temporary workers from out of region could lead to changes in community safety through individual behavioural changes and coping mechanisms.	<ul style="list-style-type: none"> • Crime (rates) • Qualitative consideration of perceived safety and qualitative considerations of gender-based violence • Traffic changes
	<u>Change in employment conditions:</u> Temporary and permanent employment conditions could lead to changes in community safety through individual behavioural changes and coping mechanisms.	<ul style="list-style-type: none"> • Crime (rates) • Qualitative consideration of perceived safety and qualitative considerations of gender-based violence

21.1.4 Boundaries

21.1.4.1 Spatial Boundaries

The **Project Area (PA)** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction, operations and decommissioning and closure of the Project. The PA includes the Open Pit, Stockpiles, two ore Processing Plants, and other mine related infrastructure, as well as a new rail spur line and the relocation of Highway 655 and existing 500 kilovolt (kV) transmission line.

The **Local Study Area (LSA)** and **Regional Study Area (RSA)** are specific to biophysical determinants of health and social determinants of health. Each LSA encompasses the area in which Project-related effects (direct or indirect) were estimated or measured with a level of confidence appropriate for the assessment and in which there is a reasonable expectation that the potential effects in the LSA are of public interest.

The biophysical determinants of health LSA includes the PA and, to comply with provincial regulatory requirements and capture effects of the specific components being assessed, includes the outer spatial boundaries of the Atmospheric Environment LSA, Acoustic Environment LSA, Surface water LSA, Fish and Fish Habitat LSA and Indigenous Interests LSA. The RSA includes the area within which cumulative effects on health conditions are likely to occur, depending on the location of other past, present, or reasonably foreseeable future projects or activities and includes the outer spatial boundaries of the

mentioned VCs. The biophysical determinants of health LSA and RSA are illustrated on Figure 21.18

The social determinants of health LSA and RSA are one in the same and includes the PA and, to comply with provincial regulatory requirements and capture effects of the specific components being assessed, is based on the geographic extent of the Cochrane District, the most populous component of the Porcupine Health Unit. As well, the LSA/RSA includes the area within which cumulative effects on health conditions are likely to occur, depending on the location of other past, present, or reasonably foreseeable future projects or activities. The social determinants of health LSA and RSA are illustrated on Figure 21.19.

21.1.4.2 Temporal Boundaries

The temporal boundary of the assessment includes all Project phases from the start of construction through to the end of closure. Based on the current Project schedule, the Project phases include:

- Construction: Year -3 to Year -1
- Operations
 - Operations phase 1 (Year 1 to Year 5): 60 kilotonnes per day (kt/d) milling capacity with ore extraction
 - Operations phase 2 (Year 5 to Year 30): 120 kt/d milling capacity with ore extraction
 - Operations phase 3 (Year 30 to Year 41): 120 kt/d milling capacity with no ore extraction
- Decommissioning and closure
 - Active closure: Year 41 to Year 46
 - Passive closure: Year 46+

21.1.5 Residual Effects Characterization

In Table 21.4 are descriptions of how the residual effects on health are characterized in this assessment.

Table 21.4 Characterization of Residual Effects on Health

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	<p>Positive – a residual effect that moves measurable parameters in a direction beneficial to health relative to baseline.</p> <p>Adverse – a residual effect that moves measurable parameters in a direction detrimental to health relative to baseline.</p> <p>Neutral – no net change in measurable parameters for the health relative to baseline.</p>
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	<p>Negligible – no measurable change from existing conditions can be noted.</p>

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		<p>Low – there is an estimated change in one or more determinants of health but the effect is indistinguishable from existing conditions.</p> <p>Moderate – there is an estimated change in one or more determinants of health that may affect individual or household health but is not expected to result in changes at the community level</p> <p>High – there is an estimated change in one or more determinants of health that may result in a change in health at the community level.</p>
Geographic Extent	The geographic area in which a residual effect occurs	<p>PA – residual effects are restricted to the PA</p> <p>LSA – residual effects extend into the LSA</p> <p>RSA – residual effects extend into the RSA</p>
Timing	Not Applicable	Not Applicable
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	<p>Short-term – the residual effect is restricted to the duration of the construction phase (<3 years).</p> <p>Medium-term – the residual effect extends through the duration of the operations phase and closure (3 to 41 years).</p> <p>Long-term – the residual effect extends beyond the life of the project (>41 years).</p>
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	<p>Single event</p> <p>Multiple irregular event – occurs at no set schedule</p> <p>Multiple regular event – occurs at regular intervals</p> <p>Continuous – occurs continuously</p>
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	<p>Reversible – the residual effect is likely to be reversed after activity completion and reclamation</p> <p>Irreversible – the residual effect is unlikely to be reversed</p>

21.1.6 Significance Definition

The Impact Statement must characterize the extent of significance of any residual adverse federal effect, which includes residual adverse effects within federal jurisdiction and any adverse direct or incidental effects as defined in section 2 of the *Impact Assessment Act*. The extent to which residual adverse effects on Indigenous health are considered significant is presented below.

A residual adverse effect of high extent of significance is one that, following the application of avoidance and mitigation measures, would result in effects on Indigenous health such that changes in physical health, mental health and social wellbeing, and community safety may be meaningfully impaired compared to baseline conditions.

A residual adverse effect of moderate extent of significance is one that, following the application of avoidance and mitigation measures, would result in effects on Indigenous health such that changes in

physical health, mental health and social wellbeing, and community safety may be reduced but not eliminated compared to baseline conditions.

A residual adverse effect of negligible to low extent of significance is one that, following the application of avoidance and mitigation measures, would result in effects on Indigenous health such that changes in physical health, mental health and social wellbeing, and community safety are largely unchanged from baseline conditions.

21.2 Existing Conditions for Health

In line with the TIS Guidelines, this section provides information on the overall health of both Indigenous nations and non-Indigenous communities, including urban populations, wherever data are available. Ultimately, this section constitutes a community health profile, which includes various health factors and outcomes of interest commonly used to measure the health status of populations and outlined in the TIS Guidelines.

21.2.1 Methods

Where possible, information was collected within communities in the LSA/RSA; however, data were primarily disaggregated at the health region level. Porcupine Health Unit is a health unit in Northeast Ontario and has offices in Cochrane, Hearst, Hornepayne, Iroquois Falls, Kapuskasing, Matheson, Moosonee and Smooth Rock Falls, with a head office in Timmins (Porcupine Health Unit 2023a). Where data were not available at the local level, provincial data followed by national data were used to inform current status. Provincial or national level data are provided as a comparison group.

As noted above, there are many factors that together may affect the health of individuals and communities. This section focuses on those that are most relevant to the Project. The Health Status Report prepared by the (Porcupine Health Unit 2021) was used to identify those determinants of health, as well as health factors and outcomes of interest to the communities within the LSA/RSA. Indigenous knowledge and other information from Traditional Land Use studies and socio-economic reports submitted by participating Indigenous nations have been integrated with health and wellbeing indicators, as has primary information from engagement sessions. Other health factors and outcomes of interest were selected based on published literature related to the health effects of large resource development projects.

Key sources of data used in the community health profile were:

- Statistics Canada
- Canadian Community Health Survey
- Public Health Ontario (Snapshots Data, Infectious Disease Surveillance Data)
- Cancer Care Ontario
- Pan-Canadian Health Inequalities Data Tool

Additional source of information that were reviewed in the development of this community health profile included:

- Apitipi Anicinapek Nation Socio-Economic Study for the Crawford Nickel Project Impact Statement (draft) (Apitipi Anicinapek Nation 2024)
- Flying Post First Nation Socio-Economic Study for Canada Nickel Company's Crawford Nickel Sulfide Project (Flying Post First Nation 2023a)
- Flying Post First Nation Knowledge and Use Study for Canada Nickel Company's Crawford Nickel Sulfide Project (Flying Post First Nation 2023b)
- Matachewan First Nation Knowledge and Use Study for Canada Nickel Company's Crawford Nickel Project (Matachewan First Nation 2023a)
- Matachewan First Nation Socio-Economic Study for Canada Nickel Company's Crawford Nickel Sulfide Project (Matachewan First Nation 2023b)
- Mattagami First Nation Knowledge and Use Study for Canada Nickel Company's Crawford Nickel Project (Mattagami First Nation 2023a)
- Mattagami First Nation Socio-Economic Study for Canada Nickel Company's Crawford Nickel Project (Mattagami First Nation 2023b)
- Métis Nation of Ontario - Region 3 Impact Study: Crawford Nickel Mine Project (Métis Nation of Ontario 2024)
- Taykwa Tagamou Nation Crawford Nickel Project Traditional Knowledge and Land Use Study (Taykwa Tagamou Nation 2023a)
- Taykwa Tagamou Nation Socio-economic Study for the Crawford Nickel Project: Summary of Findings and Recommendations Report (Taykwa Tagamou Nation 2023b)
- Porcupine Health Unit
- Timmins Police Service
- The National Inquiry into Missing and Murdered Indigenous Women and Girls
- National Collaborating Centre for Indigenous Health (NCCIH)
- National Collaborating Centre for Determinants of Health
- Public Health Agency of Canada
- World Health Organization

Several data limitations have been identified including:

- Data were not disaggregated to the granular level of communities in the RSA and were typically reported at the health region level
- Data were not consistently disaggregated by segments of the population including by gender, age, Indigeneity, or socioeconomic status
- Available data were not always current

- Data only reflect reported or diagnosed cases and may not accurately reflect those who are living with an undiagnosed condition or unreported incidences (e.g., incidences of gender-based violence)
- Specific health data are not available for Indigenous nations in the RSA

A GBA Plus process has been applied throughout Section 21.2.2 and the remainder of the assessment. Where feasible and possible, indicators have been disaggregated by segments of the population (e.g., gender, Indigeneity, sexual orientation, socioeconomic status, age) to describe disproportionate health outcomes. A rationale has been provided in Table 21.5 for populations that have been included as part of the GBA Plus process throughout the VC. In instances where information was not disaggregated by specific segments of the populations (e.g., intimate partner violence statistics), literature and national level reports were used to provide additional context into social considerations (e.g., Reclaiming Power and Place: the Final Report of the Nation Inquiry into Missing Murdered Indigenous Women and Girls [MMIWG] (2019)).

Table 21.5 GBA Plus population groups for consideration

Segment of the population for consideration	Rationale for inclusion
Indigenous nations	On average, Indigenous populations experience poorer physical and mental health outcomes than non-Indigenous populations and unequal distribution of the social determinants of health, including income, education and employment opportunities, due in part to historic and ongoing structural and systemic inequities (Loppie and Wein 2022). Mining outperforms other industries in terms of Indigenous representation, with Indigenous representation in mining tripling from 2007 to 2022. However, a high share of Indigenous workers does not necessarily indicate that occupation and skills outcomes are positive for those Indigenous workers in the industry (Mining Industry Human Resources Council 2024). Indigenous persons may be disproportionately affected by resource extraction projects, including through changes to their connection to the land, cultural continuity, and food security.
Indigenous women and girls	Indigenous women experience disproportionate rates of being victims of violence, including intimate partner violence, physical and sexual assault, and homicide (Heidinger 2022). Resource extraction projects can exacerbate the serious problem of violence against Indigenous women through gender-based violence, workplace harassment, sexual abuse, and communicable diseases (National Inquiry into Missing and Murdered Indigenous Women and Girls 2019). Indigenous women and girls are also most at risk for housing insecurity (Bleakynne and Melvin 2022) (National Inquiry into Missing and Murdered Indigenous Women and Girls 2019) and therefore may be disproportionately affected by any Project-related effects to housing.
Women+	Women are underrepresented in mining sectors and occupations likely to be required for Project construction and operations. For instance, from 2007 to 2023, women’s representation in mining and quarrying averaged 13.6% and demonstrated no significant increases (Mining Industry Human Resources Council 2024). Similarly, women make up about 12% of the construction employment, but their share of on-site occupations (skilled trades such as carpenters, mechanics, heavy equipment operators) is only about 5% (BuildForce Canada 2018), Women in mining may experience lower pay compared to their male counterparts, gender-based discrimination, and sexual harassment (Kansake, Sakyi-Addo and Dumakor-Dupey 2021). As well, women are subject to

Segment of the population for consideration	Rationale for inclusion
	higher rates of gender-based violence than men, including intimate partner violence (Government of Canada 2020a).
Men+	Men experience higher rates of substance use and suicide than other subpopulations and may experience higher rates of mental health stigma that could prevent them for seeking support (McKenzie, et al. 2022). Men may be disproportionately affected by Project- related income, employment, and working conditions, which may improve or exacerbate existing health and wellness conditions in this subpopulation.
Low-income individuals and households including persons with disabilities and lone-parent families.	People with low income or living in low-income households experience worse health outcomes compared to higher income groups (Public Health Agency of Canada 2018). Persons in lone-parent households headed by women, Indigenous people, visible minorities, recent immigrants, and persons with a disability were more likely to live in low-income households (Government of Canada 2021). While some low-income households may benefit from economic opportunities associated with the Project, other low-income households may be disproportionately affected if there are Project-related increases in the cost of living.
2SLGBTQQIA+ Community	Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, and Asexual Plus (2SLGBTQQIA+) populations experience disproportionate poorer mental health outcomes than non 2SLGBTQQIA+ persons (Gilmour 2019). Relative to their cisgendered counterparts, 2SLGBTQQIA+ people are more likely to experience homelessness, earn lower incomes, experience discrimination on the job, and encounter barriers in finding and advancing in employment (Government of Canada 2024b). 2SLGBTQQIA+ people are also more likely to experience physical or sexual assault, inappropriate behaviours in public, online and at work, and violence and to engage in binge drinking and non-medicinal cannabis use (Jaffray 2020).
Children and Youth	Children and youth are considered a particularly vulnerable segment of the population because there is strong evidence that this is a critical period for development and adverse social determinants of health (such as household income, food security, housing, and family stability) during this time can have lasting effects on health and well-being into adulthood (Raphael, et al. 2020). For instance, children living in poor quality housing conditions have a greater likelihood of poor health outcomes during childhood as well as adults (Raphael, et al. 2020). Positive changes to housing may result through increases in disposable family income and access to better housing, for families who are successful in securing project related employment.
Notes: "Men+" includes men (and/or boys), as well as some non-binary persons (Statistics Canada 2022a) "Women+" includes women (and/or girls), as well as some non-binary persons (Statistics Canada 2022a)	

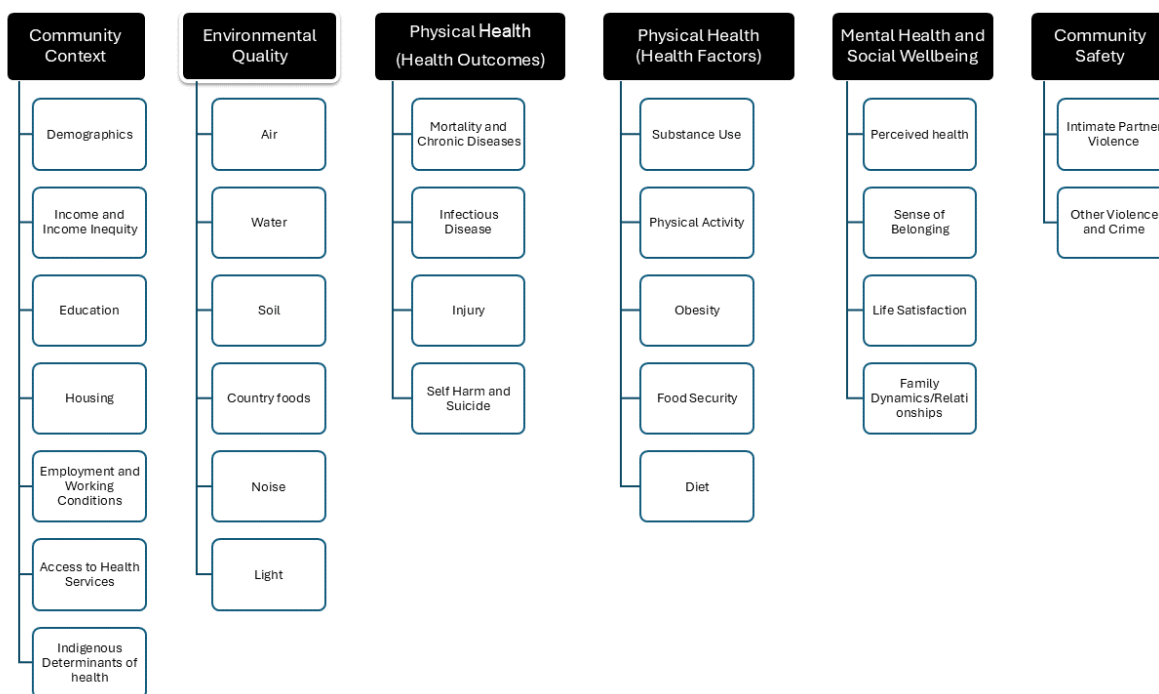
21.2.2 Overview

The Porcupine Health Unit published their Health Status Report in 2021. This report identified key health determinants, factors, and outcomes relevant to the communities within the LSA/RSA, forming the basis of the community health profile. Indigenous knowledge and other information from Traditional Land Use studies and socio-economic reports submitted by participating Indigenous nations have been integrated with health and wellbeing indicators from the Health Status Report, as has primary information from

engagement sessions. Other health factors and outcomes of interest were selected based on published literature related to the health effects of large resource development projects.

A graphical representation of the five categories addressed in this community health profile (Community Context, Environmental Quality, Physical Health, Mental Health and Social Wellbeing, and Community Safety), along with their respective biophysical and social determinants of health, health outcomes and health factors, are shown in Figure 21.2

Figure 21.2 Graphical Representation of Components of the Community Health Profile



Detailed findings of the health profile are provided in the following section (21.2.3). Demographically, the Porcupine Health Unit as compared to Ontario as a whole is sparsely populated, with a higher Indigenous population and lower immigrant population, and a higher percentage of people who have French as their mother tongue. Residents also tend to have lower levels of education. The average value of dwellings is substantially lower in the health unit than in Ontario and drug crime violations are substantial higher. The majority of residents of the Porcupine Health Unit report being very satisfied or satisfied with life in general.

With respect to health and health outcomes, all-cause mortality (in both males and females), premature and avoidable mortality rates, potential years of life lost, mortality rates for lung, breast, prostate, and colorectal cancers, mortality rates from cardiovascular disease and diabetes (but not chronic lower respiratory disease), and some infectious diseases are higher in residents of the Porcupine Health Unit than Ontario. Emergency department visits for injuries due to intentional self harm (in both males and females) are higher in residents of the Porcupine Health Unit than Ontario, but the rate in males has been decreasing. With regards to children and youth specifically, the health factors of interest were typically similar between the Porcupine Health Unit and Ontario, with the exception of food security. The percentage of children and youth aged 1-17 in the Porcupine Health Unit is significantly lower than the rest of Ontario.

21.2.3 Community Health Profile

21.2.3.1 Community Context

The community context describes the current demographics, income and income inequality, education, housing, employment and working conditions, access to health services and programs, the Indigenous determinants of health (e.g., connection to the land, self-determination and cultural continuity) and environmental quality that contribute to health outcomes.

21.2.3.1.1 Demographics

As noted in Table 21.5, certain segments of the population may experience different health outcomes than the general population. The Porcupine Health Unit selected demographic indicators that were considered relevant to the health status of residents in the region (Porcupine Health Unit 2021). These demographic indicators are presented in Table 21.6, but values have been updated based on the 2021 Census Profile (Statistics Canada 2022a). Additional demographics are assessed in Chapter 23 of the Impact Statement.

Table 21.6 Selected demographic indicators, Porcupine Health Unit and Ontario, 2021

Indicator	Porcupine Health Unit	Ontario
Size of Region (km squared)	271,922*	892,412
Population 2021	81,188	14,223,942
Population growth rate (% change from 2016 to 2021)	-3.6*	6
Population density (per square kilometre)	0.3*	16
Immigrants (%)	2.9	30
Indigenous population (%)	21.0	2.9
Visible minority (%)	3.4	34.3
English mother tongue (%)	51	65
French mother tongue (%)	38	3
Other mother tongue (%)	6	27
Speaking neither English nor French (%)	0	2
Notes: * data provided by Porcupine Health Unit, data accessed from Statistics Canada (2022a), April 6, 2023 Source: Statistics Canada 2022a		

21.2.3.1.2 Income and Income Inequality

Low income status and children in low-income status households are considered important indicators of income and income inequality as people with low income or living in low income households experience worse health outcomes compared to higher income groups (Public Health Agency of Canada 2018). The prevalence of low income in the Porcupine Health Unit and Ontario is shown in Table 21.7. Fewer residents of the Porcupine Health Unit lived in low income compared to Ontario residents. Chapter 23 of the Impact Statement assesses income and income inequality for the LSA and RSA.

Table 21.7 Prevalence Low Income, Porcupine Health Unit and Ontario, 2020

Indicator	Porcupine Health Unit			Ontario		
	Both	Men+	Women+	Both	Men+	Women+
Total population in low income (%)	3	4	3	5	6	5
Children in low income (%)	3	3	3	5	5	5
Source: Statistics Canada 2022a Notes: Low income is based on the Low-income cut-offs, after tax (LICO-AT). From Statistics Canada: “The Low-income cut-offs, after tax refers to an income threshold, defined using 1992 expenditure data, below which economic families or persons not in economic families would likely have devoted a larger share of their after-tax income than average to the necessities of food, shelter and clothing. More specifically, the thresholds represented income levels at which these families or persons were expected to spend 20 percentage points or more of their after-tax income than average on food, shelter and clothing. These thresholds have been adjusted to current dollars using the all-items Consumer Price Index”						

21.2.3.1.3 Education

Educational attainment is correlated with other determinants of health such as income and employment, which can be tied to health literacy and being able to advocate for healthcare (Raphael, et al. 2020). Education is one of the main drivers of stable employment, financial security, and social success, which are associated with higher levels of self-reported health and lower levels of morbidity and mortality (Public Health Agency of Canada 2018).

Educational attainment indicators based on the 2021 Census Profile is provided in Table 21.8. A lower proportion of Porcupine Health Unit residents completed university level programs when compared to people in Ontario as a whole. Chapter 23 of the Impact Statement assesses educational attainment in the LSA and RSA in greater detail and Chapter 22 of the Impact Statement assesses education and childcare infrastructure and services in the LSA and RSA.

Table 21.8 Educational Attainment in Porcupine Health Unit and Ontario, 2021

Educational attainment indicators (%)	Porcupine Health Unit	Ontario
Less than high school	28	17
High school	72	83
Apprenticeship/trade certificate/diploma	8.2	5
College, CEGEP, or other non-university certificate/diploma	26	20
University certificate or diploma below bachelor level	1.2	2.4
University certificate; diploma or degree at bachelor level or above	11*	30*
Notes: * data provided by Porcupine Health Unit, data accessed from Statistics Canada (2022a), April 6, 2023 Source: Statistics Canada (2022a)		

21.2.3.1.4 Housing

Relevant housing indicators for the Porcupine Health Unit and Ontario are provided in Table 21.9. About two-thirds of Porcupine Health Unit residents owned their homes, which is similar to Ontario residents. The average monthly shelter costs for Porcupine Health Unit residents were lower than those for Ontario residents. There were fewer households in the Porcupine Health Unit area that spent 30% or more of their income on shelter costs compared to the rest of Ontario; however, more Porcupine Health Unit residents lived in dwellings that need major repairs than other Ontario residents. At present Timmins has approximately 359 individuals at risk of or experiencing homelessness and vacancy rates of less than 1.5% as of April 2024 (City of Timmins 2024).

Table 21.9 Selected housing indicators of Porcupine Health Unit and Ontario, 2021

Housing indicators	Porcupine Health Unit	Ontario
Home ownership rate (%)	67	68
Average monthly shelter costs for owned dwellings (\$)	1,112	1,700
Average monthly shelter costs for rented dwellings (\$)	869	1,408
Households spending 30% or more of income on shelter costs (%)	14	24
Occupied private dwellings with major repairs needed (%)	10	6
Average value of dwellings (\$)	222,800	807,000
Source: Statistics Canada(2022a)		

21.2.3.1.5 Employment and Working Conditions

Employment and working conditions are connected to other indicators such as income and education. People who are already most vulnerable to poor health outcomes due to their lower income and education are also the ones most likely to experience working conditions that also lead to poor health, such as low wages, job insecurity, exposure to hazards, and lack of autonomy (Raphael, et al. 2020). Employment provides income, a sense of identity, and helps to structure day-to-day life while unemployment may lead to financial deprivation, psychological stress, unhealthy coping mechanisms (e.g., substance abuse), mental health issues such as depression, anxiety and increased suicide rates (Raphael, et al. 2020).

In 2021, the unemployment rate in the Porcupine Health Unit was less than the provincial unemployment rate (9% compared to 12% respectively) and mining, quarrying and oil and gas extraction industry accounted for a greater proportion of the labour force (11%) than the provincial rate (1%) (Statistics Canada 2022a). Further assessment employment and working conditions is provided in Chapter 23 of the Impact Statement.

21.2.3.1.6 Access to health services and programs

In 2019/2020, 91.7% of residents in the Porcupine Health Unit had a regular healthcare provider, which is similar to the provincial rate of 90.6% (Statistics Canada 2022b). The nearest large communities to the Project are Timmins, Smooth Rock Falls, Cochrane and Iroquois Falls, each of which has a general hospital with in and/or outpatient services. Additional assessment of health facilities, mental health and addictions services and infrastructure, and Indigenous health infrastructure and services is provided in Chapter 22 of the Impact Statement.

21.2.3.1.7 Indigenous Determinants of Health

As part of a greater initiative aimed at collecting data about racism, discrimination, and welcoming communities in Northern Ontario, the Northern Policy Institute published a report about racism and discrimination divides specifically in Timmins (Rizzuto 2023). From February 1-22, 2022, data were collected from 250 people collected via the telephone survey. Overall respondents noted that Timmins was welcoming but the experiences of Indigenous peoples tended to be relatively negative compared to the experiences of visible minorities (defined by Rizzuto as Black, Chinese, and South Asian), and “a higher percentage of respondents believed Indigenous peoples were treated less fairly than visible minorities at work, school, and public places”. Indeed, when asked specifically if “Discrimination against Indigenous people is no longer a problem”, 87% of Indigenous respondents (15 of the 250), 16% of minority respondents (12 of 250) and 65% of white respondents (200 of 25) reported that they strongly or somewhat disagreed.

Indigenous nations emphasize the intimate interconnection between community wellbeing and the health of lands and waters. More specifically, Matachewan First Nation asserted that hunting and trapping are key cultural practices that promote health through providing nutrition, food security, knowledge transmission (Matachewan First Nation 2023a). Taykwa Tagamou Nation stated that the land is central to the nation’s identity, culture, well-being, and sustenance; a strong relationship with the land is linked to stronger family relationships (Taykwa Tagamou Nation 2023a). Apitipi Anicinapek Nation noted many participants attributed their overall health and wellbeing to their ability to continue hunting, fishing, and gathering, and that health is deeply connected to traditional practices, the land, and community (Apitipi Anicinapek Nation 2024). Mattagami First Nation described a similar identity whereby the nation shares a reciprocal relationship with the land, “you treat it good, it treats you good as well” (Mattagami First Nation 2023a). Additionally, Flying Post First Nation emphasized how loss of access to lands leads to cultural disconnection (Flying Post First Nation 2023a). Environmental dispossession is evident among Mattagami First Nation members who reported not feeling safe when harvesting traditional foods near project sites (Mattagami First Nation 2023b). Apitipi Anicinapek Nation further noted that the community fears that maintaining a connection to their land and traditions will become increasingly difficult due to environmental degradation and industrial expansion, exacerbating both physical and mental health challenges (Apitipi Anicinapek Nation 2024).

The Métis Nation of Ontario - Region 3 identified the Mattagami River, Abitibi River, Frederick House River, and Jocko Creek watershed as culturally important places (IAAC 2023, Métis Nation of Ontario 2024). As well, the following water, fishing, fish and fish habitat areas that intersect with the PA have been identified as areas of importance:

- North Driftwood River (fish habitat; spawning)
- West Buskegau River (fish habitat; spawning)
- Jocko Creek Watershed (important watershed)

Apitipi Anicinapek Nation, Mattagami First Nation and Matachewan First Nation suggests that disconnection from the land is a barrier to wellbeing. Apitipi Anicinapek Nation noted that health and wellness are deeply connected to traditional practices, the land, and community, and that the loss of access to clean traditional lands and food sources due to environmental degradation and industrial expansion negatively affects physical and mental wellbeing (Apitipi Anicinapek Nation 2024). Mattagami First Nation survey respondents emphasized that connection to the land is experienced via harvesting foods (Mattagami First Nation 2023a). 31% of Mattagami First Nation respondents noted that connections to the land was a challenge for Mattagami First Nation members (Mattagami First Nation 2023a). Among Matachewan First Nation survey respondents, 29% reported a very good or excellent connection to the land, 23% reported good, and 23% reported fair or poor (Matachewan First Nation 2023b). For members living away from the community, a spiritual connection to the land persists, though people feel disconnected from traditional lands (Matachewan First Nation 2023b).

In addition, self-determination is a core social determinant of health because it influences all of the other social determinants of health, and there are links between self-determination and positive health outcomes (Loppie and Wein 2022). Adverse health outcomes such as poorer mental health conditions are also related to the lack of self-determination (Reading and Wein 2009).

As well, culture is a core social determinant of health because it informs other social determinants of health and health behaviours. Cultural continuity positively influences pillars of good mental health such as personal identity, self-esteem, and healthy coping mechanisms (Loppie and Wein 2022). Indicators of cultural continuity may include knowledge of traditional language, accessing traditional medicines, foods, and ceremonies (Salerno et al. 2021). Cultural continuity however means different things to different people and communities. For example, cultural continuity was defined by Reading and Wien (2009) “as the degree of social and cultural cohesion within a community”, which is different from the Matachewan First Nation where cultural continuity is defined as “Protecting our Treaty rights. Protecting water. Projecting the elderly and children. Being able to continue this lifestyle for years and years and millennias” (Matachewan First Nation 2023a). Regardless of the definition, cultural continuity consists of numerous aspects, some of which are described below.

Language

Language is an important determinant of health because it acts as a vehicle for traditional knowledge and Indigenous ways of knowing. Language serves as a basis for how knowledge is produced and how culture is practiced. The findings of consultation and engagement suggest that language loss was a cultural crisis among some Mattagami First Nation members (Mattagami First Nation 2023b). Within the Wabun Tribal Council (including Matachewan First Nation, Mattagami First Nation, and Flying Post First Nation), Ojibwe, Cree and Oji-Cree are traditionally spoken. When asked about language use, 93% of Mattagami First Nation respondents reported speaking English, 28% French, and 5% Ojibwe (Mattagami First Nation 2023b). Similarly, among Flying Post First Nation, 94% of respondents reported speaking English, 11% French, and 6% Ojibwe (Flying Post First Nation 2023a).

Specific Cultural Sites

Within 25 km of the Project Area, there are numerous sites of cultural importance identified by Apitipi Anicinapek Nation (Chapter 25 of the Impact Statement), TaykwaTagamou Nation (Chapter 26 of the Impact Statement) and Matachewan First Nation, Flying Post First Nation and Mattagami First Nation (Chapter 27 of the Impact Statement), and the Métis Nation of Ontario - Region 3 (Chapter 28 of the Impact Statement). Cultural continuity sites include areas used for hunting and trapping, water use and fishing, or harvesting food plants and medicines; other culturally significant uses may include burial, ceremonial, or permanent habitation sites as well as places visited for transmission of traditional knowledge. The integrity of cultural sites is important for maintaining a connection to the land, self-determination, and cultural continuity; the integrity of cultural sites promotes community wellbeing through a range of pathways of effect.

Connection to Culture

With respect to connection to culture, quantitative data about perceived connection to culture is available for Flying Post First Nation, Mattagami First Nation, and Matachewan First Nation (see Table 21.10). About one third of members of Flying Post First Nation, Matachewan First Nation and Mattagami First Nation perceived their connection to culture as good or better. Flying Post First Nation and Mattagami First Nation both identified traditional harvesting and ceremonies as cultural activities with the highest participation; other activities including traditional drumming, storytelling, singing, making regalia, dancing, toolmaking, and carving (Flying Post First Nation 2023a; Mattagami First Nation 2023a; Mattagami First Nation 2023b).

Table 21.10 Indigenous Nations' Connection to Culture, Percentage of Respondents

Indigenous Nation	Very good and excellent	Good	Poor and fair
Flying Post First Nation	15	20	40
Mattagami First Nation	21	12	23
Matachewan First Nation	16	21	39
Note: As a result of missing data percentages do not add to 100 Source: Flying Post First Nation 2023a, Mattagami First Nation 2023a, Mattagami First Nation 2023b			

Qualitatively, Apitipi Anicinapek Nation noted that a connection to culture through connections to the land. Apitipi Anicinapek Nation noted that maintaining a connection to the land is crucial for many in the community, where some community members find solace in the remaining undisturbed areas, such as Lake Abitibi and Low Bush, which continue to provide peace and a connection to their cultural heritage (Apitipi Anicinapek Nation 2024).

Matachewan First Nation identified that some of their members did not have opportunity in early life to access culture and only now are finding ways about what cultural connectedness means (Matachewan First Nation 2023b). Taykwa Tagamou Nation shared that language and cultural practices are important for strengthening traditional ways of life (Taykwa Tagamou Nation 2023b). For Flying Post First Nation, cultural continuity is characterized by land-based learning (Flying Post First Nation 2023b). Connection to

culture can be nurtured in culturally appropriate health care. Matachewan First Nation identified that the lack of cultural competency programs for miners and health care workers that come outside of the community impacts Matachewan First Nation wellbeing and safety (Matachewan First Nation 2023b). Taykwa Tagamou Nation expressed concern that there is a gap in culturally appropriate traditional healing centres (Taykwa Tagamou Nation 2023b).

21.2.3.2 Environmental Quality

Evaluations of existing conditions with respect to atmospheric and acoustic conditions (i.e., air, light, and noise), abiotic media (soil, sediment, and surface water), and country foods (fish, wild meat, and terrestrial and aquatic plants) are relevant to health. Detailed information about these evaluations is found in Chapter 12 (Atmospheric Environment), Chapter 13 (Acoustic Environment), Chapter 15 (Surface water), Chapter 17 (Fish and Fish Habitat) of the Impact Statement, and in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). A summary of these evaluations is provided below.

- Baseline air quality monitoring data were collected from November 2021 through December 2023. Concentrations of nitrogen dioxide, sulphur dioxide, volatile organic compounds, and metals in baseline air were typically very low. Concentrations of coarse particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}) were greater than the applicable 24-hour Ontario Ambient Air Quality Criteria on a limited number of occasions during the monitoring period (three times for PM₁₀ and eight times for PM_{2.5}). It was noted that the results for particulate matter may have been influenced by wildfire smoke.
- Baseline light monitoring field programs were conducted in 2022 and 2023. It was concluded based on these programs that ambient light levels were low. The existing lighting environment was described as “dark”, with a “low district brightness”.
- Baseline noise data were collected in 2023 to characterize the baseline acoustic environment. These data were collected at two separate times to evaluate conditions both when foliage is present (‘Leaves-On Season’) and when foliage is absent (‘Leaves-Off Season’) given that noise levels in remote forested areas are strongly influenced by the presence of foliage (higher when leaves are present due to wind induced noise from deciduous trees). Existing noise levels in the Project area were found to be dominated by nature-based ambient sources (e.g., wind induced noise due to vegetation, wildlife, and insects) with a low level of contribution from anthropogenic sources (e.g. traffic and local industry).
- Soil, Sediment, and Surface Water: Baseline soil, sediment, and surface water quality samples were collected between 2021 and 2023. Concentrations of metals measured in these media were compared to environmental guidelines protective of human health (where available) in the Human Health and Ecological Risk Assessment Technical Data Report.
- Between 2021 and 2023, baseline country food information was collected through sampling of various media identified in consultation with local First Nations. These samples included fish (northern pike, walleye, and perch), wild meat (spruce grouse and ruffed grouse), terrestrial vegetation (raspberry, squash berry, pin cherry, rosehip berry, blueberry, choke cherry, wild

cranberry, and other plants), and aquatic vegetation (cattail). The concentrations of metals measured in these samples were used to evaluate human health risks in the Human Health and Ecological Risk Assessment Technical Data Report.

In terms of fish specifically, northern pike, walleye and perch were targeted as species representative of what people in the LSA/RSA would consume (i.e., angling fish). Sixteen northern pike were collected from the North Driftwood watershed, and 1 walleye and 2 perch were collected from the West Buskegau River Watershed. Of these 19 samples, the mercury concentration in almost 60% (11 out of 19) were greater than the Health Canada commercial limit of 0.5 mg/kg (wet weight) total mercury.

The presence of methyl mercury in fish tissues is a regional concern. Throughout the province, and within waterbodies found in the LSA/RSA, the Ontario Ministry of the Environment, Conservation and Parks (MECP) has fish consumption advisories related to mercury (as methyl mercury) in fish (MECP 2021). For example, the MECP has fish consumption advisories mercury for Big Water Lake and Mattagami River downstream of Sturgeon Falls, which are within the LSA/RSA. Big Water Lake has consumption advisories for: northern pike, walleye and white sucker and the Mattagami River downstream of Sturgeon Falls has consumption advisories for northern pike, redhorse sucker and walleye. These consumption advisories provide the maximum number of meals per month people can safely eat and are based on size of fish and chemical found in the fish (in this case methyl mercury) and have been set for the general population and members of the sensitive population (i.e., women of child-bearing age and children under 15). For example, members of the general public can safely consume 16 meals (one meal is equivalent to 227 g or 8 oz [MECP, 2023]) per month of northern pike that contain methyl mercury that range in size from 30 to 35 cm caught in Big Water Lake, while members of the sensitive population can safely consume 12 meals per month of northern pike that range in size from 30 to 35 cm. The advisories are meant to protect members of the general population as well as members of sensitive populations from the toxicological effects of methyl mercury.

21.2.3.3 Physical Health

As previously noted, physical health refers to the state of the human body and how well it functions. A useful indicator of physical health is self assessed health, which is described as perceived physical health. Perceived physical health in the Porcupine Health Unit is lower when compared to Ontario (see Table 21.11). The indicator of perceived physical health is fair or poor is statistically significantly higher in the Porcupine Health Unit, indicating that overall physical health in the area is worse than Ontario as a whole (Public Health Ontario n.d.).

Table 21.11 Physical Health for Porcupine Health Unit and Ontario, 2019-2020

Indicator	Porcupine Health Unit	Ontario
Perceived health, very good or excellent (%)	57.2	62.2
Perceived health, fair or poor (%)	17.6	10.8
Source: Public Health Ontario (n.d., Overall Health Snapshot, extracted May 2024)		

In this section, existing conditions for physical health are described in terms of key health outcomes of interest and health factors of interest. However, as noted previously, there physical health can also be influenced by mental health and social wellbeing and community safety.

21.2.3.3.1 Health Outcomes of Interest

Health outcomes of interest refer to the health outcomes and indicators that have been identified as most relevant to the Project through potential effects and pathways identified in Table 21.3. Health outcomes and conditions include rates of mortality and chronic diseases, infectious diseases such as infections STIs, injury rates, and intentional self-harm and suicide.

Mortality and Chronic Diseases

Age-standardized mortality rates are measures of death that are used to help understand the health status of a population and allow comparisons between communities and within communities over time. Age-standardized mortality rates show the number of deaths per 100,000 people that would have occurred in a given area if the age structure of the population of that area was the same as the age structure of a specified standard population. Age-standardization removes the effect of differences in the age structure of populations among areas and over time (Statistics Canada 2023a).

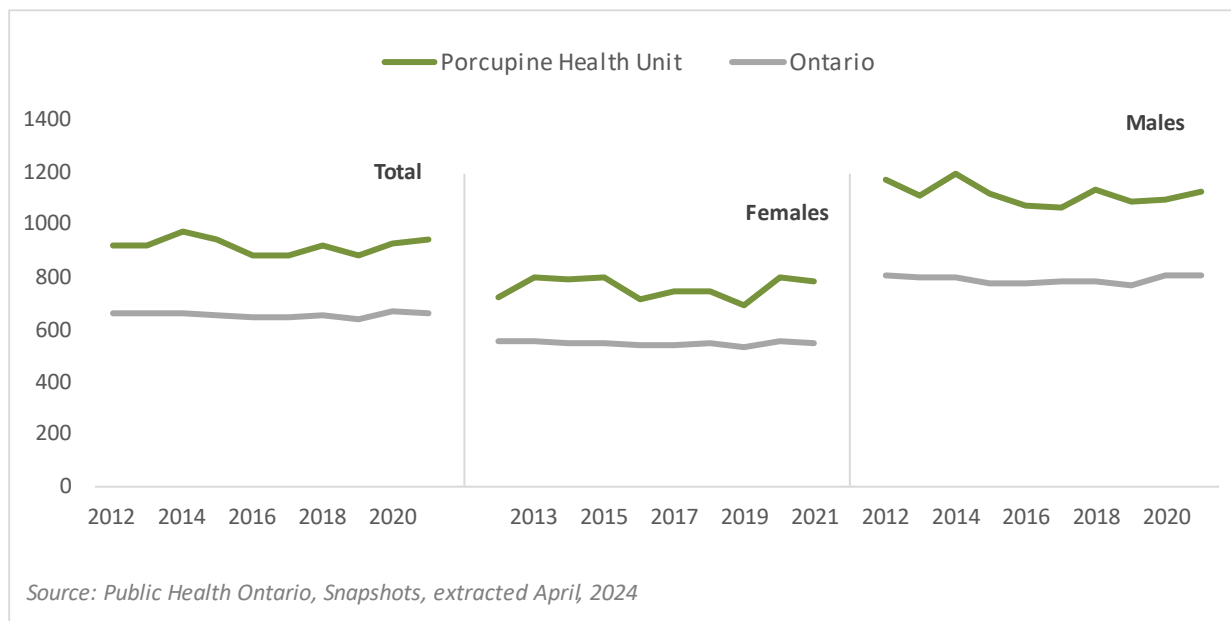
From 2012 to 2021, all-cause mortality rates among residents of the Porcupine Health Unit were consistently statistically higher than amongst their counterparts in Ontario (Public Health Ontario n.d., All-Cause Mortality Snapshot). This trend is illustrated in Figure 21.3. Although mortality rates for Indigenous Peoples in the Porcupine Health Unit have not been disaggregated, Park (2021) notes that the disparity in mortality between the Indigenous and non-Indigenous population has been well documented and determined that mortality rates for Indigenous Peoples in Ontario (2006 to 2016) are higher than non-Indigenous Peoples in Ontario.

Chronic illnesses typically last a long time and develop gradually, affecting the quality of life. Cancer Care Ontario and the Ontario Agency for Health Protection and Promotion (Public Health Ontario) (2019) found that four major chronic diseases - cancers, cardiovascular diseases, chronic lower respiratory diseases and diabetes - cause about two-thirds of all deaths in Ontario and contribute to premature mortality. They identified the following modifiable risk factors for chronic disease in Ontario:

- Tobacco smoking – which includes daily or occasional smokers
- Excess alcohol consumption – defined as exceeding Canada’s Low-Risk Alcohol Drinking Guidelines, which recommend no more than 2 drinks a day or 10 drinks a week for women and no more than 3 drinks a day or 15 drinks a week for men, and at least 2 non-drinking days per week
- Physical inactivity – defined not meeting the Canadian Physical Activity Guidelines, which recommend that adults ages 18 and older should accumulate at least 150 minutes of moderate-to vigorous-intensity aerobic physical activity per week in bouts of 10 minutes or more.
- Unhealthy diet – defined as consuming fruits and vegetables fewer than five times a day
- Multiple risk factors – defined as having two or more risk factors for chronic disease, which can create a synergistic effect

Further, the same study found that people with the lowest socioeconomic status (e.g., low income) had disproportionately higher rates of hospitalization and deaths due to a chronic disease. Additional discussion of these risk factors is provided in Section 21.2.3.3.2. Additional information on premature mortality, and mortality rates for these major chronic diseases and injuries, are provided below.

Figure 21.3 All-cause Mortality Rates, Porcupine Health Region and Ontario, 2012 to 2021 (age-standardized rates per 100,000 population)

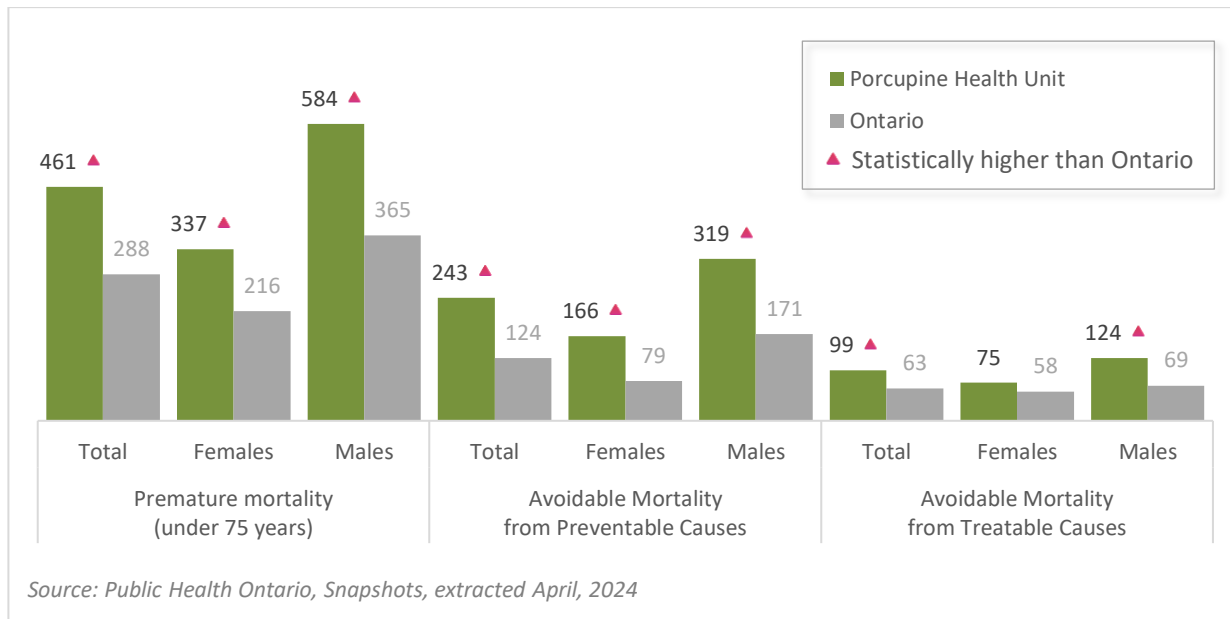


Premature Mortality and Potential Years of Life Lost

Premature mortality and potential years of life lost help accurately assess the impact of diseases, injuries and risk factors on premature mortality (Martinez, et al. 2019). Premature mortality refers to the deaths of those individuals who are younger than age 75 while the potential years of life lost is the number of years of potential life not lived when a person dies prematurely.

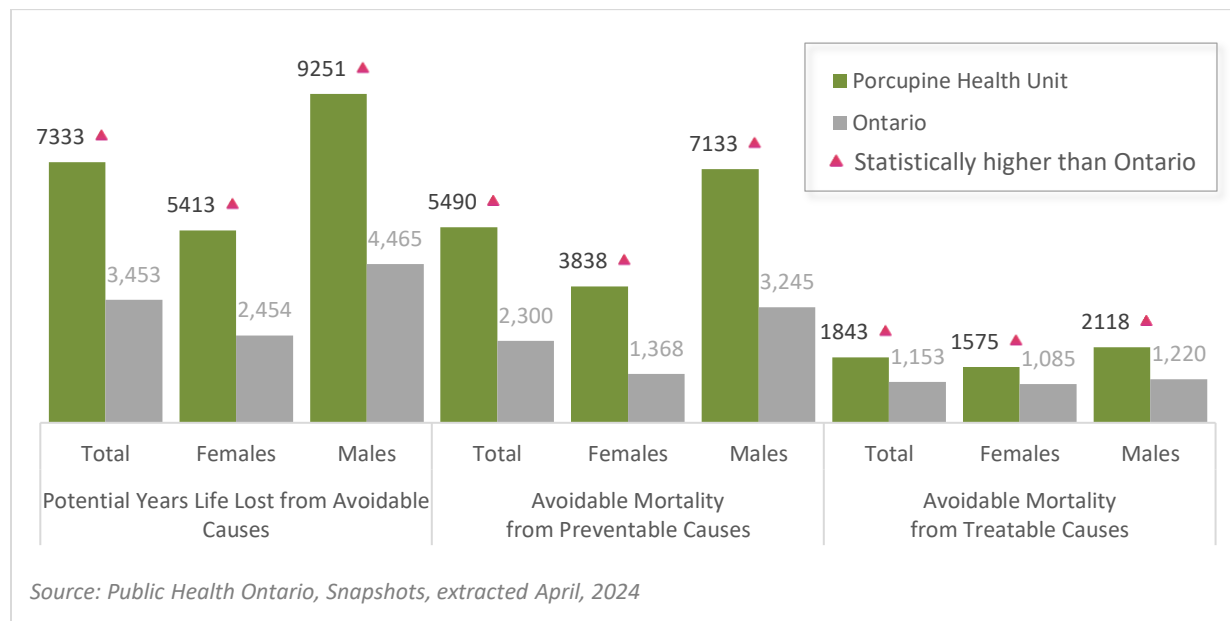
As illustrated in Figure 21.4, the rate of premature mortality among residents of the Porcupine Health Unit, both males and females, was significantly higher than for their counterparts in Ontario in 2021. Premature mortality encompasses all causes of death. Avoidable mortality is a subset of premature mortality and refers to deaths considered preventable given changes in lifestyle or behaviours (preventable mortality), or treatable given access to proper health care (treatable mortality). Avoidable mortality rates for female and male residents of the Porcupine Health Unit are significantly higher than for their counterparts in the Ontario, for both preventable (female and male residents) and treatable (male residents) causes. For both the Porcupine Health Unit and Ontario overall, the premature and avoidable mortality rates for male residents are substantially higher than the rate for female residents. These findings are consistent with the data from 2015 (Porcupine Health Unit 2021).

Figure 21.4 Premature and Avoidable Mortality Rates, Porcupine Health Region and Ontario 2021 (age-standardized rates per 100,000 population)



Similarly, the potential years of life lost for residents of the Porcupine Health Unit (both females and males) are significantly higher than their counterparts in Ontario (Figure 21.5). For both the Porcupine Health Unit and Ontario overall, the potential years of life lost due to premature and avoidable causes for males are substantially higher than for females.

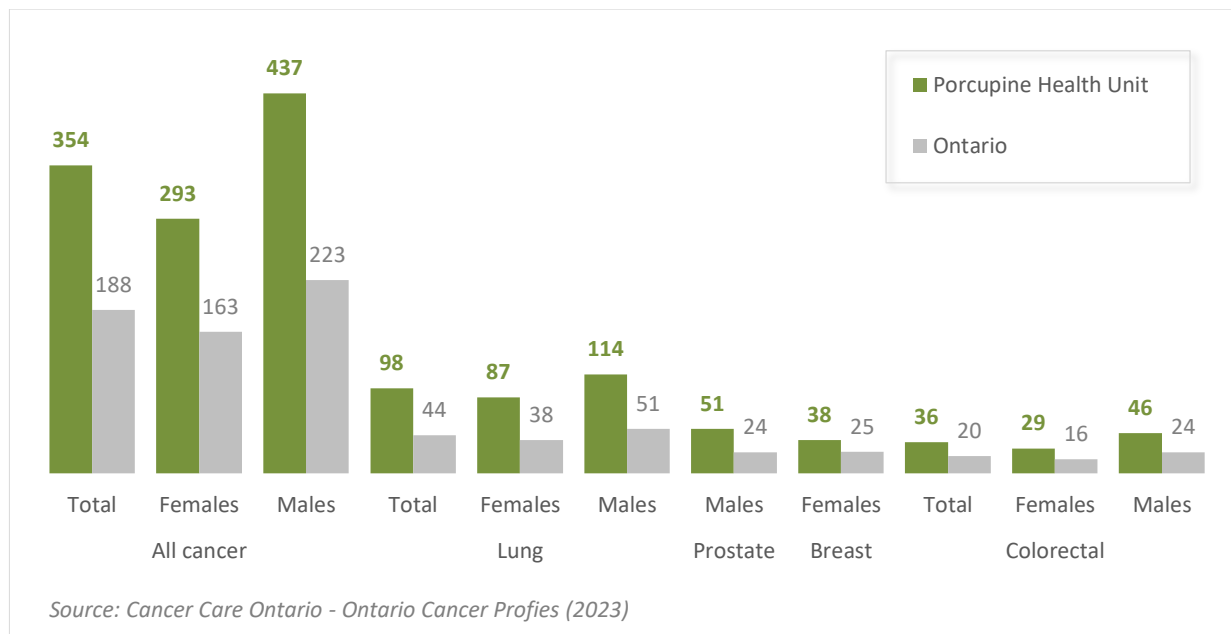
Figure 21.5 Potential Years of Life Lost, Porcupine Health Region and Ontario, 2021 (age standardized rates per 100,000 population)



Mortality Due to Cancer

Approximately 1 in 4 people in Ontario is expected to die of cancer (Cancer Care Ontario [CCO] 2022) with most deaths caused by lung, breast (females), colorectal, and prostate cancers (CCO and Ontario Agency for Health Protection and Promotion (Public Health Ontario 2019). As indicated in Figure 21.6, the mortality rate from all cancers is higher for residents of the Porcupine Health Unit than residents of Ontario overall, and mortality rates from cancers is higher for male residents than for female residents. Mortality rates for lung, breast, prostate, and colorectal cancers are also shown in Figure 21.7; mortality rates for each of these cancers is higher for residents of the Porcupine Health Unit than in Ontario overall.

Figure 21.6 Cancer Mortality for Porcupine Health Unit and Ontario, 2016-2018 (age-standardized rates per 100,000 population)



A study by the Chiefs of Ontario, Cancer Care Ontario and Institute for Clinical Evaluative Services (2017) determined that cancer mortality in First Nations people (both females and males) in Ontario from 1991 to 2010 were significantly higher than cancer mortality for other people in Ontario during this period, and that incidence rates are increasing more rapidly in First Nations populations. The study also found that lung cancer was the leading cause of cancer deaths in First Nations females and males, with significantly higher rates than other residents of Ontario during this period.

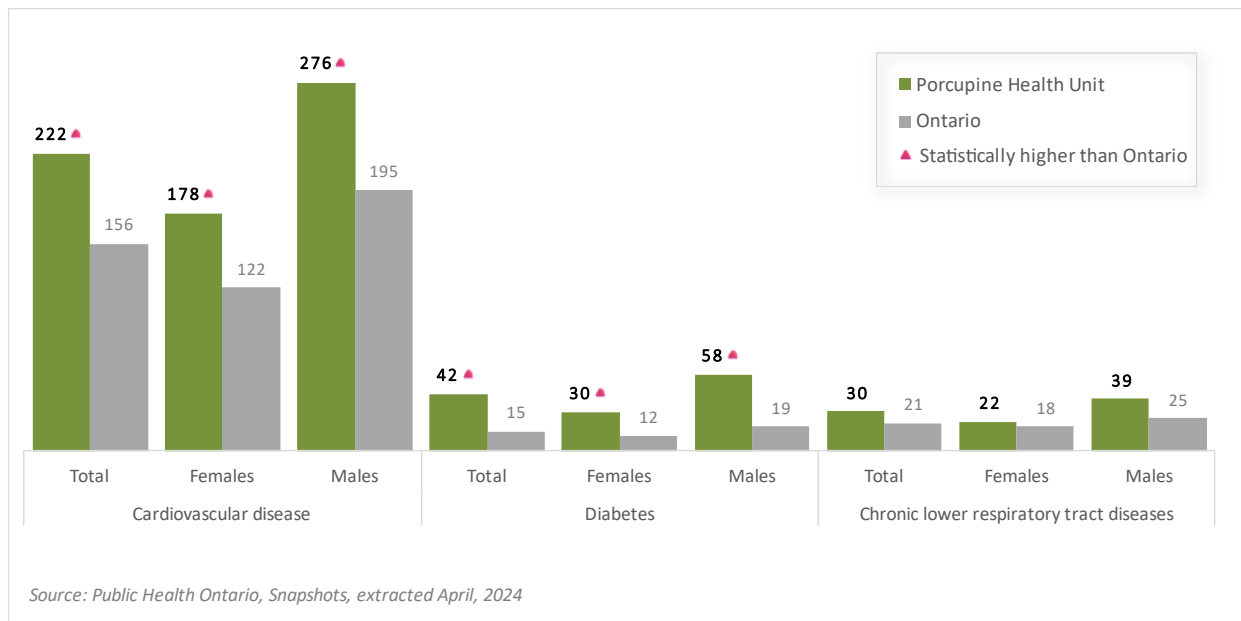
Mortality Due to Other Chronic Diseases

Besides cancers, other substantial contributors to chronic disease deaths in Ontario are:

- Cardiovascular disease (including ischemic heart disease, heart failure, and stroke)
- Diabetes
- Chronic lower respiratory diseases (including asthma and chronic obstructive pulmonary disease)

The mortality rates for these chronic diseases are illustrated in Figure 21.7. While the mortality rates for chronic lower respiratory disease for the residents of the Porcupine Health Unit were similar to those for Ontario overall, mortality rates from cardiovascular disease and diabetes were significantly higher for both female and male residents of the Porcupine Health Unit relative to rates for residents of Ontario (Public Health Ontario n.d., Chronic Disease Mortality Snapshot).

Figure 21.7 Chronic Disease Mortality Rates for Porcupine Health Unit and Ontario, 2021 (age-standardized rates per 100,000 population)



CCO and Public Health Ontario (2019) found that a higher percentage of First Nations living off-reserve and Métis populations reported having cardiovascular diseases, diabetes, and lower chronic respiratory tract diseases than non-Indigenous people in Ontario. They also reported that chronic disease mortality rates in Indigenous populations are much higher than the rates in the non-Indigenous population in Ontario, with mortality rates for diabetes as much as five times higher in First Nations women than in non-Indigenous women and three-and-half times higher in First Nations men than in non-Indigenous men.

Infectious Diseases

Infectious diseases are disorders caused by pathogenic microorganisms, such as bacteria, viruses, parasites, or fungi that can be spread from the environment or from person to person resulting in illness (Public Health Ontario 2019). Public Health Ontario (2019) provides information on:

- blood borne infections - viruses that are carried in the blood (specifically hepatitis B, hepatitis C, and human immunodeficiency virus (HIV))
- enteric and food borne diseases - intestinal illnesses caused by micro-organisms such as viruses, bacteria, and parasites (e.g., hepatitis A, salmonellosis, giardiasis)
- respiratory diseases - infections of the respiratory systems (e.g., Coronavirus disease 2019 (COVID-19), influenza, tuberculosis)
- STIs – infections caused by micro-organisms such as viruses or bacteria that are transmitted through sexual contact
- vaccine preventable diseases and

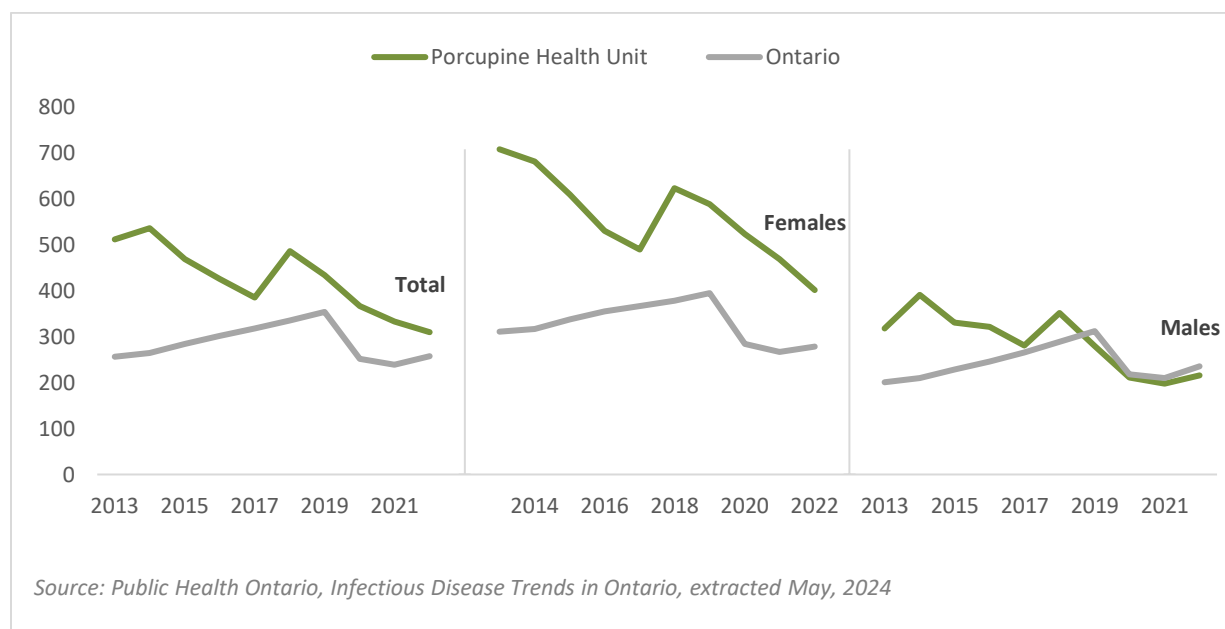
- vector-borne and zoonotic diseases – vector-borne and zoonotic diseases that are transmitted to human from animals or insects.

The Porcupine Health Unit (2021) found that, compared to Ontario, residents of the Porcupine Health Unit had a lower rate of enteric diseases and a decreasing rate of influenza. The top three diseases identified the Porcupine Health Unit were chlamydia, hepatitis C, and gonorrhoea, which accounted for 99.4% of all cases locally. Additional discussion of these sexually transmitted infections and blood-borne diseases is provided below.

Sexually Transmitted Infections and Blood-Borne Diseases

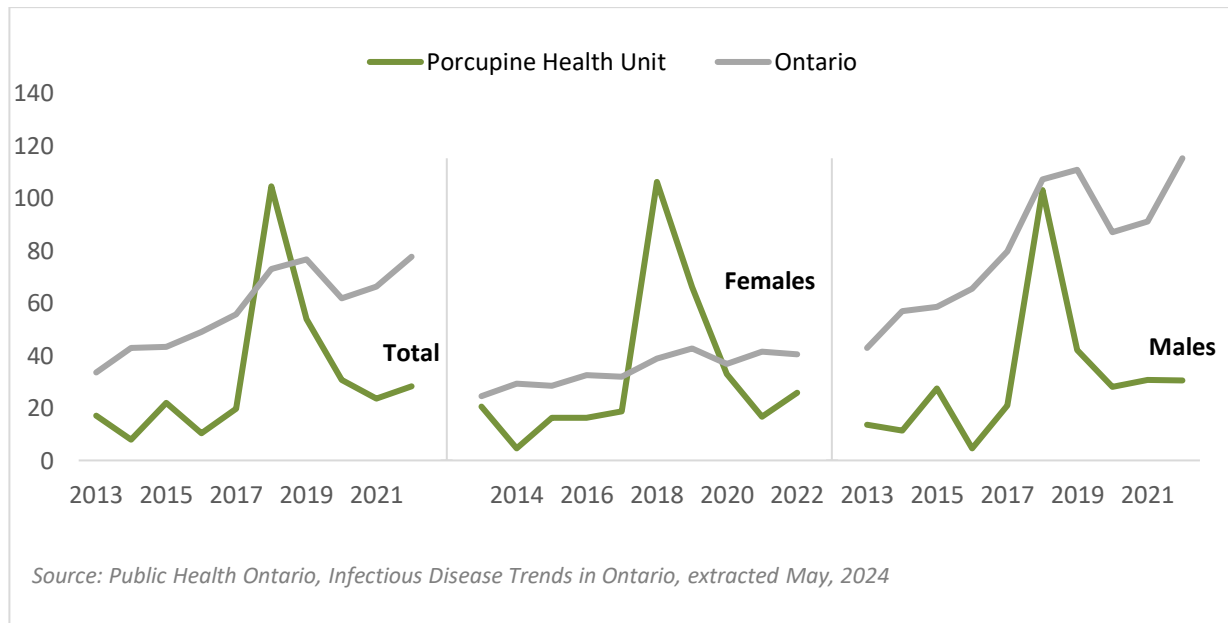
According to Ontario Public Health (2024b), chlamydia is the most commonly reported STI. As indicated in Figure 21.8, the chlamydia incidence rates for female residents of the Porcupine Health Unit from 2013 to 2022 have generally been decreasing; however, the rates have been consistently higher than those for Ontario during this period (Public Health Ontario 2024b). Chlamydia rates for male residents of Porcupine Health Unit have been lower than those for female residents of the Porcupine Health Unit, and from 2019 to 2022, the rates for male residents of the Porcupine Health Unit are similar to those for the rest of Ontario.

Figure 21.8 Chlamydia Incidence Rates for Porcupine Health Unit and Ontario, 2013 to 2022 (rates per 100,000 population)



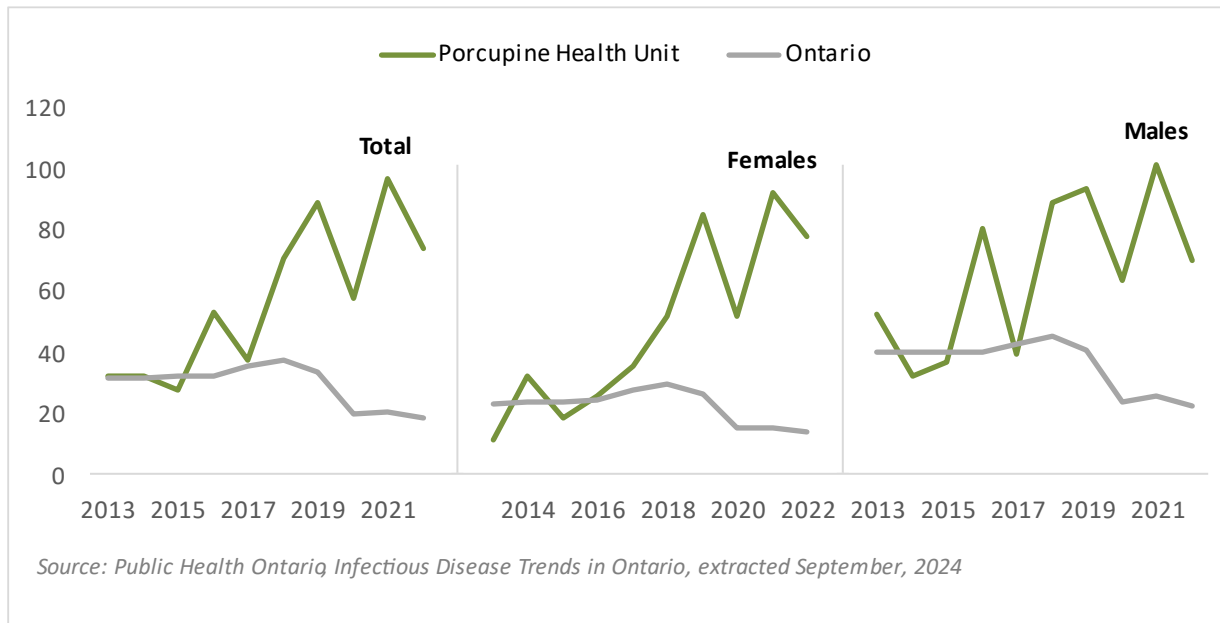
Gonorrhoea is another commonly reported STI. As shown in Figure 21.9, the rates of gonorrhoea for both male and female residents of the Porcupine Health Unit spiked in 2018 but were less than the rates for Ontario for all other years between 2013 and 2022. Incidences of gonorrhoea were higher for males than females in Ontario, but rates for female and male residents of the Porcupine Health Unit were similar.

Figure 21.9 Gonorrhoea Incidence Rates for Porcupine Health Unit and Ontario, 2013 to 2022 (rates per 100,000 population)



As indicated in Figure 21.10, the hepatitis C incidence rates for both female and male residents of the Porcupine Health Unit from 2013 to 2022 have been increasing while rates for Ontario have been stable to decreasing. As a result, the rates for Porcupine Health Unit have been consistently higher than those for Ontario since 2017 (Public Health Ontario 2024b).

Figure 21.10 Hepatitis C Incidence Rates for Porcupine Health Unit and Ontario, 2013 to 2022 (rates per 100,000 population)



The rates for syphilis and HIV are lower in the Porcupine Health Unit than in Ontario, although rates are higher in male residents than female residents (Figure 21.11 and Figure 21.12). Public Health Ontario (2024b) cautions that, due to the impact of the COVID-19 pandemic on the public health and health care sectors, there may be limitations with the 2019 to 2022 data provided and trends should be interpreted with caution.

Figure 21.11 Syphilis Incidence Rates for Porcupine Health Unit and Ontario, 2013 to 2022 (rates per 100,000 population)

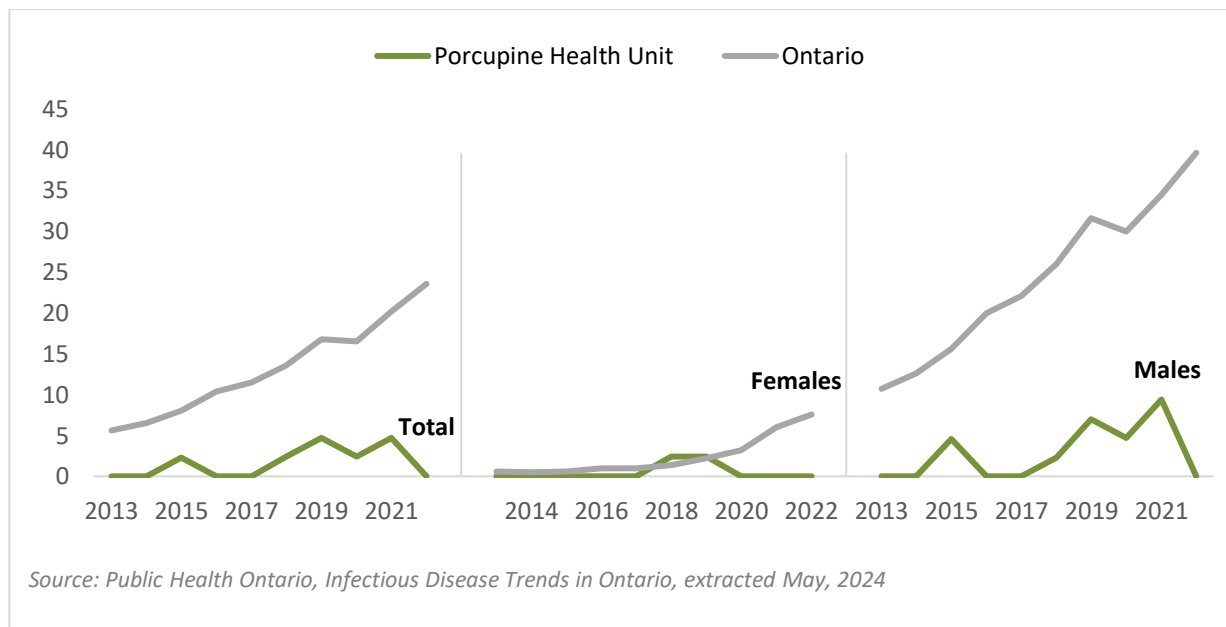
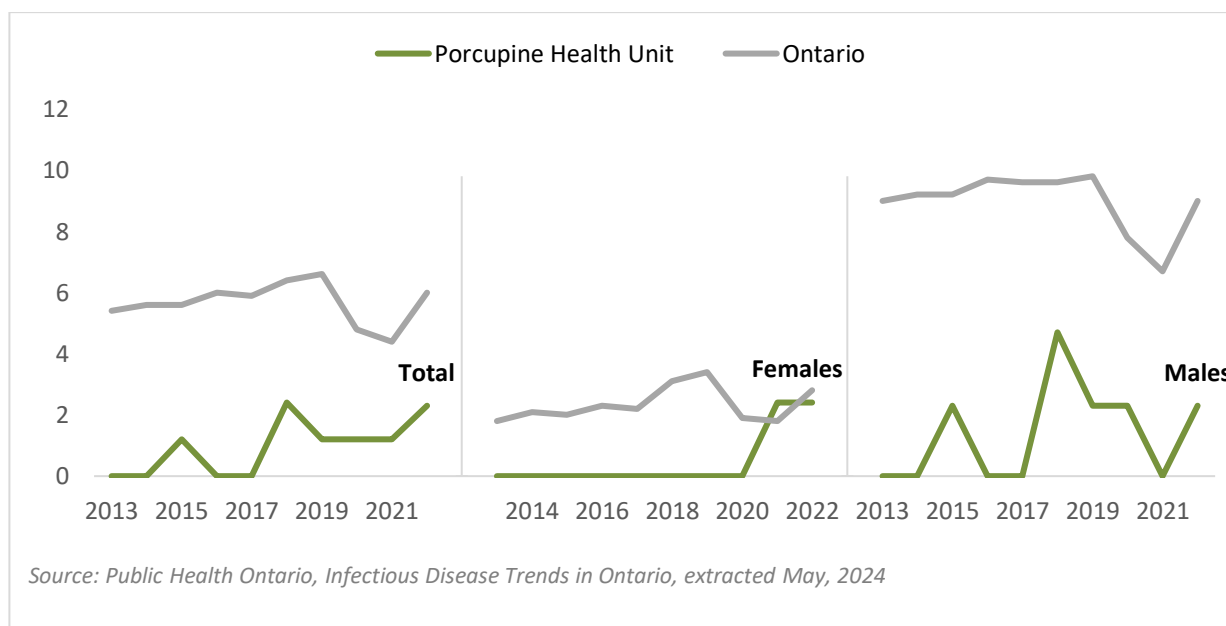


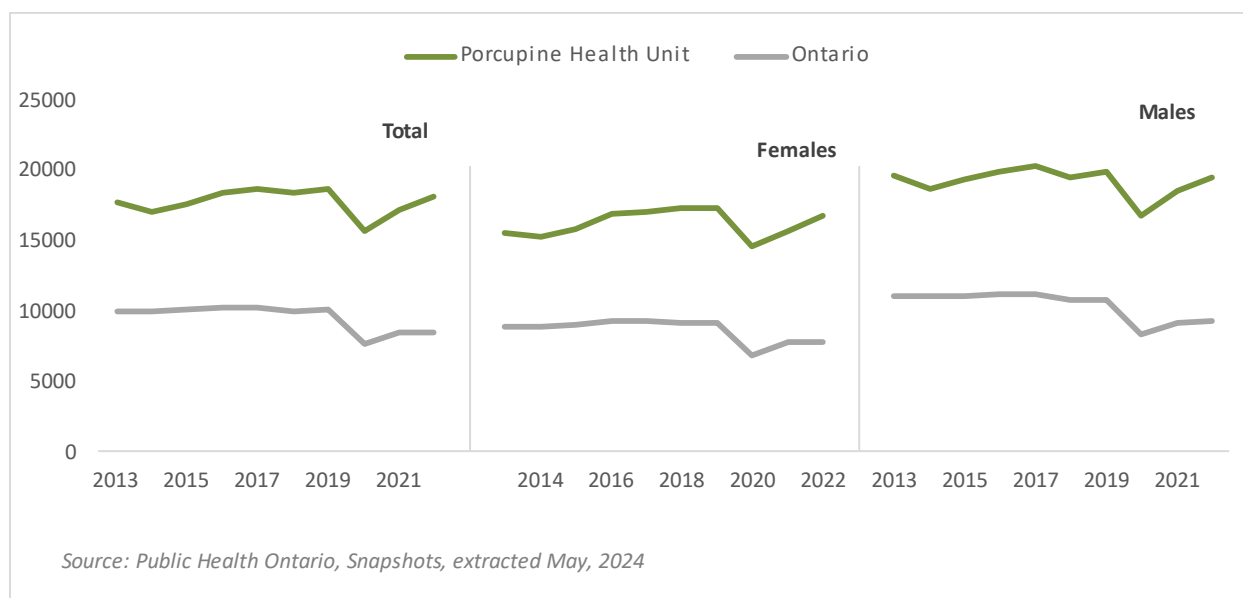
Figure 21.12 HIV Incidence Rates for Porcupine Health Unit and Ontario, 2013 to 2022 (rates per 100,000 population)



Injury Rates

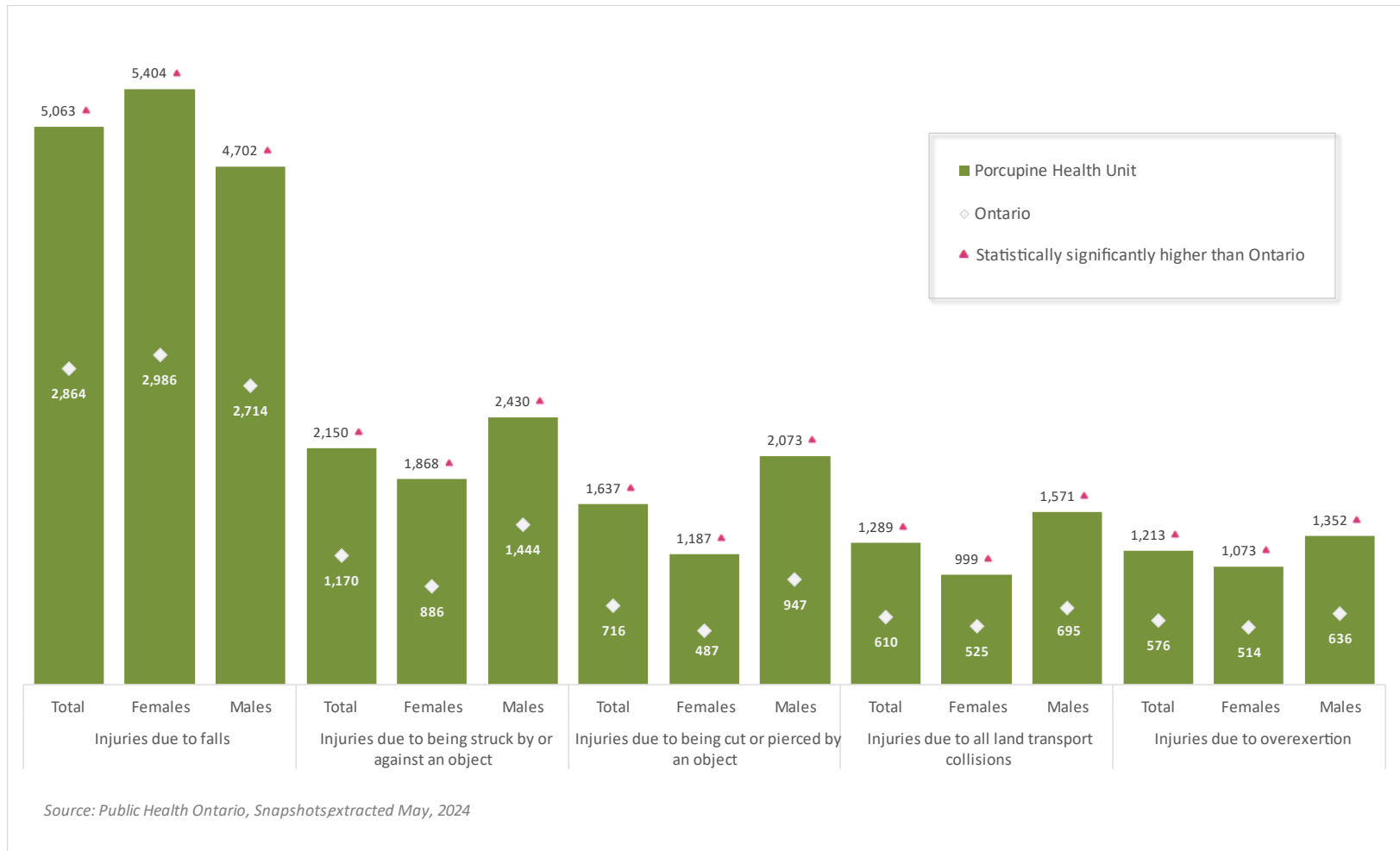
Injury rates can provide insights into the types and severity of health risks present in a community. Emergency department visits for all injuries to residents of the Porcupine Health Unit were higher than for Ontario from 2013 to 2022, as shown in Figure 21.13. The age-standardized rates for all injuries were consistently higher for males than for females.

Figure 21.13 Emergency Department Visits for All Injuries, Porcupine Health Unit and Ontario, 2013 to 2022 (age-standardized rates per 100,000 population)



Based on the data from Public Health Ontario, the highest rates of emergency room visits for injuries in the Porcupine Health Unit in 2022 were caused by falls, being struck by or against an object, being cut or pierced by an object, all land transport collisions, and overexertion. As indicated in Figure 21.14, rates of emergency room visits for each of these causes were significantly higher for residents of the Porcupine Health Unit than for their counterparts in Ontario. Rates for females were higher than males for injuries caused by falls, both within the Porcupine Health Unit and Ontario.

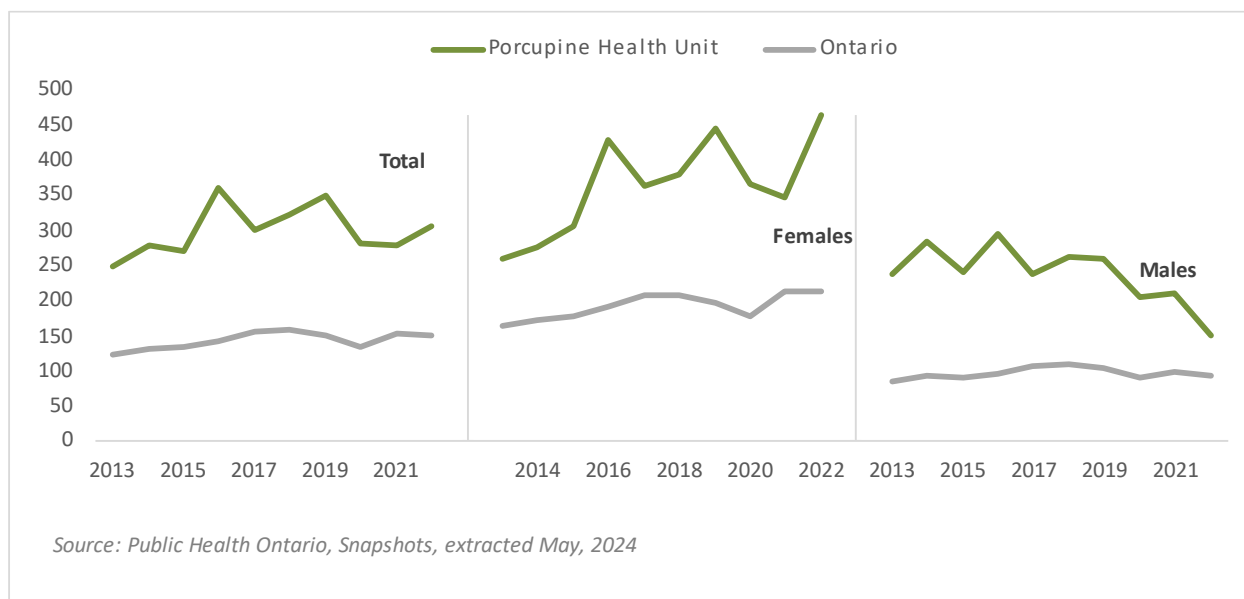
Figure 21.14 Emergency Department Visits for Injuries, Porcupine Health Unit and Ontario, 2022 (age-standardized rates per 100,000 population)



Intentional Self-harm and Suicide

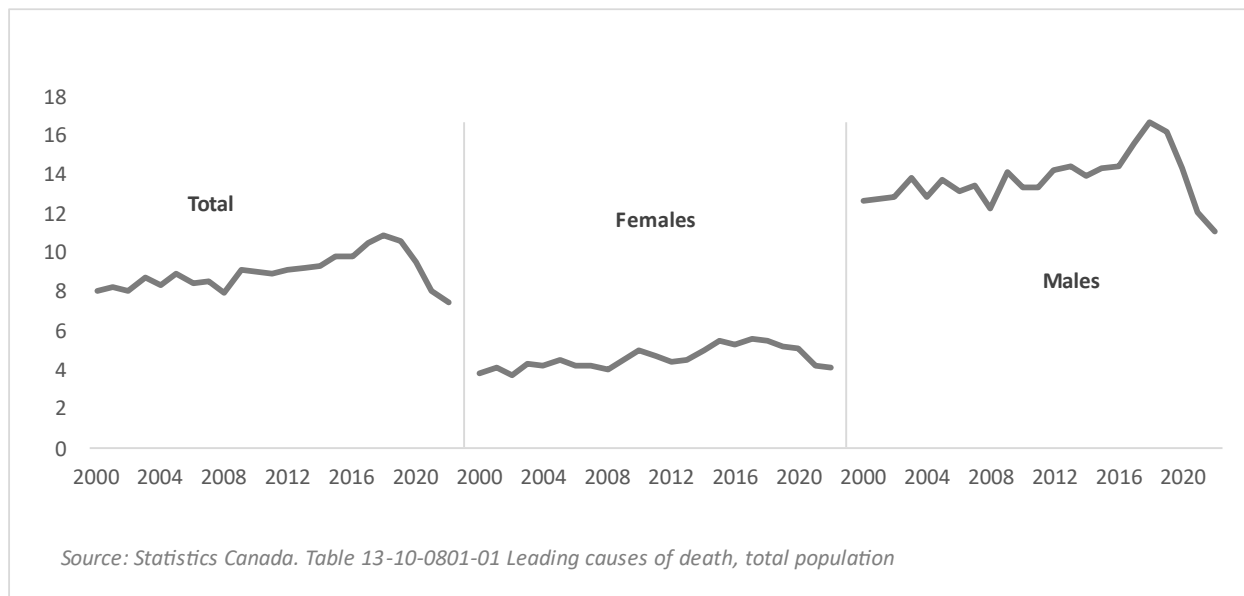
Emergency department visits for injuries due to intentional self harm from 2013 to 2022 for the Porcupine Health Unit and Ontario are shown in Figure 21.15. The age-standardized rates for intentional self-harm for residents of the Porcupine Health Unit were significantly higher than rates for Ontario, and rates for females were higher than rates for males (Public Health Ontario n.d.).

Figure 21.15 Emergency Department Visits for Injuries due to Intentional Self Harm, Porcupine Health Unit and Ontario, 2013 to 2022 (age-standardized rates per 100,000 population)



Suicide rates are not publicly available for the Porcupine Health Region. Although rates of emergency room visits for intentional self-harm were higher for females than males, the rate of suicides in Ontario are substantially higher for males than females, as shown on Figure 21.16 (Statistics Canada 2023a). Suicide rates for male residents of Ontario appear to be decreasing since 2018.

Figure 21.16 Suicide Rates for Ontario, 2013 to 2022 (age-standardized rates per 100,000 population)



21.2.3.3.2 Health Factors of Interest

This section describes common behavioural risk factors including substance use (tobacco and alcohol), physical activity, unhealthy diet and food security. These risk factors influence physical health outcomes and conditions (Section 21.2.3.1.7) and are influenced by the biophysical and social determinants of health such as social and economic conditions (described in Section 21.2.3.1), environmental conditions (described in Section 21.2.3.2) and cultural determinants of health (described in Section 21.2.3.1.7).

Substance Use

There may be many reasons why people use substances including for medical purposes, religious or ceremonial purposes, personal enjoyment or to cope with stress trauma or pain (Government of Canada 2024c). Substance use can fall on a spectrum which includes (Government of Canada 2024c):

- Non-use (abstinence)
- Beneficial use, which can have a positive social, health or spiritual effect (e.g., prescribed medication, religious use of tobacco)
- Lower-risk use (e.g., drinking or smoking cannabis following lower-risk use guidelines)
- Higher-risk use (e.g., illegal drugs, impaired driving, binge drinking)
- Addiction (e.g., compulsive and continuous substance use)

Daily or occasional tobacco smoking is a major cause of chronic diseases in Ontario, and it has been estimated that about 23.7% of deaths in Ontario were due to tobacco smoking (CCO and Public Health Ontario 2019). Based on age-standardized self-reported adult smoking rates (daily or occasional) for 2019-2020, a significantly higher proportion of Porcupine Health Unit residents (28.2%) reported being a current smoker compared to Ontario (14.2%), with rates for male residents (36.2%) being higher than females (20.3%) (Public Health Ontario n.d.).

As noted previously, excess alcohol consumption as a factor for chronic disease has been defined by CCO and Public Health Ontario (2019) as more than two drinks a day or 10 drinks a week for women and more than three drinks a day or 15 drinks a week for men. Based on data from 2019-2020, the age-standardized rates of self-reported excess alcohol consumption for chronic disease in the Porcupine Health Unit for males (26.6%) and females (17.7%) were not statistically different than Ontario overall (Public Health Ontario n.d.).

Heavy drinking (defined as consuming five or more standard drinks in one setting on at least one occasion per month for men, or four or more standard drinks in one setting on at least one occasion per month for women) is a pattern of consumption that is a well-established risk factor for death from any cause, including unintentional injuries, violence chronic disease, and for developing an alcohol use disorder (Paradis, et al. 2023). Based on data from 2019-20, the age-standardized rates of heavy drinking in the Porcupine Health Unit for males (36.6%) and females (18.4%) were statistically higher than Ontario overall (19.6 % for males; 12.6 for females) (Public Health Ontario n.d.).

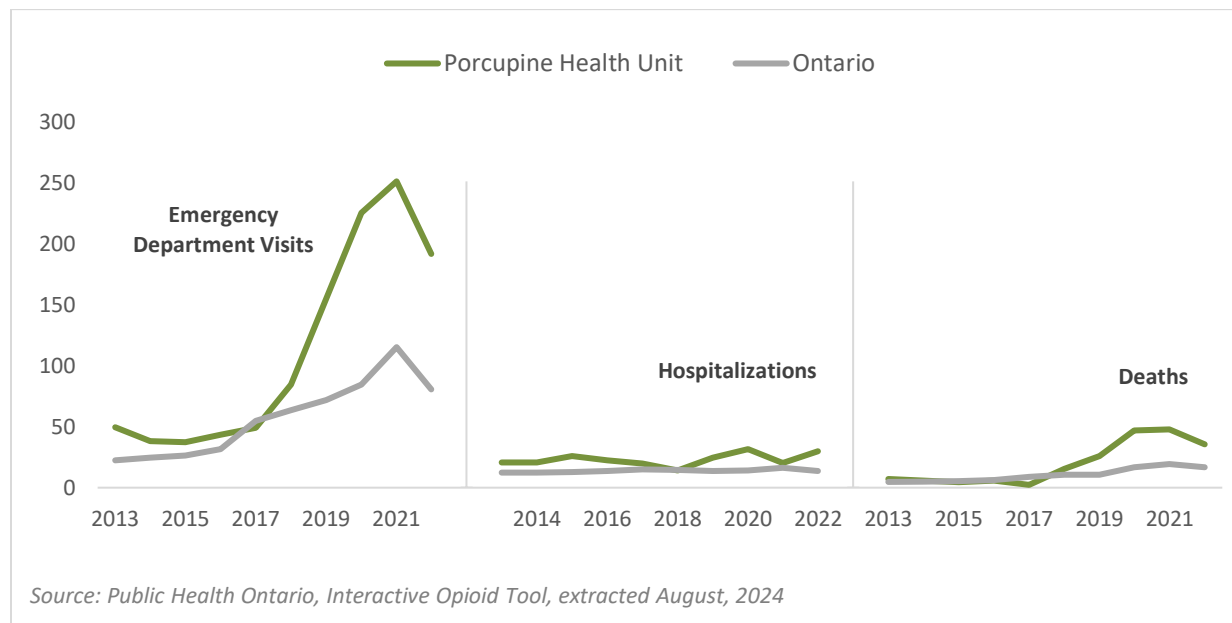
Statistics Canada (2023b) data describing drug crime violations in Smooth Rock Falls and Timmins (municipal) are summarized in Table 21.12. As shown, Timmins had higher rates of drug crime violations compared to the provincial rates, including rates that are approximately three times higher for total possession and total cocaine trafficking, production or distribution. Cochrane also had generally higher rates of drug crime violations than the provincial rates, with rates for possession of controlled drugs and substances and rates for trafficking, production, or distribution of controlled drugs and substances that are approximately ten times the provincial rates. Due to its relatively small populations, the rates of drug crime violations for Smooth Rock Falls should be interpreted with caution. For example, while the rate of trafficking, production, or distribution of controlled drugs and substances in Smooth Rock Falls shown in Table 21.12 is four times higher than the provincial rate, the number of violations was one.

Table 21.12 Drug crime violations for 2022 (rate per 100,000 population)

Crime	Timmins	Smooth Rock Falls	Cochrane	Ontario
Possession of Cocaine	14.18	0	0	9.14
Possession of Controlled Drugs and Substances	75.64	0	276.04	26.1
Trafficking, Production, or Distribution of Cocaine	40.19	0	18.4	12.19
Trafficking, Production, or Distribution of Controlled Drugs and Substances	21.27	81.17	220.83	17.8
Possession, Production, Sale, or Import of Anything to be Knowingly Used in Drug Production or Trafficking	0	0	0	0.08
Source: Statistics Canada (2023b), extracted May, 2024				

Canada is experiencing an opioid crisis which can be measured in many ways, including opioid related hospitalizations, deaths, and emergency medical services responses (Hatt 2022). The rates of opioid related emergency department visits, hospitalizations, deaths for the Porcupine Health Unit as provided by Public Health Ontario (Public Health Ontario 2024a) are illustrated in Figure 21.17. Since 2017, there has been a sharp increase in emergency department visits and deaths in the Porcupine Health Unit. Although provincial rates also increased during this period, the rates for the Porcupine Health Unit are generally more than twice the provincial rates during this period. Fentanyl (all types) was identified as the type of opioid present at death for approximately 95% of the opioid-related deaths in the Porcupine Health Unit in 2021 and 2022 (the two most recent years reported) (Public Health Ontario 2024a).

Figure 21.17 Opioid-related Emergency Department Visits, Hospitalizations, and Deaths, Porcupine Health Unit and Ontario, 2013-2022 (rates per 100,000 population)



While opioid statistics for Porcupine Health Unit are not disaggregated by Indigeneity, many Indigenous nations in Canada are disproportionately harmed by opioids (Hatt 2022). Locally, 24% of Flying Post First Nation, 43% of Matachewan First Nation, and 55% of Mattagammi First Nation survey respondents indicated that substance use was a main challenge (Flying Post First Nation 2023a; Matachewan First Nation 2023b; Mattagammi First Nation 2023b) and Taykwa Tagamou Nation interview participants noted that substance abuse challenges within Taykwa Tagamou Nation is a key concern and is a symptom of underlying mental health challenges (Taykwa Tagamou Nation 2023b). Participants also indicated that substance abuse may be a result of lack of adequate housing and employment (Taykwa Tagamou Nation 2023b). Apitipi Anicinapek Nation noted that drug and alcohol use, especially among youth, remains a significant concern, exacerbated by intergenerational trauma and easy access to substances (Apitipi Anicinapek Nation 2024).

Physical Activity

In 2020, 58% of adult residents of the Porcupine Health Unit self-reported being physically active at or above the recommended level from the Canadian Physical Activity Guidelines, which are not significantly different than the provincial rate of 52.1% (Public Health Ontario n.d.). Males in the Porcupine Health Unit had the highest levels of self reported physical activity in Ontario at 73.4%, which is significantly higher than the provincial rate of 55.6%. The rate for females in the Porcupine Health Unit was 43.8%, which is not significantly different than the provincial rate of 48.7%

Obesity

Obesity is a complex disease characterized by abnormal or excessive fat accumulation. Obesity is diagnosed by calculating Body Mass Index (BMI), based on height and weight ratio. An index of 30 or more defines obesity. Risk factors of obesity include genetic predisposition, an unhealthy diet, a sedentary lifestyle, and lack of sleep. Obesity places a strain on health systems as it increases the risk of many chronic diseases. Within the Porcupine Health Unit, self reported prevalence of adult obesity (both sexes) has been above 30% from 2015 to 2020, which is statistically higher than Ontario, which had a self-reported obesity rate (both sexes) of about 20% during this same period (Public Health Ontario n.d.). The difference is particularly acute for female residents of the Porcupine Health Unit. In 2019-2020, 36.6% of female residents of Porcupine Health Unit reported they were obese compared to 20.9% of females in Ontario.

Food Security

Household food insecurity occurs when people don't have reliable access to a sufficient quantity or quality of affordable and nutritious food (Porcupine Health Unit 2021). Food insecurity is related to poorer diet and nutrition (e.g., fewer fruits and vegetables, milk production and vitamins) (Raphael, et al. 2020). Based on data for 2022, the percentage of people experiencing food insecurity in the Porcupine Health Unit (16.3% for individuals and 18.8% for households) is not significantly different from Ontario (17.7% for individuals and 17.45 for households) (Public Health Ontario n.d.).

Segments of the population may experience food security differently. Based on studies by Uppal (2023) and Statistics Canada (2024):

- Food insecurity was highest among female lone parent families
- Families with an Indigenous major income earner living in the provinces and off reserve were almost twice as likely to report food insecurity compared to those with a non-Indigenous major income earner
- Among Indigenous people aged 15 years and older, 28.6% experienced food insecurity in 2022, which is greater than that experienced by the non-Indigenous population aged 15 years and older (15.7%)

Two additional aspects that influence food security are food affordability and food harvesting.

Food Affordability

Based on the National Nutritious Food Basket and an Ontario pilot process which used in-store and online data collection from six grocery stores in the district, in 2022, it was estimated that the cost of food would average (Porcupine Health Unit 2023b):

- \$1,240/month for a family of four
- \$870/month of single parent household with two children (Ontario Works)
- \$369/month for one person household (Ontario Works and Ontario Disability Support Program)

- \$269/month for one person household (Old Age Security/Guaranteed Income Supplement)
- \$674/month for married couple (Ontario Disability Support Program)

It is estimated that based on average incomes, for a family of four working full-time earning minimum wage that 31% of income is required to purchase healthy food (Porcupine Health Unit 2023b). The cost of store-bought food is a concern for Indigenous nations as well. When asked about food security, half of Mattagami First Nation respondents reported concern over their ability to get sufficient amount of store-bought food at some point during the year (Mattagami First Nation 2023a). Similarly, 22% of Flying Post First Nation and Matachewan First Nation survey respondents were concerned about their ability to obtain a sufficient amount of store-bought food to meet their food and nutritional needs, with 12% reporting challenges at one or more points during the year and 11% reporting it was a monthly challenge (Flying Post First Nation 2023a). Additionally, the effect of inflation on food security has led to a heightened cost of fresh fruit and vegetables (Taykwa Tagamou Nation 2023b). Lack of access to a grocery store with nutritious foods is a concern, the nearest store to Mattagami First Nation is a gas station that does not supply adequate goods to support food security (Mattagami First Nation 2023b).

Food Harvesting

Food harvesting is particularly important to Indigenous nations because it enables consumption of culturally appropriate food. Hunting and trapping support diets year-round for Indigenous nations. For example, First Nations in the RSA have noted that wild meats are central to food security and the ability to harvest and process wild game provides members with nutritional and cultural benefits (Taykwa Tagamou Nation 2023b, Flying Post First Nation 2023b, Mattagami First Nation 2023b, Matachewan First Nation 2023b, Apitipi Anicinapek Nation 2024); that food harvesting can contribute to feeling of connection with the land and food harvesting is connected to cultural continuity and knowledge transmission (Flying Post First Nation 2023a, Apitipi Anicinapek Nation 2024); and that processing is part of food harvesting and is a powerful method of knowledge transmission (Mattagami First Nation 2023a). Hunting and harvesting activities are not only a means of providing food, but also a way to maintain a deep connection with the land and their ancestors (Apitipi Anicinapek Nation 2024 & Tamarack Environmental Associates Inc. 2024). Efforts are underway to establish community gardens and local agriculture businesses to provide fresh produce and meats, which are believed to be crucial for improving nutrition and health within the community (Apitipi Anicinapek Nation 2024).

Diet

Consuming fruits and vegetables at least five times a day is part of a nutritious diet and important for reducing the risk of many chronic diseases. In 2020, rates of self-reported consumption of vegetables and fruits five or more times per day was similar for residents of the Porcupine Health Unit and Ontario. Slightly more female residents consumed vegetables and fruits five or more times per day than male residents (Table 21.13).

Table 21.13 Self-report consumption of vegetables and fruits five or more times per day for 2017 and 2020 in Porcupine Health Unit (age-standardized rates per 100,000)

	Porcupine Health Unit		Ontario	
	2017	2020	2017	2020
Age-standardized rate (both sexes)	24.0	21.9	26.7	21.3
Age-standardized rate (females)	26.2	23.0	31.3	25.0
Age-standardized rate (males)	21.7	19.6	21.8	17.4

Source: Public Health Ontario, Snapshots, extracted May, 2024

Children and Youth

As noted previously, children and youth are considered a particularly vulnerable segment of the population because there is strong evidence that this is a critical period for development, and adverse social determinants of health (such as household income, food security, housing, and family stability) during this time can have lasting effects on health and well-being into adulthood (Raphael, et al. 2020). Selected children and youth indicators are summarized in Table 21.14.

Table 21.14 Selected Children and Youth Indicators, Porcupine Health Unit and Ontario, 2019 (% of population)

Indicator	Porcupine Health Unit	Ontario
Anxious daily (5-17yr)	5.2	5.2
Concussion (1-17yr)	4.7	4.4
Difficulty accessing doctors (1-17yr)	10.4	6.9
Food insecure (1-17yr)	10.6 ▼	15.3
Overweight/obese (2-17yr)	30.4	29.4
Physically inactive (3-17yr)	35.4	25.6

Notes:
 ▼ indicates value is significantly lower than Ontario
 Source: Canadian Health Survey on Children and Youth (CHSCY) 2019, Statistics Canada, extracted June 7, 2024 ([Statistics Canada 2020] as provided by Porcupine Health Unit).

Children and youth facing food insecurity tend to have worse health overall, increased bone fracture risk, higher chances of chronic illnesses like asthma, and mental health issues such as social anxiety, suicidal ideation, and depression (Ontario Dietitians in Public Health 2020). These children are also more likely to experience ongoing anxiety, depression, hyperactivity, inattention, diminished self-esteem, and insufficient self-assurance to choose healthier lifestyles including proper diet and activity (Ontario Dietitians in Public Health 2020). As indicated in Table 21.14, the percentage of children experiencing food insecurity in the Porcupine Health Unit in 2019 was significantly less than Ontario.

In addition to food insecurity, the Porcupine Health Unit (2021) reported that youth aged 12 to 19 were exposed to a higher percentage of second-hand smoke at home as compared to Ontario (based on 2015-2016 data obtained from Statistics Canada, Canadian Community Health Survey (CCHS), which was extracted from Public Health Ontario (n.d.). A reason for this is likely a contributor to the smaller percentage of Porcupine Health Unit area youth abstaining from smoking for both males and females, as compared to Ontario. Further, the Porcupine Health Unit (2021) reported (also based on Public Health Ontario n.d.) that the teenage pregnancy rate among 15 to 19 year olds was 2- 2.5 times higher in the Porcupine Health Unit compared to Ontario between 2013 and 2017; however, the teenage pregnancy rate decreased both locally and provincially during this time.

The Porcupine Health Unit (2021) also reported that youth in the Cochrane District were facing educational and social challenges. According to a study completed during the 2017-2018 school year using the Early Development Instrument, a higher percentage of kindergarten children in the Cochrane area were determined to be vulnerable or at risk in the categories of emotional maturity and language and cognitive development, compared to children across Ontario. This study also found that Cochrane area school-aged boys were more vulnerable in all categories except language and cognitive development, as compared to girls.

Additionally, in recent years, youth in the Cochrane District area appear to have relied heavily on the emergency services within the Porcupine Health Unit (2021). According to Public Health Ontario 2020, emergency department visits for all injuries were highest for Porcupine Health Unit area youth aged 0 to 19 years of age, with rates nearly double those for Ontario. Furthermore, emergency department visits related to intentional self-harm by Porcupine Health Unit area youth aged 0 to 19 years between 2016 and 2018 were reportedly more than double the Ontario numbers. These trends of self-harm have been shown to continue to mortality, as the rate of deaths due to self-harm for area youth aged 10 to 19 was almost 6 times the Ontario rate (based on data extracted 2019 by the Porcupine Health Unit from Ministry of Health & Long-Term Care, IntelliHealth, Vital Statistics). This statistic is significantly higher for males both provincially and locally.

21.2.3.4 Mental Health and Social Wellbeing

The state of mental health can be assessed by understanding the rates of mental illness, which is the reduced ability to function effectively over a prolonged period of time due to factors such as levels of distress, changes in thinking, mood or behaviour, feelings of isolation, loneliness or sadness and the feeling of being disconnected from people and activities (Government of Canada 2017). Based on the definitions of mental health, indicators include mental illness conditions (e.g., rates of anxiety, depression and other mood disorders), sense of belonging, life satisfaction, perceived fear and substance use. Substance use is considered a mental health indicator because substance use is strongly influenced by mental health conditions (Mental Health Commission of Canada 2024). These factors may be caused by genetics and environmental influences on a fetus, early life experiences, stressful live events, and the social determinants of health (Government of Canada 2017).

Mental health, mental illness and social wellbeing have overlapping indicators. For the purposes of this assessment, terms such as social wellbeing, social connectedness, and community cohesion among

others, are used interchangeably and generally refer to the building of relationships and social networks to foster social integration into a larger community to feel connected and to have a community support system (Statistics Canada 2022)b. There are linkages between mental health conditions and physical health conditions; for instance, people who have chronic physical health conditions are at risk of developing mental illnesses (Canadian Mental Health Association 2024).

The Quality-of-Life Framework for Canada identifies several indicators for social cohesion and connection including (Statistics Canada 2023c):

- Sense of belonging to a local community
- Someone to count on
- Trust in others
- Volunteering
- Satisfaction with personal relationship (family and friends)
- Loneliness
- Accessible environments

Many of the aforementioned indicators are primarily reported at the provincial or national level and not disaggregated at the regional level. Therefore, for the purposes of this assessment, perceived mental health and life stress, sense of belonging, life satisfaction and indicators related to family relationships (e.g., marital status) are described in the following sections.

21.2.3.4.1 Perceived Mental Health and Life Stress

In 2019/2020, the percentage of residents in the Porcupine Health Unit who reported that their perceived very good or excellent mental health (62%) was not significantly different than the provincial rate (64.7%) (Public Health Ontario n.d.). Fewer female than male residents reported a perceived very good or excellent mental health (58.3% for females versus 65.9% for males). Additional mental health indicators are summarized in Table 21.15. There are no reported significant differences between rates for the Porcupine Health Unit and Ontario for 2019/2020 (Public Health Ontario n.d.)

Table 21.15 Mental Health Indicators; Porcupine Health Unit; 2019/2020 (% of population)

Indicator	Porcupine Health Unit	Ontario
Perceived mental health, very good or excellent	62	64.7
Perceived mental health, fair or poor	8.5	9.8
Perceived life stress, not at all or not very stressful	38.9	36.4
Perceived life stress, quite a bit or extremely stressful	23.9	21.2
Source: Public Health Ontario, Snapshots, extracted May, 2024		

In a 2022 follow-up survey for impacts of Covid-19 in the Porcupine Health Unit, 52% of residents indicated that their current mental health was “excellent” or “very good” while 23% indicated that their mental health status was “fair” and “poor” (Porcupine Health Unit 2023).

21.2.3.4.2 Sense of Belonging

In 2019/2020, 75.2% of the residents of the Porcupine Health Unit self-reported a sense of belonging to local community that was somewhat strong or very strong, which is slightly higher than the rate for Ontario (71.3%) (Statistics Canada 2022b). However, the rates for males and females in the Porcupine Health Unit (80.4% for males and 69.9% for females) suggests a stronger gap between male and female adults sense of belonging compared to the Ontario (69.9% for males and 72.7% for females) (Statistics Canada 2022b).

While data are not available for the Porcupine Health Unit, Statistics Canada (2022b) determined that in 2021 and 2022, the sense of belonging was lower among certain population groups. Young people aged 15 to 34 were less likely to have a strong sense of belonging to their community compared to those aged 35 and older and members of the 2SLGBTQQIA+ community were less likely to have a strong sense of belonging to their community compared to the non-2SLGBTQQIA+ population. Further, people who experienced social and economic challenges were less likely to have a strong sense of belonging to their local community than those who did not experience financial hardship.

Mattagami First Nation stated that a strong sense of identity and belonging fosters self-confidence, self-esteem, and pride, among other benefits (Mattagami First Nation 2023b) and Matachewan First Nation stated that there was a lack of social supports for mothers, which has affects community wellbeing (Matachewan First Nation 2023b).

21.2.3.4.3 Life Satisfaction

Life satisfaction is based on how respondents feel about their life as a whole at the moment. Life satisfaction for residents of the Porcupine Health Unit are comparable to residents of Ontario (Table 21.16). In 2019/2020, residents of the Porcupine Health Unit who reported they were satisfied or very satisfied with life in general for were 91.2% for males and 91.0% for females, which are not significantly different to the provincial rates of 92.9% for males and 92.6% for females (Public Health Ontario n.d., Overall Health Sanpshot Data).

Table 21.16 Life Satisfaction for Porcupine Health Unit and Ontario, 2019-2020 (% of population)

Indicator	Porcupine Health Unit	Ontario
Very satisfied or satisfied with life in general	91.6	92.8
Dissatisfied or very dissatisfied with life in general	2.9	2.7

Source: Public Health Ontario, Snapshots, extracted May, 2024

21.2.3.4.4 Family Dynamics/Relationships

Negative family dynamics can impact health, with children in such environments facing a higher likelihood of diseases like heart and lung conditions, obesity, and mental health issues, along with a propensity for substance abuse and addiction. Additionally, these dynamics are linked to poor sleep, elevated heart rates and blood pressure, and potentially harmful coping strategies. Family-level environments are affected by separation, divorce, and lone-parent status.

Within the LSA/RSA, there is substantial variability among the communities with regards to the proportion of married couples (Table 21.17). When compared to Ontario, marital status within the LSA/RSA is similar, with the exception of Mattagami, for which the percentage of married couples is substantially lower than the provincial rates while the percentage of partners living common-law is substantially higher.

Table 21.17 Marital Status for Porcupine Health Unit, Census Subdivisions within the RSA, and Ontario 2021 (% of population)

Location	Married (%)	Living common-law (%)	Not married and not living common-law (%)
Porcupine Health Unit	42	15.3	42.7
City of Timmins	41.3	14.7	44
Town of Cochrane	44.6	14.5	41
Town of Iroquois Falls	44.1	15.6	40.2
Town of Smooth Rock Falls	48.4	13.1	38.5
Matachewan Reserve Lands	50	8.3	33.3
Mattagami Reserve Lands	24.2	27.3	45.5
District of Cochrane	42.4	15.2	42.3
District of Timiskaming	44.3	14	41.7
Ontario	47.9	8.6	43.5
Source: Statistics Canada (2022a)			

Lone-parent households experience economic disadvantages such as higher family debt and a lower net worth (Government of Canada 2016). Women are at a greater disadvantage because statistically, female lone-parent families have lower incomes than male lone-parent families (Government of Canada 2016) and as noted previously, considerable research has shown that health status improves with each step up in income (Statistics Canada 2023a). Rates of lone parent families in Mattagami First Nation and Matachewan First Nation are substantially higher than Ontario. Across all jurisdictions, one parent families are predominately parented by a woman+, indicating a gendered division of parenthood. The prevalence of lone parent families for communities in the RSA are summarized in Table 21.18.

Table 21.18 Lone Parent Families for Census Subdivisions within the RSA, 2021 (% of population)

Location	One Parent Families		
	Total (%)	in which the parent is a woman+ (%)	in which the parent is a man+ (%)
Porcupine Health Unit	18.3	13.3	5.1
City of Timmins	18.6	13.7	4.9
Town of Cochrane	18.9	13.6	5.4
Town of Iroquois Falls	15.1	11.2	3.9
Town of Smooth Rock Falls	12.3	6.8	4.1
Matachewan Reserve Lands	40	20	0
Mattagami Reserve Lands	25	25	0
District of Cochrane	17.8	13	4.9
District of Timiskaming	15.7	11.3	4.3
Ontario	17.1	13.6	3.5

Source: Statistics Canada (2022a)

21.2.3.5 Community Safety

For the purposes of this assessment, community safety refers to the actual or perceived harm to a person or community and includes indicators such as intimate partner violence and violent crimes. Community safety influences mental health and wellbeing conditions and outcomes (Section 21.2.3.3), which can affect physical health outcomes and conditions (Section 21.2.3.1.7). Physical health outcomes such as injury rates and STIs can be directly affected through community safety indicators (e.g., violent crimes and sexual assault).

21.2.3.5.1 Intimate Partner Violence

Intimate partner violence refers to multiple forms of harm cause by a current or former intimate partner or spouse (Government of Canada 2020a). Relationship violence can affect victims in multiple ways including damage to self-esteem, loss of sense of safety, financial instability, damage to personal development and ability to actively participate in society, physical injury, mental health and STIs (Royal Canadian Mounted Police 2021).

Based on data provided by the Government of Canada (2020a):

- 79% of Canadians who experienced intimate partner violence in 2019 were women
- among Canadians who experienced intimate partner violence, women are four times more likely than men to have been afraid of a partner
- Indigenous women in Canada (61%) were more likely to have experienced intimate partner violence in their lifetime than non-Indigenous women (44%)

- 2SLGBTQQIA+ persons and women living with disabilities also experience higher prevalence of intimate partner violence

Among Indigenous nations in the RSA, Mattagami First Nation survey respondents identified lateral violence and domestic abuse as challenges for Mattagami First Nation members (Mattagami First Nation 2023b). One respondent identified the linkages between housing shortages and domestic violence, noting that accessing help can be limited by a lack of housing mobility and that unstable or short-term housing is related to increased levels of domestic violence (Mattagami First Nation 2023b). Taykwa Tagamou Nation also shared that the relationship with the land is linked to stronger family relationships (Taykwa Tagamou Nation 2023b).

21.2.3.5.2 Other Violence and Crime

Data are available in the LSA/RSA for other crime related activities. Based on the reported crime statistics for 2022 provided in Table 21.19, sexual assault level 1 in Smooth Rock Falls (81.17 cases per 100,000) was similar to the provincial rate (80.45 per 100,000). However, the overall reported rates of sexual assaults, total sexual violations against children, and trafficking were considerably higher in Cochrane, Smooth Rock Falls, and Timmins when compared to the provincial rate.

Table 21.19 Crime Statistics in RSA and Ontario, 2022 (rate per 100,000 population)

Crime	Cochrane	Smooth Rock Falls	Timmins	Ontario
All Criminal Code Violations (excluding traffic)	8667.65	3327.92	11582.83	4151.06
Violent Criminal Code Violations	2373.94	1623.38	2843.7	994.41
Homicide	0	0	0	1.91
Sexual Assault, Level 3	0	0	4.73	0.21
Sexual Assault, Level 2	0	0	11.82	1.73
Sexual Assault, Level 1	257.64	81.17	236.38	80.45
Sexual Violations Against Children	92.01	81.17	87.46	18
Other Assaults	18.4	0	0	4.66
Forcible Confinement or Kidnapping	18.4	0	28.37	7.42
Abduction	0	0	0	0.45
Offences in Relation to Sexual Services	0	0	0	0.76
Trafficking in Persons	0	0	4.73	1.68
Source: Statistics Canada (2023b), extracted May, 2024				

From 2013 to 2022, age-standardized rates of hospitalization for injuries due to assault have been significantly higher in the Porcupine Health Unit than Ontario (Public Health Ontario n.d.). In 2022, the Porcupine Health Unit had an age-standardized rate of 672.1 emergency department visits for injuries due to assault per 100,000 population, which is about three times the provincial rate of 206.2 per 100,000. Males had higher rates of emergency department visits than females (791.8 per 100,000 population for males compared to 553.6 per 100,000 population for females).

Gender-based violence is a form of violence towards someone because of their gender, gender expression, gender identity or perceived gender and encompasses a range of violent behaviours, some of which are not considered criminal (Cotter and Savage 2019). The groups more likely to experience gender-based violence include women, young women and girls, Indigenous women, and girls, 2SLGBTQQIA+ peoples, women living in Northern, rural, and remote communities and women living with disabilities (Government of Canada 2024d). For instance, 46% of Indigenous women experience sexual violence in their lifetime compared to 33% of non-Indigenous women (Heidinger 2021). In response to the disproportionate rates of violence experienced by Indigenous women and girls, including the 2SLGBTQQIA+ peoples, the National Inquiry into MMIWG was launched in 2016 (Government of Canada 2020b). One in three women and one in eight men experience unwanted sexual behaviour in public and the most common types of unwanted sexual behaviour include sexual attention, physical contact and comments about their sex or gender (Cotter and Savage 2019).

Apitipi Anicinapek Nation noted that the community feels secure despite a limited police presence, relying on community watch initiatives; however, the broader challenges of drug addiction, attributed to intergenerational trauma, remain a significant concern (Apitipi Anicinapek Nation 2024).

21.3 Project Interactions with Health

Table 21.20 identifies, for each potential effect, the physical activities that might interact with the VC and result in the identified effect. These interactions are indicated by a check mark or a dash and are discussed in detail in Section 21.4, in the context of effects pathways, standard and project-specific mitigation/enhancement, and residual effects.

Table 21.20 Project Interactions with Health

Physical Activities	Change in physical health	Change in mental health and social wellbeing	Change in community safety
Construction			
Mobilization of construction equipment and materials on site.	✓	–	–
Vegetation clearing, including the removal and disposal of trees, brush, shrubs, and other foliage.	✓	✓	–
Stripping, including the removal of topsoil and other organic materials, as well as storing of some materials for use in reclamation.	✓	✓	–

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Physical Activities	Change in physical health	Change in mental health and social wellbeing	Change in community safety
Grading of overburden to be used as fill.	✓	✓	–
Handling and use of explosives, including blasting.	✓	✓	–
Excavating and pre-stripping of mine rock from the Open Pit and surrounding area.	✓	✓	–
Development of the Impoundment Facility for storage of rock, clay, sand, and till.	✓	✓	–
Preparation of construction surfaces, including hauling reclaimed graded material and crushed mine rock to construction locations.	✓	✓	–
Construction of water management systems to collect, manage, treat and discharge contact water from mine components to the receiving waterbodies via collection ponds, ditches, and water treatment plants.	✓	✓	–
Construction of minor water diversions around perimeter of the mine site to collect and divert flows.	✓	✓	–
Dewatering of natural water bodies within the PA.	✓	✓	–
Waste management, including collection and temporary storage.	✓	✓	–
Construction of mine infrastructure, including crusher facilities, process plant and Tailings Management Facility (TMF), as well as the potable water well, and ancillary infrastructure (e.g., offices, workshop, fuel farm, magazine storage and explosives pad).	✓	✓	–
Construction of internal haul roads and internal access roads, including water crossings.	✓	✓	–
Construction of power supply and distribution systems.	✓	✓	–
Construction of temporary Highway 655 by-pass and overpass.	✓	✓	–
Construction of the rail spur.	✓	✓	–
Vehicle operation within the PA.	✓	✓	–
Employment and expenditures ¹ .	✓	✓	✓

Physical Activities	Change in physical health	Change in mental health and social wellbeing	Change in community safety
Operations (Mining and Processing)			
Construction of Project infrastructure, including the expansion of ore processing components.	✓	✓	–
Relocation and decommissioning of Highway 655 and associated infrastructure.	✓	✓	–
Relocation of 500 kV transmission line.	✓	✓	–
Construction of the North Driftwood Diversion Channel.	✓	✓	–
Handling and use of explosives including blasting.	✓	✓	–
Ore extraction in the Main Zone and East Zone of the Open Pit, including drilling, loading and hauling of mine rock from the pits.	✓	✓	–
Maintenance and management of mine rock stockpiles, overburden, and TMF.	✓	✓	–
Ore processing, including conveyor, crushing and processing activities with and between the stockpiles, crusher facilities and process plant.	✓	✓	–
Operation of water management systems, including the collection, management, treatment and discharge of contact water from mine components to the receiving waterbodies via collection ponds, ditches and water treatment plants.	✓	✓	–
Transportation of Ore via the rail spur line.	✓	✓	✓
Waste management, including collection and temporary storage.	✓	✓	–
Vehicle operation within the PA.	✓	✓	–
Progressive reclamation of disturbed areas.	✓	✓	–
Employment and expenditures ¹ .	✓	✓	✓
Decommissioning and Closure			
Pit flooding through the creation of channels from the collection ponds towards the Open Pit.	✓	✓	–
Water management, including groundwater and surface water.	✓	✓	–
Decommissioning, dismantling and/or disposal of buildings and mine infrastructure.	✓	✓	–

Physical Activities	Change in physical health	Change in mental health and social wellbeing	Change in community safety
Removal of power lines and electrical equipment.	✓	✓	–
Decommissioning of potable water and sewage systems.	✓	✓	–
Vehicle operation within the PA.	✓	✓	–
Reclamation, including the placement of overburden, seeding and re-grading.	✓	✓	–
Monitoring and maintenance.	✓	✓	–
Employment and expenditures ¹ .	✓	✓	✓
Notes: ✓ = Potential interaction – = No interaction 1 Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and expenditures” is listed as a separate item under each phase of the Project.			

For a change in physical health and change in mental health and social wellbeing, physical activities are applicable primarily to human health exposure pathways and changes to land used by Indigenous peoples. For a change in community safety, employment and expenditures are the only interaction as this effect is strictly related to social aspects as opposed to specific Project physical activities. Interactions are further described in Section 21.4.

21.4 Assessment of Residual Effects on Health

As noted above in Section 21.1.3., the three potential effects of the Project on Health being assessed in the VC are:

- change in physical health
- change in mental health and social wellbeing, and
- change in community safety.

There are several pathways linking Project activities to each of these potential effects, each with its own set of measurable parameters. The potential changes in these pathways, and ultimately the residual effects on health, are assessed below in terms of direction, magnitude, geographic extent, duration, frequency, and reversibility, particularly concerning the health of Indigenous peoples and the public. The assessment of residual effects is based on mitigation and enhancement measures being in place. The significance of these changes as they relate to federal lands is provided in Section 21.4.6.

21.4.1 Analytical Assessment Techniques

The assessment of residual effects on health draws on related VCs and uses analytical assessment techniques and assumptions identified in Atmospheric Environment (Chapter 12), Acoustic Environment (Chapter 13), Surface Water (Chapter 15), Social Conditions (Chapter 22), Economics (Chapter 23) and Indigenous Interests (Chapters 25 to 28) of the Impact Statement. The assessment of residual effects on health is also supported by a detailed Human Health and Ecological Risk Assessment (HHERA; Appendix C.7 of the Impact Statement), which was used to assess interactions between measured or modelled concentrations of chemicals in environmental media (i.e., air, soil, water, air, and food items) that may occur due to Project-related emissions, and the potential for these interactions to result in adverse health risks to people .

The assessment of residual effects on health uses both quantitative and qualitative methods. For residual effects related to changes in environmental quality (those associated with biophysical determinants of health), the assessment was primarily quantitative in nature, with conclusions drawn from comparisons of estimated environmental changes to regulatory thresholds. For example, sleep disturbance was assessed by comparing estimated nighttime noise levels (Ln) to Health Canada's annual limit of 40 dBA, and non-cancer risks (HQ) from exposure to chemicals in environmental media were compared to Health Canada's threshold of risk acceptability. For residual effects related to changes on traditional land use, population dynamics, and employment conditions (those primarily associated with social determinants of health), the assessment was qualitative in nature with conclusions drawn based on academic, government, and industry literature, input from potentially affected Indigenous nations and the public health unit, and professional judgment.

A GBA Plus process has been applied throughout the residual effects assessment by describing how different segments of the population identified in Table 21.5 may disproportionately experience Project-related effects on health.

21.4.2 Change in Physical Health

21.4.2.1 Project Pathways

Physical health is defined as the state of the human body and how well it functions. As identified in Section 21.1.3, Project activities have the potential to lead to adverse and positive effects on physical health through the following effect pathways.

21.4.2.1.1 Change in Environmental Quality

Physical health can be affected by Project-related changes in environmental quality. Actual or perceived, changes in chemical concentrations in air, water, soil, and country foods, and alterations in noise and light levels, can lead to toxicological and behavioural changes. For example, chemicals (referred to as contaminants of potential concern, or CoPCs, in the HHERA [Appendix C.7 of the Impact Statement]), associated with construction, operations, and decommissioning phases of the Project can be released to the air and subsequently inhaled by people in the LSA. Additionally, chemicals in air can be deposited onto soils and vegetation that people within the LSA might consume. As identified in Table 21.2, a key

concern expressed by First Nations and members of the public is related to chemical exposure as a result of Project activities. Exposure to Project-associated chemicals has the potential to change existing cancer risk and non-cancer hazards. Perceived changes in food quality could lead to changes in the way people eat traditional foods and alter food security, which could lead to physical health changes.

Potential Project-related changes to light could affect people directly and indirectly through:

- light trespass (the transmission of light from fixtures within the Project to the environment and receptors outside the facility)
- glare (intense, harsh or contrasting lighting conditions reduce humans' ability to see) and
- sky glow (the illumination of the sky and/or clouds by Project light sources).

Noise emissions from Project equipment and activities associated with construction, operations, blasting, vehicle traffic along realigned Highway 655 and train traffic along new rail spur line and existing spur line could affect quality of sleep, which in turn can affect biological health (e.g., change in cardiovascular activity, waking) (WHO 2009).

21.4.2.1.2 Change in Land Use

The physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect the physical health of people in the LSA because of diet and nutritional changes. Among Indigenous nations in the LSA/RSA there is a concern that industrial activities are affecting food harvesting (Apitipi Anicinapek Nation 2024, Taykwa Tagamou Nation 2023a, Flying Post First Nation 2023b, Mattagami First Nation 2023a, Matachewan First Nation 2023a). For example, there is concern that pesticides and herbicides from the forestry industry are affecting animals (Flying Post First Nation 2023b, Matachewan First Nation 2023a) and water contamination generates concerns and doubts about the health of fish and whether it is safe for human consumption (Apitipi Anicinapek Nation 2024, Flying Post First Nation 2023b, Mattagami First Nation 2023a). These concerns could lead to changes in how people consume traditional foods and impact food security, potentially resulting in physical health changes. (Lewis et al. 2021), in their methodological guidance and operational direction focused on mental health indicators in IA for major projects that impact Indigenous populations, state that “*Mental health is intimately interconnected with physical, emotional and spiritual health*”.

As noted in Chapter 22 of the Impact Statement, there are a variety of outdoor recreational land uses and water-based activities in the LSA, and to a lesser extent within the PA, which can be affected by the physical presence of the Project. Recreational use (e.g., snowmobiling, hiking, cross-country skiing, ATV use, and sport and traditional fishing) could be affected adjacent to the PA and within the LSA. Construction, operations, and decommissioning phases of the Project can reduce the available land base for these recreational activities, and recreational users in the LSA may also be affected by sensory disturbance (e.g., noise, visual) resulting from Project activities. In addition, site clearing and access restrictions would result in the loss of commercial resource use activities within the PA. These include hunting, trapping and bait harvesting. Timber areas within the PA would be cleared as part of site preparation, as well as through the construction of mine facilities, TMF, linear facilities, and realignments

(i.e., 500 kV transmission line, Highway 655). These changes in land use could lead to changes in how people use traditional lands, which could affect activity levels and food security, potentially resulting in changes in behavioural and physical health.

As well, Project-related income and employment opportunities may positively and adversely influence physical health by affecting individual and household food insecurity, and Project-related influences on cost of living may lead to lower-income households struggling to afford sufficient and nutritious food to feed their families. The Porcupine Health Unit (2023) notes *“Household food insecurity is harmful to our health and well-being. It also creates a burden on our healthcare system. Children are more likely to lack self-efficacy to make healthy lifestyle choices. Adults experiencing food insecurity often have poorer mental [e.g. anxiety, depression], physical [e.g. diabetes, high blood pressure], and oral health”*.

21.4.2.1.3 Change in Population Dynamics

Project-related population growth and the employment of temporary workers (mainly during the construction phase) from outside the region may lead to increased competition for food harvesting. This increase in people in the LSA/RSA could also result in a rise in infectious diseases and changes in the cost of living, which may affect physical health by impacting food security and increasing disease rates.

Project-related influences on cost of living may lead to lower-income households struggling to afford sufficient and nutritious food to feed their families. It could also lead to those with employment opportunities to afford a well balance diet. Project-related influx in temporary out-of-region workers may contribute to increases in recreational hunting, which could have adverse effects related to food availability for traditional hunters. Matachewan First Nation, Mattagami First Nation and Flying Post First Nation expressed concern related to the influx of non-local workers, noting this could lead to increased recreational hunting and decreased success of hunting, trapping, and fishing for subsistence (Matachewan First Nation 2023a, Flying Post First Nation 2023b) and a decrease in abundance of harvested foods (Apitipi Anicinapek Nation 2024, Mattagami First Nation 2023a). As noted above, changes in traditional land use by First Nations could lead to a reduction in physical activity.

Changes in population dynamics has the potential to result in changes in the rates of chronic illness in the LSA/RSA. While there are many factors that can contribute to the onset of chronic illness, lifestyle behaviours, exposure to environmental conditions and the influence of the social determinants of health are those that are relevant to the Project. For example, it can be envisioned that smoking and substance use could potentially increase among temporary employees and their families related to a variety of factors such as stress, isolation, and boredom which could in turn effect chronic illness. Long working hours and work stress may lead to a reduction in physical activity related to work fatigue. As noted in Chapter 22 of the Impact Statement, due to the nature of shift work and work rotations, Project construction workers are unlikely to have time to use local recreation facilities. There is a growing literature base that suggests that working conditions such as shift work may contribute to chronic conditions and health factors such as sleep disorders, cancers, gastrointestinal disorders, cardiovascular disease, metabolic disturbances and obesity (Northern Health 2018).

As well, during construction, transient out-of-region workers may interact with local community members, potentially contributing to changes in transmission of infectious disease. There is some evidence in the literature that out-of-region and temporary workers may participate in high-risk behaviours that can result in increased rates of STIs in communities, and that Indigenous women may be most affected by these behaviours (Northern Health 2018, Prospectors & Developers Association of Canada 2022). For example, Northern Health (2018) summarized studies from Canada and around the world that have highlighted the negative impacts of resource development on STIs, sexual health, and sex work at the community level. However, these effects are often associated with remote projects, those with worker camps, and those associated with boom town communities, conditions that generally do not apply for the Project.

21.4.2.1.4 Change in Employment Conditions

Employment conditions, from temporary and long-term employees (from construction and operations phases), may have a positive or negative effect on physical health. Irregular shift work is known to be associated with an increased risk of occupational injury due to fatigue and often less supervision and co-worker support during night-shifts (Canadian Centre of Occupational Health and Safety 2024). While Canada Nickel will have standard occupational measures in place to reduce the number of injuries for workers, accidental injuries may still occur, and like temporary employees, smoking and substance use could potentially increase related to a variety of factors such as stress, isolation, and boredom and changes in chronic illness.

Based on data made available through the Pan-Canadian Health Inequalities Data Tool, developed through collaboration of the Public Health Agency of Canada, the Pan-Canadian Public Health Network, Statistics Canada, and the Canadian Institute for Health Information, income in Ontario is associated with physical health. Those with higher incomes tend to have higher rates of physical activity, less rates of smoking, higher fruit and vegetable consumption, lower rates of anxiety, lower rates of heart disease and hypertension, greater food security, higher prevalence of regular access to a health care provider among other conditions compared to those with the lowest incomes (Pan-Canadian Health Inequalities Data Tool 2024). Overall, those who secure Project employment may experience reported physical health benefits. As noted in Chapter 23 of the Impact Statement, wages paid to the Project's direct workforce are estimated to be substantially higher than the average wage rates paid in the region, which means Project-related employment may be (and be perceived as) being more desirable than other forms of employment. However, given that the social determinants of health are complex and interrelated, educational attainment, working conditions (such as shift work and stress), and changes to mental health, social well-being and substance use are also contributing factors to chronic conditions and health outcomes.

During operations it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. As assessed in Chapter 22 of the Impact Statement, the number of available temporary accommodations in the LSA/RSA will not likely be sufficient to accommodate non-local workers. This scenario could lead to insufficient availability of accommodations and inflation in the housing rental market as the non-local workforce competes for rental spaces. This means that those with lower socioeconomic status (e.g., income) could be lead further into poverty or housing insecurity due to the competitive rental market and housing costs. Increased housing rental markets could lead to the most vulnerable populations experiencing higher financial pressures and

may have to make difficult decisions about the quality and quantity of food they can afford, which puts them at risk for food insecurity. Contrarywise, people with employment may have reduced financial-related pressures that could reduce housing concerns.

21.4.2.1.5 GBA Plus Considerations

As described in Section 21.2.1, a GBA Plus process has been applied throughout this VC to the extent possible given available information. Where feasible and possible, indicators have been disaggregated by segments of the population (e.g., gender, Indigeneity, sexual orientation and socioeconomic status) to describe disproportionate health outcomes. In terms of assessing residual effects on physical health, GBA Plus is considered in the evaluation of the environmental quality effect pathway by incorporating conservative assumptions toward protecting sensitive receptors (e.g., because of genetic makeup, age, health and nutritional status, behaviour). For example, toxicity reference values used in the human health risk assessment and noise limits used in the Noise and Vibration Assessment [Appendix C.3 of the Impact Statement] and VC [Chapter 13 of the Impact Statement] take into account sensitive individuals like children and the elderly. In addition, human receptors were selected such that these sensitive individuals and individuals having the greatest potential for exposure to chemical changes and adverse responses from such exposures were represented (e.g., Indigenous toddler).

For the other three effect pathways, GBA Plus considerations consider trends in existing conditions within the Porcupine Health Unit. For instance, as described in Section 21.2, males in the Porcupine Health Unit experience worse health outcomes than females, and both males and females in the Porcupine Health Unit experience worse health outcomes than males and females in Ontario, including higher rates of all cause mortality (Figure 21.3), premature and avoidable mortality (Figure 21.4), potential years of life lost from avoidable and preventable causes (Figure 21.5), mortality due to cancer (Figure 21.6), mortality due to chronic diseases (Figure 21.7), some STIs (Figure 21.9), and emergency department visits for all injuries (Figure 21.11). Women on the other hand tend to have higher rates for some STIs (i.e., chlamydia) (Figure 21.8) and emergency visits from self harm (Figure 21.15).

Low-income (including persons living with a disability or lone parent families) households, including those of Indigenous peoples, may be more susceptible to potential changes in Project-related cost of living and food insecurity as these populations already experience disproportionate rates of food insecurity. Therefore, any potential changes to cost of living as a result of the Project may place these populations and their families at a disadvantage and risk of becoming food insecure. Potential changes of cost of living due to the Project may also contribute to these segments of the population struggling to find safe and affordable housing, thereby risking increased homelessness or overcrowding. These potential effects may further affect child development.

2SLGBTQQIA+ populations are also overrepresented by the homeless population and have higher rates of suicide ideation (Government of Canada 2024b). This general trend may also occur within the RSA, and potential Project-related changes in cost of living or Project-related income and employment conditions could affect these populations disproportionately.

21.4.2.2 Mitigation and Enhancement Measures

Canada Nickel is committed to the following mitigation and enhancement measures related to surface water and groundwater that can reduce potential changes in physical health.

- Canada Nickel will limit the construction footprint (i.e., PA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds and subwatersheds overprinted by the PA.
- Canada Nickel will prepare an Emergency Preparedness and Response Plan and a Spill Prevention and Contingency Plan which will describe spill prevention, contingency planning and reporting practices for the timely and effective response to fuel and other chemical spills.
- Canada Nickel will install contact water collection ditches around the Stockpiles, Impoundment Facility, and TMF to collect toe seepage and groundwater recharge from these Project components.
- Canada Nickel will implement progressive rehabilitation (placement of a vegetated soil cover) to reduce infiltration into the Impoundment Facility and TMF, thereby reducing the amount of water and loading to groundwater and improvements to groundwater quality.
- Canada Nickel will develop and implement a Metal Leaching and Acid Rock Drainage Management Plan to reduce and limit the known and potential risks of metal leaching and acid rock drainage associated with the Project, thereby reducing potential effects to water quality.
- Canada Nickel will routinely monitor construction areas to identify areas of potential erosion and apply appropriate erosion and sedimentation control measures.
- Canada Nickel will treat water effluents prior to discharge to the receiving environment, as required, to meet regulatory criteria including an Environmental Compliance Approval issued by the MECP as well as criteria developed through the receiving watercourse Assimilative Capacity Study (Appendix G of the Surface Water Resources Assessment [Appendix C.5 of the Impact Statement]), in addition to the Metal and Diamond Mining Effluent Regulations.
- Canada Nickel will implement water treatment through use of a water treatment plant to receive discharge from the TMF, collection ponds and will use proven processes to treat the water to meet regulatory effluent criteria prior to discharge to the environment.

Canada Nickel is committed to the following mitigation and enhancement measures related to the atmospheric environment and acoustic environment that can reduce potential changes in physical health.

- Canada Nickel will engage with municipal authorities and provincial Crown land use permit holders to address potential conflict, disturbance, or access restrictions to municipal and Crown land use areas.
- Canada Nickel will impose the following restrictions within the Modeled Mine Boundary as presented on Figure 12.4 (see Chapter 12) at receptor locations R01 and R05:

- Agreements with property owners within the restricted area to remove buildings (through acquisition of the property or other arrangements).
- Agreements with other individual landowners to prevent construction of any seasonal or permanent housing through acquisition or specific agreements to defer any construction until after mine operations are completed.
- Crown Leases to be obtained on Crown lands, to restrict access.
- In addition to the receptor specific mitigations listed above, the following general mitigation are proposed:
 - Install signage and/or gates on trails to restrict access and prevent overnight stays in the Modelled Mine Boundary (agreement with landowners if needed to place the signs).
 - Work with the snowmobile clubs to prohibit overnight stays in warming huts except in cases of emergency along the snowmobile trail (signage for warming huts to be installed).
- Canada Nickel will consider the following principles during the Project lighting design for construction, operations and closure/decommissioning:
 - Project lighting (locations, intensity) will be limited to that which is necessary for safe and efficient Project activities.
 - Use lighting fixtures that limit or concentrate the lighting to targeted areas and avoid light spilling out of the spaces to be illuminated.
 - Limit the projection of light toward the sky by using fixtures that meet actual lighting needs.
 - Avoid the emission of light at more than 90 degrees, using luminaires with known cut-off specifications.
 - Mobile and permanent lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside of the PA, to the extent practicable.
- Canada Nickel will design the exterior lighting systems for Project operations to include directional lighting to limit light trespass and to avoid glare. Downward directed, full cutoff luminaires will be incorporated into the Project lighting plan (where practical) and portable lighting will be positioned to limit visibility outside the PA.
- Canada Nickel will leave tree cover in place to reduce the line-of-sight from onsite infrastructure to Highway 655.

Canada Nickel is committed to the following mitigation and enhancement measures related to social and economic conditions that can reduce potential changes in physical health.

- Canada Nickel will develop a Health and Medical Services Plan (HMSP) to manage occupational and non-occupations injuries and illness. This will include provision of medical care at the Project site through the onsite presence of medical personnel. Canada Nickel will also make available an on-line physician 24 hours/day. The HMSP will also include procedures to manage communicable diseases and access to an Employee Family Assistance Program (EFAP).

- The Project footprint will be limited to the extent possible (i.e., PA) including site clearing and disturbance associated with access routes and realigned transmission line corridor/Highway 655 Right of Way.
- Canada Nickel will install signage around the PA to alert land users of the presence of the Project and its facilities.
- Canada Nickel will engage with municipal authorities and provincial Crown land use permit holders to address potential conflict, disturbance, or access restrictions to municipal and Crown land use areas.
- Canada Nickel will undertake rehabilitation activities in consideration of desired end land uses that are achievable in the preparation of the Mine Development Closure Plan (refer to Appendix F of the Impact Statement for the Conceptual Closure Plan) under the provisions of the Mining Act for the Project site.
- Where possible in accessible areas (e.g., along cleared rights-of-way), Canada Nickel will leave trees and other vegetation in place to buffer views of Project components.
- Canada Nickel will provide in-kind support to local snowmobile club(s) for the loss of a snowmobile trail and associated warming hut or re-establish a snowmobile trail bypass around the PA.
- Canada Nickel will prohibit Project personnel from hunting, fishing, and bringing firearms and fishing gear to the site while working to limit competition for wildlife and fish species.
- Canada Nickel will engage with local resource users (commercial hunters, trappers, bait harvesters) and Ministry of Natural Resources (MNR) Regional Officials to address to the extent possible the potential conflict, disturbance, or access restrictions to commercial hunting, trapping, and bait fishing areas in the Project Area, and availability of wildlife and bait fish resources.
- Medical staff will be trained in the delivery of naloxone and naloxone kits will be available on-site.
- Canada Nickel will increase flexibility in work schedules to enable the continued participation of Indigenous employees in traditional and cultural activities.

21.4.2.3 Project Residual Effect

21.4.2.3.1 Change in Environmental Quality

Actual or perceived changes in food quality and aesthetics in the LSA/RSA could lead to changes in the way people eat traditional foods and alter food security, which could lead to changes in physical health. For instance, as described in Chapters 25 to 28 of the Impact Statement, Apitipi Anicinapek Nation, Taykwa Tagamou Nation, Flying Post First Nations, Matachewan First Nation, Mattagami First Nation and Métis Nations of Ontario – Region 3 identified hunting/trapping, fishing and gathering sites within the PA, which during construction, operations, and decommissioning of the Project will not be available. For safety reasons, Canada Nickel will restrict overnight access in the Modeled Mine Boundary throughout the duration of the Project using a variety of measures listed above. While this practice would limit access to traditional sites, Canada Nickel plans to engage with Indigenous nations to identify and implement measures to mitigate these potential effects. Site access is a key element considered in the Impact

Benefit Agreement under negotiation with Indigenous Nations and will include the conditions for Indigenous Nations to access select areas of the PA for the exercise of Indigenous and Treaty Rights, acknowledging that, for safety and operational reasons, it may be necessary for Canada Nickel to restrict access to certain lands and/or activities within the PA. To address the influx of non-local workers participating in recreational activities like hunting that could negatively affect the availability of harvested foods (Chapter 22 of the Impact Statement), Canada Nickel will prohibit Project personnel from hunting, fishing, and bringing firearms and fishing gear to the site while working to limit competition for wildlife and fish species. As well, Canada Nickel will consider more flexible work schedules to enable the continued participation of Indigenous employees in traditional and cultural activities.

Sensory disturbances (e.g., noise and light) due to Project-related activities may change the outdoor recreational experiences in the LSA and RSA. Although federal and provincial criteria for noise will be met, sensory disturbance (e.g., change in noise levels) is predicted within the (Indigenous Interests) LSA as noise generated through construction, operations, decommissioning and closure activities may influence the quality of experience or required conditions that are connected to the exercise of Indigenous Nations' Indigenous and Treaty Rights, and are likely to increase when harvesting or engaging in other cultural activities in proximity to the PA and Modelled Mine Boundary.

Traditional harvesters may perceive the area as contaminated, which could lead to avoidance of harvesting areas and in turn, contribute to reduction in harvesting. A reduction in consumption of harvested foods may contribute to a change in dietary practices as households may seek alternative sources of food to consume that are less nutritious (e.g., store-bought food). Consumption of less nutritious food can contribute to an increased risk of chronic diseases (assessed in Section 21.4.2.3.3). However, as noted in Chapters 12 and 13 of the Impact Statement, light and noise levels associated with construction and operations are limited in nature and not expected to interfere with land use and would be most noticeable immediately adjacent to the PA.

Project construction and operations noise effects were assessed according to Health Canada and MECP guidance (Noise and Vibration Assessment Technical Data Report [Appendix C.3 of the Impact Statement] and Chapter 13 of the Impact Statement). These effects were evaluated at thirteen representative receptor locations (R01 through R13). The noise assessment concluded that noise levels are expected to exceed applicable noise criteria for sleep disturbance and a change in % highly annoyed people at three receptor locations during construction (R01, R02, and R03) and at five locations during Project operations (R01, R02, R03, R04, and R05). These receptor locations are within an area where it is anticipated the measured listed above (e.g., restrictions to access and/or the ability to stay overnight) will mitigate sleep disturbance and annoyance.

The effects of the Project lighting on nearby receptors are assessed by comparing modeled light levels to the specified light criteria (Appendix C.2 [Light Assessment] and Chapter 12 of the Impact Statement). The analysis of a change in ambient light focused on the potential effects that the Project infrastructure and activities could have on light trespass, glare and sky glow. Lighting can become obtrusive if the light criteria are exceeded. There are few light sensitive receptors in the LSA outside the PA, and they are all distant from the Project with intervening forested areas that will obstruct Project lighting. Therefore, no adverse light trespass impacts at the receptors are anticipated. However, portable light units typically illuminate an area lateral to the unit and are typically bright, powerful lights that unavoidably cause some glare and vertically directed illumination. This type of effect can be avoided by using directional light fixtures to avoid the transmission of light outside of the PA. By implementing this mitigation, the levels of light trespass and glare from mobile artificial lighting units are not expected to exceed guidelines at the receptor locations. Mitigation measures would also control light emissions that may contribute to sky glow, and so it is expected that sky glow levels would be like baseline conditions.

In terms of inhalation exposure of people to Project-related emissions, the risk assessment demonstrated that Project-related contaminants in air are not likely to be greater than the applicable health-based exposure limits and toxicity reference values at locations where people are expected to be present for extended periods of time (including overnight stays or beyond). However, given that some identified CoPCs are non-threshold contaminants for which any increase in exposure could result in increased risk of health effects (e.g., PM_{2.5}), mitigations will be undertaken to reduce releases of CoPCs to the environment during Project operations and monitoring will be undertaken through follow-up programs to evaluate exposures.

The risk assessment also considered multimedia exposures to Indigenous Receptors and Recreational Receptors while they engaged in activities within the LSA. This included exposures within the North Driftwood River, West Buskegau River, and Jocko Creek watersheds. It was assumed that these receptors (people) would have direct contact with soil, drink surface water, and consume fish, wild meat, and vegetation from the LSA. The quantitative risk characterization compared estimated exposures to the CoPC for each of the receptors with the toxicity reference values. This involved the calculation of either HQs or ILCR.

Of the CoPC assessed, only Project-related risk estimates for arsenic were identified above targets for the North Driftwood River and West Buskegau River watersheds, while Project-related risk estimates were below targets for the Jocko Creek watershed. The risk estimates for arsenic are primarily affected by exposures resulting from modelled changes in surface water, specifically through fish and potable water consumption. However, given that studies indicate most of the arsenic in fish is in a relatively non-toxic form, that modelled concentrations in fish tissues were below Health Canada maximum levels, and that concentrations in water meet guidelines for Canadian drinking water quality, it is expected that Project-related activities would not result in unacceptable health risk for people in the LSA. Because risk estimates are based on modelled concentrations, monitoring of arsenic in surface water and fish in each watershed assessed would better represent changes in exposure.

As well, for the North Driftwood River channel realignment, changes in methyl mercury concentration in angling fish compared to current existing are expected to be low (approximately 4% - Chapter 15 of the Impact Statement). As such, these changes are not expected to markedly increase potential exposures to methyl mercury through fish consumption due to the North Driftwood River Channel realignment.

Overall, with mitigation in place, changes to physical health via changes in the environmental quality pathway are expected to be neutral or adverse in direction, of low to moderate magnitude, limited to the LSA (biophysical changes) and RSA (social changes), short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.2.3.2 Change in Land Use

The physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect physical health through diet and nutritional changes. As well, Project-related income and employment opportunities may both positively and adversely influence individual and household food insecurity. Project-related influences on cost of living may lead to lower-income households struggling to afford sufficient and nutritious food to feed their families. The Project will result in revenue, taxes, and funding that will flow to municipal, provincial and federal governments in the RSA, contributing to the local, regional, provincial, and federal tax base during the life of the Project. Revenue, taxes, and funding will support the government to direct funds and resources to its respective priorities and interests, which can include improvements to food affordability and availability. Residents in the RSA successful in securing Project-related employment may have reduced financial-related pressures due to employment income which may bring some families out of food insecurity.

Also, as mentioned above, Canada Nickel will prohibit Project personnel from hunting, fishing, and bringing firearms and fishing gear to the site while working to limit competition for wildlife and fish species..

Overall, with mitigation in place, changes to physical health via changes in the traditional land use pathway are expected to be neutral, limited to the RSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.2.3.3 Change in Population Dynamics

Project-related population growth and employment of temporary workers (mainly from the construction phase) from outside of the region may increase competition for Indigenous food harvesting, increase infectious diseases, and increase the cost of living.

Matachewan First Nation, Mattagami First Nation and Flying Post First Nation expressed concern related to the influx of non-local workers, noting this could lead to increased recreational hunting and decreased success of hunting, trapping, and fishing for subsistence (Matachewan First Nation 2023a, Flying Post First Nation 2023b) and a decrease in abundance of harvested foods (Apitipi Anicinapek Nation 2024, Mattagami First Nation 2023a). As noted above, Canada Nickel will implement a number of mitigation and enhancement measures that are expected to reduce competition for Indigenous food harvesting.

Though Canada Nickel is committed to hire from local communities and the region, pending the availability of qualified applicants, workers from outside of the region will most probably be required to meet the workforce demand of the Project. It is assumed that majority of the construction workforce will be non-local workers that will require accommodation. The workforce for construction activities is expected to be made up of specialized (temporary) and generalized (more permanent) employees. It is also expected that specialized (temporary) employees will require temporary housing.

As assessed in Chapter 22 of the Impact Statement, the number of available temporary accommodations in the LSA/RSA will not likely be sufficient to accommodate the non-local workers. An insufficient availability of accommodations could lead to an inflation in the housing rental market due to the competition for rental spaces. This means that those with lower socioeconomic status (e.g., income) could be lead further into poverty or housing insecurity due to the competitive rental market and housing costs. However, an increase of on average 449 FTEs over a three-year construction cycle (assuming all are in need of temporary accommodation) represents less than a 1% increase to the population in the LSA (52,710 people; Table 23.4 in Chapter 23 of the Impact Statement). It is acknowledged that this change could be higher during periods when a maximum workforce is present (which would include permanent employees).

However, Northeastern Ontario has experience hosting mining projects and their workforces. In addition, Canada Nickel has plans to undertake an accommodations study and is in discussion with third parties to explore options to provide accommodations for Project workers (Chapter 22 of the Impact Statement). This study may provide insight into additional mitigation and management measures for Project accommodation. Historically, independent accommodation providers in the region have followed the trends of demand and have had the capacity to provide accommodations for temporary workers when required for large projects. The same is expected in the case of the Project (Chapter 22 of the Impact Statement).

Increased housing rental markets could lead to the most vulnerable populations experiencing higher financial pressures and may have to make difficult decisions about the quality and quantity of food they can afford, which puts them at risk for food insecurity. Contrarywise, residents in the LSA and RSA successful in securing Project-related employment may have reduced financial-related pressures due to employment income, which may bring some families out of food insecurity.

There are many factors that can contribute to the onset of chronic diseases including genetics, lifestyle behaviours, exposure to environmental conditions and the influence of the social determinants of health. Factors like income, employment, housing, access to health care and working conditions can directly and indirectly result in changes to chronic diseases. As assessed in Chapter 23 of the Impact Statement, wages paid to the Project's direct workforce are estimated to be substantially higher than the average

wage rates paid within the LSA and RSA. Income generally has a positive correlation with health outcomes meaning that those who earn higher incomes have lower rates of chronic diseases. However, since social determinants of health are complex and interrelated, factors such as educational attainment, working conditions (such as shift work and stress), and changes to mental health, social well-being and substance use also play a role in the development of chronic conditions and overall health outcomes. There is some ambiguity regarding which contributor has a stronger influence on chronic diseases, and this influence may vary from person to person. Regardless, Canada Nickel will have an HMSP that includes the presence of onsite medical personnel and access to online physicians 24 hours/day. Medical staff may be able to assist workers presenting with health concerns and provide guidance on follow-up. The HMSP is intended to reduce strain on the health care system within the Porcupine Health Unit with the influx of workers (assessed in Chapter 22 of the Impact Statement) and to reduce the onset of Project-related illness and injuries.

Since the Project is not, for example, remote, in an isolated northern environment, or associated with a “fly-in” workforce, an influx in transient workers is not expected to change rates of infectious disease, including STI transmission and changes to sexual health. Regardless, Canada Nickel will have access to virtual physician support for their workforce and their families, 24 hours/day, and will develop a plan to manage communicable diseases as part of the larger HMSP. These measures will enable workers to confidentially inquire about signs and symptoms of infectious diseases in a non-stigmatizing environment and seek treatment options. As well, in the event of an infectious outbreak (e.g., Covid-19), Canada Nickel will implement the measures developed in the HMSP to reduce and control infectious disease transmission at the worksite which could include measures such as timely communication with the Porcupine Health Unit, enhanced cleaning practices, social distancing, appropriate signage, and screening of workers as fit for duty.

Overall, with mitigation in place, changes to physical health via changes in the population dynamics pathway are expected to be neutral or negative in direction, of low to moderate magnitude, limited to the RSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.2.3.4 Change in Employment Conditions

Though Canada Nickel plans to hire primarily from local communities and Indigenous nations, workers from outside of the region will be required to meet the workforce demand of the Project. As described in Chapter 23 of the Impact Statement, there will be a maximum of 1,290 FTEs during phase 1 of operations (average of 1,200), 1,371 during phase 2 of operations (average of 850) and 334 during phase 3 of operations (average of 300), and it is assumed that 80% of the workforce is from out of region (Chapter 22 of the Impact Statement). During operations, it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities.

At present, it is estimated that Timmins has 359 individuals at risk of or experiencing homelessness and vacancy rates of less than 1.5% as of April 2024 (City of Timmins 2024). As such, this scenario could lead to insufficient availability of accommodations and inflation in the housing market, which could mean those with lower socio-economic status (e.g., income) could be lead further into poverty or homelessness due to

the competitive housing market and housing costs. The City of Timmins acknowledges that mining related employment is expected to increase and notes that there is demand for housing at every price point in the market (City of Timmins 2024). As noted above, Canada Nickel has plans to undertake an accommodations study and is in discussion with third parties to explore options to provide accommodations for Project workers. It is expected that independent accommodation providers in the region will provide accommodations for temporary workers as they have for other large projects (Chapter 22 of the Impact Statement).

Canada Nickel will have standard occupational measures in place to reduce the amount of injuries for workers. Shift rotations during construction were not available at the time of writing, but during operations, it is expected that there will be four rotating crews that work 12-hour shifts and on average 42-hours a week. It is anticipated that this work schedule will reduce work-related fatigue and burnout, and provide a more balanced lifestyle. Irregular shift work may contribute to sleep deprivation and fatigue, which can result in work-related accidents and injuries (Canadian Centre for Occupational Health and Safety 2024). Canada Nickel anticipates that workers will commute daily from existing residences in communities located within approximately an hour drive of the Project site.

Canada Nickel will have a HMSP that includes provisions for on-site and virtual medical staff. This will include provision of medical personnel at the Project site and access to on-line physician 24 hours/day. Canada Nickel will also provide access to an EFAP.

It is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. The nearest large communities to the Project are Timmins, Smooth Rock Falls, Cochrane, and Iroquois Falls, each of which has a general hospital with in and/or outpatient services that employees turned residents can access.

Overall, with mitigation in place, changes to physical health via changes in the employment conditions pathway are expected to be neutral, positive or negative in direction, of low to moderate magnitude, limited to the LSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.2.3.5 GBA Plus Considerations

As described above, GBA Plus considerations for changes in physical health are inherent to the assessment of chemical, noise and light exposure. In terms of changes in traditional land use, population dynamics and employment conditions, and the direct and indirect links to health effects and outcomes, effects from Project activities could be experienced disproportionately in the temporary and permanent workforce and Indigenous and non-Indigenous people. More specifically, changes in land use disproportionately affect Indigenous nations, changes in population dynamics disproportionately affects those with lower social and economic status, and Indigenous and 2SLGBTQQIA+ community members are overrepresented in this group. Children and youth within these groups are particularly susceptible.

Crawford Nickel will have mitigation measures in place that are meant to alleviate these effects. For example, hiring practices have been developed to encourage employment of Indigenous peoples, local youth, women, and under-represented populations; Canada Nickel will provide access to an EFAP; and Canada Nickel is developing Code of Conduct and Ethics, Violence and Harassment, Diversity and Inclusion, Fit for Duty, and Cultural Awareness policies. Canada Nickel has also made, and will continue to make, contributions to support social, economic, health, and other activities/programs for local communities through its Community Contributions Program. Canada Nickel will continue future collaboration with recreational, social, economic, municipal, and health groups to identify impacts and develop mitigation measures.

21.4.3 Change in Mental Health and Social Wellbeing

21.4.3.1 Project Pathways

Mental health and social wellbeing is defined as an individual's psychological and emotional state and how that relates to the ability to communicate with others and build meaningful relationships in a community (i.e., community wellbeing). As identified in Section 21.1.3, Project activities have the potential to lead to adverse and positive effects on mental health and social wellbeing through the following effects pathways. These effect pathways are the same as those assessed in changes to physical health because the outcomes are often tied to mental and social wellbeing (Figure 21.1).

21.4.3.1.1 Change in Environmental Quality

Mental health and social wellbeing can be affected by Project-related changes in environmental quality. Actual or perceived changes in the quality of air, water, soil, and country foods, and alterations in noise and light levels, could lead to behavioural and biological changes related to stress responses and coping mechanisms (Figure 21.1). Perceived changes in food quality and Project-related aesthetic disturbances (e.g., increased noise or decreased visual quality) could lead to changes in the way people eat traditional foods and alter food security, which could lead to behavioural changes and coping mechanisms.

A case study about the Pictou Landing First Nation, summarized by Lewis et al. (2021), illustrates how changes in environmental quality by an industrial project can affect health and wellbeing. Community members were concerned about contamination in a culturally significant water body due to the long-term release of pulp and paper mill effluent. Lewis et al. (2021) found that:

- 88% of participants reported good to excellent physical health when they were not fearful of their environment, compared to only 45% when they were fearful.
- 84% of participants felt depressed when fearful, whereas 63% felt depressed when not fearful. Fear of the environment did not seem to affect happiness, which Lewis et al. hypothesized might be a coping strategy.
- 85% of those fearful of their environment considered spirituality important, compared to 67% of those who were not fearful.

This study suggests that physical and mental health outcomes are directly linked to fear of degradation of the environment.

Noise and light can lead to an increase in potential community annoyance, and the ability to enjoy nighttime views because of increased sky glow and light trespass in an already dark area. As noted by Whitfield Aslund et al. (2013), noise-related annoyance is described as a “feeling of displeasure evoked by a noise” (Berglund and Lindvall 1995), and although annoyance is considered to be the least severe potential impact of community noise exposure (WHO Europe, 2011), it has been hypothesized that sufficiently high levels of noise-related annoyance could lead to negative emotional responses (e.g., anger, disappointment, depression, or anxiety) and psychosocial symptoms (e.g., tiredness, stomach discomfort and stress) (summarized in Whitfield Aslund et al. 2013)). Noise and light can also affect quality of sleep, which in turn can affect mental health and well being (e.g., sleep disturbance, use of sedatives, insomnia) (WHO 2009).

21.4.3.1.2 Change in Land Use

The physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect mental health and social wellbeing of people in the LSA. Among Indigenous nations in the LSA/RSA there is a concern that industrial activities are affecting food harvesting (Taykwa Tagamou Nation 2023a, Flying Post First Nation 2023b, Mattagami First Nation 2023a, Matachewan First Nation 2023a). These concerns may affect mental health and social wellbeing through behavioural changes and coping mechanisms. For example, for Indigenous populations, mining, like many other projects (e.g., oil and gas extraction, hydroelectric power generation) can be associated with several mental wellness effects including fear, anxiety, depression, anger, sense of loss (solastalgia), loss of self-esteem, loss of agency, feelings of injustice, domestic issues and reduced social cohesion (Salerno, et al. 2021). The loss and alteration of culturally important features, locations or areas may reduce opportunities for knowledge transmission, which can adversely affect cultural continuity. Loss of knowledge transmission is connected to mental wellbeing and social wellbeing for Indigenous peoples (Salerno, et al. 2021). A potential reduction in land-based activities such as harvesting and cultural events could affect cultural continuity which has a positive effect on mental health conditions including personal identity, self-esteem, and healthy coping mechanisms (Loppie and Wien 2022).

21.4.3.1.3 Change in Population Dynamics

Project-related population growth and employment of temporary workers from out of region may increase competition for food harvesting, changes in cost of living, and changes to the family unit that may affect mental health and social wellbeing through behavioural changes and coping mechanisms. It is estimated that based on average incomes, for a family of four working full-time earning minimum wage that 31% of income is required to purchase healthy food (Porcupine Health Unit 2023b). Project-related influences on cost of living may lead to lower-income households struggling to afford sufficient and nutritious food to feed their families, and this could lead to stress and unhealthy coping mechanisms (e.g., increased substance use). Project-related influx in temporary out of region workers may contribute to increases in recreational hunting, which could have adverse effects related to food availability for traditional hunters,

which could also result in stress and unhealthy coping mechanisms (e.g., increased substance use) and change the way people sense their belonging to a community.

Men have disproportionate rates of alcohol and substance abuse, and trade workers (who are predominately male) are more impacted by substance use and addiction than other fields of work due to physically demanding work and pain management (Government of Canada 2023). In the Porcupine Health Unit, rates of risky drinking, smoking, opioid-related hospitalizations, emergency department visits and deaths and drug crime violations are higher than provincial rates (Section 21.2.2.3) which makes the communities more vulnerable to substance abuse associated with a non-local workforce. From a bigger picture perspective, male tradespersons/construction workers are at greater risk for substance abuse; their influx into these already affected communities could exacerbate an existing problem.

21.4.3.1.4 Change in Employment Conditions

Employment conditions, from temporary and long-term employees (from construction and operations phases), may have a positive or negative effect on mental health and social wellbeing through behavioural changes and coping mechanisms. Positive effects can also be attributed to Project-related income and employment, which may alleviate stress related to household financial strain and contribute to positive family dynamics. Project-related income and employment opportunities may positively influence individual and household food insecurity and Project-related influences on cost of living may lead to lower-income households struggling to afford sufficient and nutritious food to feed their families, which could also affect mental health and social wellbeing through behavioural changes and coping mechanism. The Porcupine Health Unit (2023) notes “Household food insecurity is harmful to our health and well-being. It also creates a burden on our healthcare system. Children are more likely to lack self-efficacy to make healthy lifestyle choices. Adults experiencing food insecurity often have poorer mental [e.g. anxiety, depression], physical [e.g. diabetes, high blood pressure], and oral health”.

Workers’ and communities’ sense of belonging and life satisfaction may positively change as a result of the Project. Examples of positive social wellbeing have been observed through improvements or additions of new infrastructure or community investments as a result of other resource extraction projects (Prospectors & Developers Association of Canada 2022).

For those successful in securing Project employment, working conditions such as shift work and stressful working conditions, often accompanied by high wages, may contribute to adverse coping mechanisms such as substance abuse (National Inquiry into Missing and Murdered Indigenous Women and Girls 2019; Northern Health 2018). Shift work associated with the Project may adversely contribute to family dynamics given that workers may be away from their families for longer periods of time and many household responsibilities may fall on the partner who is at home, leading to potential loneliness and stress, family instability, abandonment and divorces and child neglect (Northern Health 2018). However, in the literature cited by Northern Health, these effects were associated with boom-bust cycles in remote communities and as such are not directly applicable to the Project, but do highlight some of the concerns associated with this type of employment.

High project wages earned by workers may be a risk factor for risky drinking as there is an inverse relation between alcohol and income, meaning those who earn more, have higher rates of risky drinking (Pan-Canadian Health Inequalities Data Tool 2023). Risky drinking may disproportionately affect men employed by the Project compared to women as men in Ontario, have higher rates of heavy drinking (and substance use as noted above) (Pan-Canadian Health Inequalities Data Tool 2023).

As noted above, during operations it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. At present, Timmins has vacancy rates of less than 1.5% as of April 2024 (City of Timmins 2024), meaning those employees and their families looking for permanent housing could face difficulty securing housing, and this could lead to changes in mental health and social wellbeing.

During operations, it is anticipated that there will be four rotating crews that work 12-hour shifts and on average 42-hours a week. This shift schedule may allow workers to spend more time with families and friends and is anticipated to reduce mental health outcomes associated with shift work. Conversely, and as noted above, during operations it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. Being part of a community provides several important benefits that contribute to positive mental health and social well-being. As a member of a community, a sense of belonging and ability to connect with others are necessary for psychological well-being and by connecting with others, community members can experience feelings of emotional support, learn about shared values and beliefs, and limit their isolation and loneliness (Stein 2023). These sources of support are particularly critical during times of crisis to prevent declines in mental health, increased stress and anxiety, and social disconnection (Bowe et al. 2022). More specifically, Timmins has a Community Safety and Well-being Plan (2021) with goals including an innovative community approach to end homelessness, improved care and outcomes for residents suffering from mental health or addiction related issues, and youth-focused community programs that promote well-being, inclusivity and resiliency. There is also emphasis on eradicating gender-based violence and fostering a safe and equitable society.

21.4.3.1.5 GBA Plus Considerations

As described in Section 21.2.1, a GBA Plus process has been applied throughout this VC. Where feasible and possible, indicators have been disaggregated by segments of the population (e.g., gender, Indigeneity, sexual orientation and socioeconomic status) to describe disproportionate mental health and social well being outcomes.

Indigenous peoples and low-income (including persons living with a disability or lone parent families) households may be more susceptible to potential changes in Project-related cost of living and food insecurity as these populations already experience disproportionate rates of food insecurity (Section 21.2). Therefore, any potential changes to cost of living as a result of the Project may place these populations and their families at a disadvantage and risk of becoming food insecure, which would lead to disproportionate rates of potential changes in mental health and wellbeing. As noted in Section 21.4.2.2, males in the Porcupine Health Unit experience worse health outcomes than females (see Section 21.2), and both males and females in the Porcupine Health Unit experience worse health outcomes than males

and females in Ontario. Experiencing the aforementioned health outcomes can lead to changes in mental health and social wellbeing above that seen in existing conditions.

2SLGBTQQIA+ communities may be at an increased risk of experiencing adverse mental health outcomes as a result of Project-related working conditions. 2SLGBTQQIA+ populations currently are experiencing disproportionate rates of bullying, poor mental health, and suicidal ideation (Government of Canada 2024b). This general trend may also occur within the RSA, and potential Project-related changes in cost of living or Project-related income and employment conditions could affect these populations disproportionately. As well, 2SLGBTQQIA+ persons employed by the Project could experience discrimination in the workplace and in the community and in turn may have increased rates of adverse mental health outcomes.

As noted in Chapter 23 of the Impact Statement, within the LSA, men+ (includes men, and/or boys, as well as some non-binary persons) account for the largest proportion of the employed labour force in most occupations likely to provide the goods, services, and labour to the Project. Men+ also account for the greatest proportion of the population with an apprenticeship or trades certificate or diploma, education required for occupations with the most demand during all Project phases. Average employment income (both mean and median) earned by men+ is greater than that earned by women+ (includes women (and/or girls), as well as some non-binary persons) within the LSA and is greater among the non-Indigenous population than the Indigenous populations. Further, women+ are disproportionately under-represented in the mining labour force.

21.4.3.2 Mitigation and Enhancement Measures

Canada Nickel is committed to the following mitigation and enhancement measures related to social and economic conditions that can reduce potential changes in mental health and social wellbeing.

- Canada Nickel is participating in the initiative “Equal by 30”, which aims to increase benefits to women and to accelerate gender equality and diversity to close the gender gap by 2030.
- Canada Nickel will develop a HMSP to manage occupational and non-occupations injuries and illness. This will include provision of medical care at the Project site through the onsite presence of medical personnel. Canada Nickel will also make available an on-line physician 24 hours/day. The HMSP will also include procedures to manage communicable diseases and access to an EFAP.
- Canada Nickel has made, and will continue to make, contributions to support social, economic, health, and other activities/programs for local communities, including Indigenous nations through its Community Contributions Program. This Program includes a local procurement policy, as well as a sponsorship and donation strategy adapted to Canada Nickel’s guiding principles and the needs of the communities.
- Canada Nickel is committed to hire from local communities and the region, pending the availability of qualified applicants.

- Canada Nickel will engage with local municipalities on the availability of housing to inform the housing strategy for the area that encourages and provides opportunities for workers to move permanently into the area.
- Canada Nickel is in regular communication with local training/education institutions regarding existing, upcoming, and potential course and training offerings, and how this aligns with Canada Nickel's anticipated needs. Canada Nickel continues to explore education, training opportunities and will develop hiring practices that encourages the employment and retention of qualified Indigenous peoples and local community members, including opportunities targeted towards youth.
- Canada Nickel will explore opportunities to support training, education, and scholarship programs that improve employment opportunities, including participation in and contribution to local training networks, which are targeted at diverse groups such as Indigenous nations, local youth, and various relevant subgroups, such as the Indigenous Skills and Employment Training Program.
- The work schedule and crew rotations will be adapted when practical to decrease the number of non-local workers requiring accommodations at any one time.
- Canada Nickel has established communication with recreational, social, economic, municipal, and health groups and will continue to collaborate around impact identification and development of mitigation measures.
- Canada Nickel will undertake a detailed Project accommodation study based on workforce requirements and develop an Accommodations Management Plan.
- Canada Nickel is committed to, and has been engaged in, on-going discussions with third parties, including Indigenous nations, to explore opportunities for the provision of accommodations in the region to support offsetting the house needs during construction and operations.
- Canada Nickel will communicate Project needs to local accommodation providers, including hotel, motel, and bed-and-breakfast accommodation providers to help secure rooms for construction workers.
- Canada Nickel will increase flexibility in work schedules to enable the continued participation of Indigenous employees in traditional and cultural activities.
- Canada Nickel has or will be developing several policies, procedures, and training programs which will mitigate adverse effects on services and infrastructure. These are:
 - Health and Safety Policy
 - Local Procurement Policy
 - Code of Business Conduct and Ethics
 - Workplace Violence, Harassment and Discrimination Policy
 - Diversity and Inclusion
 - Fit for Duty, including Drug and Alcohol Policy
 - Cultural Awareness Training

21.4.3.3 Project Residual Effect

21.4.3.3.1 Changes in Environmental Quality

To address fears about environmental change, including perceptions from traditional harvesters, Canada Nickel is committed to engage with potentially affected Indigenous nations to understand and mitigate the Project's impacts on Indigenous interests, explore opportunities to enhance Project benefits, and consider Indigenous nation's recommendations and input on Project decisions, including the development of management plans (e.g., CEMP, Traffic Management Plan; Health and Medical Services Plan). As well, follow-up programs (see Chapter 34 of the Impact Statement) will be developed with input from potentially affected Indigenous nations, the results of which will be shared with Indigenous nations during ongoing engagement. Through this ongoing collaboration, Canada Nickel aims to foster a positive long-term relationship with Indigenous nations throughout the life of the Project. Research has shown that relationship building efforts can positively enhance community cohesion and mental health impacts (e.g., Salerno, et al. 2021).

Overall, with mitigation in place, changes to mental health and social wellbeing via changes in the environmental quality pathway are expected to be neutral, positive and negative in direction, of low to moderate magnitude, limited to the LSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.3.3.2 Change in Traditional Land Use

Physical presence of the Project could change traditional land use, which could lead to reductions in country food availability and accessibility that may affect mental health and social wellbeing. Site access is a key element considered in the agreements under negotiation with the Indigenous Nations and will include the conditions for the Indigenous Nations to access select areas of the PA for the exercise of Indigenous and Treaty Rights, acknowledging that, for safety and operational reasons, it may be necessary for Canada Nickel to restrict access to certain lands and/or activities within the PA. It is expected that the Indigenous Nations will be able to continue their harvesting, hunting, trapping and fishing activities on accessible Crown lands and other areas where their member's currently exercise their Indigenous and Treaty Rights outside of the PA. As noted above, Canada Nickel is committed to engage with Indigenous nations to understand and mitigate the Project's impacts on Indigenous interests. Through this ongoing collaboration, Canada Nickel aims to foster a positive long-term relationship with Indigenous nations throughout the life of the Project.

Overall, with mitigation in place, changes to mental health and social wellbeing via changes in the traditional land use pathway are expected to be neutral, positive and negative in direction, of low to moderate magnitude, limited to the RSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.3.3.3 Change in Population Dynamics

For those successful in securing Project-related income and employment there may be positive mental health and social wellbeing effects. Positive effects are related to Project-related income that can be realized directly through Project employment, or indirectly through potential increases in local economy and businesses due to the presence of a non-local workforce or industry specific business (changes to regional employment, regional business and provincial economy are assessed in Chapter 23 of the Impact Statement). Project-related income can reduce financial strain and potentially financial-related stress that may be contributing to adverse family dynamics. Project wages are anticipated to be substantially higher than the average wage in the LSA and RSA (assessed in Chapter 23 of the Impact Statement), and local workers successful in securing employment by Canada Nickel may have more income that can go towards safe housing, nutrient dense food and recreational activities that support mental health and social wellbeing.

The Project is anticipated to result in positive effects on employment, business, and the economy (assessed in Chapters 22 and 23 of the Impact Statement). Increased employment is expected to have positive effects on Indigenous unemployment rates, increase income levels for Indigenous individuals (and families) who secure employment with the Project and will provide valuable employment experience that can be leveraged by Indigenous workers to secure employment with other projects/employers following completion of Project-related work (assessed in Chapter 23 of the Impact Statement). Canada Nickel will also implement measures specifically aimed at increasing economic participation among local and Indigenous businesses (assessed in Chapter 23 of the Impact Statement).

Non-local worker living arrangements may generate positive and adverse effects on mental health outcomes and social wellbeing. Since workers (local and non-local workers) will be living within the communities in the RSA, they may have more opportunities for flexible accommodation options and can choose accommodation location based on preferred extra curricular activities (e.g., residing close to a rec center, park or downtown). This may enhance mental health and social well-being as workers have 'freedom' to reside in areas of their choice. Contrarywise, non-local workers will have added responsibility of securing accommodations in the RSA. As assessed in Chapter 22 of the Impact Statement, it is anticipated that the number of available temporary accommodations in the LSA and RSA will not be sufficient to accommodate non-local workers and existing stock of home ownership housing is not adequate to meet the current demand. Canada Nickel is committed to, and has been engaged in, ongoing discussions with third parties, including Indigenous nations, to explore opportunities for the provision of accommodations in the region to support offsetting the house needs during construction and operations. This is anticipated to reduce any Project-related stress workers may have in finding temporary accommodations for the duration of their shift. In the event that workers share accommodations, there may be positive and adverse effects on mental health with house sharing. Personality traits and habits may be complementary or conflicting. If complementary, workers may have positive experiences with their house mate which can positively contribute to mental health and social well-being, however, if workers experience personality conflicts, there may be adverse effects on mental health and social well-being.

As well, the communities in the RSA are experienced with a labour force made up of miners. For example, the mining, quarrying, and oil and gas extraction sector is the next largest source of

employment in the RSA (~12% - tied with retail trade but less than employment in health care and social assistance at 16%) (Statistics Canada 2022a). This means that while the Project might bring people to the RSA for employment, it will not create a new work sector in the communities.

The Project is anticipated to result in both positive and adverse effects on Indigenous employment, business, and economy within the region during all Project phases (Chapter 23 of the Impact Statement). Positive effects include direct, indirect, and induced employment and labour income in the Economic Conditions LSA and other parts of Ontario and Canada. Increased employment is expected to have positive effects on Indigenous unemployment rates, increase income levels for Indigenous individuals (and families) who secure employment with the Project and will provide valuable employment experience that can be leveraged by Indigenous workers to secure employment with other projects/employers following completion of Project-related work (Chapter 23 of the Impact Statement). Canada Nickel will also implement measures specifically aimed at increasing economic participation among local and Indigenous businesses (Chapter 23 of the Impact Statement). However, adverse effects on regional businesses, including Indigenous ones, are expected throughout the Project phases. This is mainly due to Project wages being higher than current conditions, aligned with mining industry standards, making Project jobs more appealing compared to other employment in the Economic Conditions LSA/RSA. This could increase labor competition and push wages up to attract and retain workers (Chapter 23 of the Impact Statement).

Overall, with mitigation in place, changes to mental health and social wellbeing via changes in the population dynamics pathway are expected to be neutral, positive or negative in direction, of low magnitude, limited to the RSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.3.3.4 Changes in Employment Conditions

Stress from securing housing could have adverse effects of mental wellbeing of employees and their families. Also, as noted above, high wages by Project workers may lead to risky drinking as those who earn more tend to have higher such rates. Canada Nickel will have an HMSP that includes provisions for on-site and virtual medical staff. Canada Nickel will also make available an on-line physician 24 hours/day. Canada Nickel will also provide access to an Employee Family Assistance Program. As well, those in need of mental health support, if needed, can access additional non-Project services through the Porcupine Health Unit. However, once established, the benefits of being in a community are available, and this can lead to positive mental health and wellbeing outcomes.

As noted above, the communities in the RSA are experienced with a labour force made up of miners. This means that while the Project might bring people to the RSA for employment, it will not create a new work sector in the communities.

As noted before, during operations it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. Because the vacancy rates in the RSA are low, insufficient availability of accommodations and inflation in the housing market, could result in short term to long term strain on employees and their families. The City of Timmins acknowledges that mining related employment is expected to increase and notes that that there is demand for housing at every price point in the market (City of Timmins 2024).

Canada Nickel is committed to enhancing the positive impacts locally of the Project through the inclusion of mitigation and enhancement measures. Canada Nickel's corporate gender equity and diversity policies include provisions to hire locally first, with a focus on hiring members of Indigenous nations, women, and youth to increase Project employment among underrepresented populations, as well as to reduce the wage inequality gap between men, women, and Indigenous populations. This includes providing training opportunities for local people. For Indigenous peoples, accommodations are provided to allow employees to engage in traditional and cultural activities.

In addition, with emerging technology trends, employees require a specific set of skills, and Canada Nickel is working to develop courses that will be administered by local institutions, which will include apprenticeship programs as well as specialized training for vehicle operation. This program will be run multiple times to provide an opportunity to equip locals with the skills needed to work on the Project. Further, Canada Nickel will develop a Diversity and Inclusion Policy, which does not discriminate against employees or contractors of the company based on race, ethnicity, physical/mental capabilities, sexual orientation, or Indigeneity, and requires employees to adhere to respectful workplace practices.

Overall, with mitigation in place, changes to mental health and social wellbeing via changes in the employment conditions pathway are expected to be neutral, positive or negative in direction, of low to moderate magnitude, limited to the RSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.3.3.5 GBA Plus Considerations

As previously described, Project-related working conditions may contribute to an increase in adverse mental health conditions and in turn, unhealthy coping mechanisms such as substance use. Indigenous persons, men and 2SLGTBQQIA+ persons may realize disproportionate rates. Stigma, associated with mental health may disproportionately effect men and 2SLGTBQIIA+ persons which could result in avoidance to seek support and treatment even though Canada Nickel will provide access to an effective EFAP service. Enhancements in a supportive working culture may contribute to an increase in mental health support utilization within male dominated professions.

While gender roles are evolving, and Canada Nickel will implement education, training and hiring practices to encourage employment and retention of Indigenous peoples, local youth and under-represented populations (e.g., women), there remains disproportionate rates of women in mining (per Chapter 23 of the Impact Statement, 80.2% are men and 19.8% are women), which means that women are likely to experience adverse effects of their spouses working shift work (e.g., added household responsibilities).

21.4.4 Change in Community Safety

21.4.4.1 Project Pathways

The Ontario Ministry of Community Safety and Correctional Services (2021) defines community safety and well-being as “The ideal state of a sustainable community where everyone is safe, has a sense of belonging, opportunities to participate, and where individuals and families are able to meet their needs for education, health care, food, housing, income, and social and cultural expression.” Potential changes in community safety are inherently linked to changes in physical health and mental health and social wellbeing. As identified above, Project activities have the potential to lead to adverse and positive effects on physical health and mental health and social wellbeing through four pathways, and while all four can be associated with community safety (Figure 21.1), changes in population dynamics and employment condition are most directly relevant to the assessment of residual effects.

21.4.4.1.1 Changes in Population Dynamics

Changes in community safety are directly and indirectly linked to changes in physical health and changes in mental health and social wellbeing, particularly via the population dynamics pathway because resource development is known to be, in some cases, associated with adverse community safety due to increases in crime. As noted in the National Inquiry into Missing and Murdered Indigenous Women and Girls (2019), crime can increase due to the influx of transient (i.e., temporary) and in migration (i.e., out of region) non-local workers required to satisfy Project-employment demands. Examples of community safety concerns published in the literature include organized gang, sex-trade related activities and drug-related crime, increasing assault rates, including sexual assaults and missing persons reports (summarized in Northern Health 2018). However, these effects are often associated with remote mine projects, those with worker camps, and those associated with boom town communities. Regardless, with an increase in population in a community, there could also be an increase in the number of individuals that take part in criminal activity. Nevertheless, this doesn't necessarily imply that overall community safety will be affected, as individual actions do not necessarily lead to substantial changes in the community.

As noted in Chapter 22 of the Impact Statement, the transportation of Project goods, services, and workers during construction will lead to additional use of existing transportation infrastructure. During the realignment of Highway 655, it is expected that there will be some delays in local traffic. In both cases, an increase in traffic and change in traffic movement could increase the relative risk of an accident or increase response times in the event of an emergency).

21.4.4.1.2 Changes in Employment Conditions

Though Canada Nickel plans to hire primarily from local communities and Indigenous nations, workers from outside of the region will be required to meet the workforce demand of the Project. During operations it is expected that workers will be employed full-time through the life of the Project, with a goal that the majority of workers will reside in surrounding communities. As noted above, being part of a community provides several important benefits that contribute to positive mental health and social well-being which are directly related to community safety. For example, it stands to reason that strong social bonds and community engagement foster a sense of belonging and mutual support, which can deter criminal

behavior, and employment and living wages are known to reduce the stress and desperation that can lead to criminal activities. And as noted before, access to health care (through Canada Nickel and the communities where people reside) can lead to safer communities.

Also as noted in Chapter 23 of the Impact Statement, the transportation of Project goods, services, and workers will lead to additional use of existing transportation infrastructure, which could decrease traffic safety during operations.

21.4.4.1.3 GBA Plus Considerations

Indigenous women and girls experience disproportionate rates of violence compared to the general population. For instance, 46% of Indigenous women experience sexual violence in their lifetime compared to 33% of non-Indigenous women (Heidinger 2021). In response to the disproportionate rates of violence experienced by Indigenous women and girls, including the 2SLGBTQIA+ peoples, the National Inquiry into MMIWG was launched in 2016 (Government of Canada 2020b). The National Inquiry into MMIWG discussed how the dehumanizing process and structure of colonization has contributed to discrimination, racism and is foundational to the social inequities that contribute to the disproportionate rates of (National Inquiry into Missing and Murdered Indigenous Women and Girls 2019).

Flying Post First Nation posed concerns about the safety of women and children including rates of sexual violence with respect to temporary work camps (Flying Post First Nation 2023a) and Matachewan First Nation was concerned about the lack of safe spaces for women and stated, “women and mothers don’t always have a safe space to go during emergency or violent situations” (Matachewan First Nation 2023b).

Given that majority of transient workers are anticipated to be men, there remains a degree of safety concerns related to sexual behaviours in the community. Indigenous women and girls and the 2SLGBTQIA+ community are particularly at risk of being victims of gender-based violence as there is an overrepresentation of intimate partner violence and gender-based violence among these populations (described in Section 21.2.3.5). Apitipi Anicinapek Nation, Mattagami First Nation, Flying Post First Nation, Taykwa Tagamou Nation and Matachewan First Nation expressed concern regarding impacts on social well-being from in and out migrations, including crime rates, addiction, mental health, impacts to women, girls, and 2SLGBTQIA+, and discrimination and violence towards Indigenous peoples (Chapters 25 to 28 of the Impact Statement). Mattagami First Nation expressed concern regarding human trafficking, especially as it is amplified by the presence of mining activities (Mattagami First Nation 2023b).

21.4.4.2 Mitigation and Enhancement Measures

Canada Nickel is committed to the following mitigation and enhancement measures related to social and economic conditions that can reduce potential changes in community safety.

- Canada Nickel is participating in the initiative “Equal by 30”, which aims to increase benefits to women and to accelerate gender equality and diversity to close the gender gap by 2030.
- Canada Nickel has made, and will continue to make, contributions to support social, economic, health, and other activities/programs for local communities, including Indigenous nations through its Community Contributions Program. The Program will include a local procurement policy, as

well as a sponsorship and donation strategy adapted to Canada Nickel's guiding principles and the needs of the communities.

- Canada Nickel has developed an internal Whistleblower Program for employee feedback and communication of concerns, as well as an external feedback mechanism to capture Project-related comments and concerns from community members.
- To manage Project-related demands on police services and to enhance the safety of women in the community and at the site, Canada Nickel will provide security at the site and implement several workplace policies which will limit adverse behaviours in the community.
- Canada Nickel has or will be developing several policies, procedures, and training programs which will mitigate adverse effects on services and infrastructure. These are:
 - Health and Safety Policy
 - Local Procurement Policy
 - Code of Business Conduct and Ethics
 - Workplace Violence, Harassment and Discrimination Policy
 - Diversity and Inclusion
 - Fit for Duty, including Drug and Alcohol Policy
 - Cultural Awareness Training
- Canada Nickel will prepare a Traffic Management Plan. The Traffic Management Plan will be developed during ongoing planning and engineering to address traffic staging in order to reduce delays.
- Canada Nickel is committed to mitigation and enhancement measures to address the change in demand for transportation Infrastructure as result of the Project. These include, but are not limited to, the following:
 - Project vehicles will be driven by licensed and trained drivers who will use approved routes. All drivers will be required to have training in incident response and management.
 - Highway laws will be obeyed, including seasonal weight restrictions, speed limits, traffic signage and requirements for permit for oversized loads.
 - Design and build the Highway 655 realignment according to Ministry of Transportation (MTO) standards.
 - Canada Nickel will explore providing a shuttle bus service to employees from nearby communities to the mine site.
 - Speed limits will be posted and monitored onsite access roads. Canada Nickel will follow up with contractors on any reports of transport trucks travelling at excessive speeds along the transport route.

21.4.4.3 Project Residual Effect

21.4.4.3.1 Changes in Population Dynamics

Though Canada Nickel plans to hire primarily from local and Indigenous nations, workers from outside of the region will be required to meet the workforce demand of the Project. It is assumed that majority of the construction workforce will be non-local workers that will require accommodation. The workforce for construction activities is expected to be made up of specialized (temporary) and generalized (more permanent) employees.

It is acknowledged that this change could be higher during periods when a maximum workforce is present (which would include permanent employees). While an increase in people could mean an increase in the number of individual's that take part in criminal activity, this does not mean changes in community safety would occur, nor would individual activities necessarily manifest as community level changes.

The number of transient workers required to observe an increase over existing rates in community crime rates is uncertain; however, Canada Nickel will implement and enforce several policies, procedures and training that are anticipated to reduce potential unethical behaviour from workers including having workers adhere to a code of conduct and ethics policy, a violence and harassment policy and a drug and alcohol policy. Failure to comply to these policies can result in worker disciplinary action including termination. Canada Nickel will have internal and external community feedback mechanisms to capture Project-related comments and concerns from community members, which can include unethical observations. Canada Nickel will investigate and document each complaint accordingly and take any necessary follow-up actions.

With the implementation of a Traffic Management Plan and considering the use of an overpass to separate mine traffic / conveyor system from road traffic prior to the realignment of Highway 655, traffic delays or congestion (and associated safety concerns) associated with the Project will be reduced. As such, the Project's adverse residual effects on demand for transportation infrastructure is expected to occur in the LSA/RSA in the short- to medium-term, be low in magnitude, reversible, and continuous throughout construction and operations. There is no evidence to suggest that members of vulnerable groups will experience differential effects with respect to demand for transportation infrastructure.

Overall, with mitigation in place, changes in community safety via changes in the population dynamics pathway are expected to be neutral, positive or negative in direction, of low to moderate magnitude, limited to the LSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.4.3.2 Changes in Employment Conditions

As described in Chapter 23 of the Impact Statement (Section 23.5.2.3.1), there will be a maximum of 1,290 FTEs during phase 1 of operations (average of 1,200), 1,371 during phase 2 of operations (average of 850) and 334 during phase 3 of operations (average of 300). Operation of the Project is expected to last 41 years. As noted above, being part of a community provides several important benefits that contribute to positive mental health and social well-being which are directly related to community safety. Positive mental health and social well-being are closely linked to community safety and crime reduction.

With the implementation of a Traffic Management Plan and considering the use of an overpass prior to the realignment of Highway 655, which will limit any traffic delays or congestion, the Project's adverse residual effects on demand for transportation infrastructure is expected to occur in the LSA/RSA in the short- to medium-term, be low in magnitude, reversible, and continuous throughout construction and operations. There is no evidence to suggest that members of vulnerable groups will experience differential effects with respect to demand for transportation infrastructure. In addition, the presence of the Project workforce during construction and operations may result in positive effects on services and infrastructure because the workforce will contribute economically to the LSA/RSA (through property and income taxes) representing a potential expansion of municipal tax bases. This in turn may help pay for service providers to re-size appropriately for the increased population.

Overall, with mitigation in place, changes community safety via changes in the employment conditions pathway are expected to be neutral, positive or negative in direction, of low to moderate magnitude, limited to the LSA, short-term to medium-term in duration, irregular to regular events, but reversible.

21.4.4.3.3 GBA Plus Considerations

Canada Nickel will provide cultural awareness training, which is anticipated to enhance understanding of Indigenous history and culture and to describe the root causes of inequities that Indigenous nations experience. Additionally, given that women are a minority in the mining industry, women employed by the Project may experience forms of sexual harassment or assault in the workplace. Canada Nickel will implement a harassment policy and an internal whistleblower mechanism for confidential reporting of workplace harassment. Given that Canada Nickel does not have camp accommodations, this may reduce the risk of sexual harassment or abuse for female workers during off-work hours. However, people subject to workplace harassment may not report incidences due to fear of reprisal (National Inquiry into Missing Murdered Indigenous Women and Girls 2019) and, as such, Canada Nickel will consider mechanisms to encourage reporting of workplace harassment.

21.4.5 Summary of Project Residual Effects

Overall, the residual effects of the Project on health, with proposed mitigation and Project design in place, are expected to be: neutral, positive or adverse; ranging in magnitude from low to medium; limited to the LSA and RSA; short-term to medium-term in duration; irregular to regular events; but reversible. Project residual effects on health are summarized in Table 21.21.

Table 21.21 Project Residual Effects on Health

Residual Effect	Residual Effects Characterization							
	Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in physical health	C/O/D	P/A/N	L/M	LSA/RSA	N/A	ST/MT	IR/R	R
Change in mental health and social well-being	C/O/D	P/A/N	L/M	LSA/RSA	N/A	ST/MT	IR/R	R
Change in community safety	C/O/D	P/A/N	L/M	RSA	N/A	ST/MT	IR/R	R
<p>KEY</p> <p>See Table 21.4 for detailed definitions</p> <p>Project Phase: C: Construction O: Operation D: Decommissioning and closure</p> <p>Direction: P: Positive A: Adverse N: Neutral</p> <p>Magnitude: N: Negligible L: Low M: Moderate H: High</p> <p>Geographic Extent: PA: Project Area LSA: Local Study Area RSA: Regional Study Area</p> <p>Timing: NS: No sensitivity MS: Moderate sensitivity HS: High sensitivity</p> <p>Duration: ST: Short-term MT: Medium-term LT: Long-term N/A: Not applicable</p> <p>Frequency: S: Single event IR: Irregular event R: Regular event C: Continuous</p> <p>Reversibility: R: Reversible I: Irreversible</p>								

21.4.5.1 Summary of Adverse Residual Effects

In terms of changes on physical health, mental health and social wellbeing, and community safety, and depending on the exposure pathway assessed, adverse residual effects are estimated to be of low to moderate magnitude, limited to the LSA (biophysical changes) and RSA (social changes), short-term to medium-term in duration, irregular to regular events, but reversible.

- While Project-related contaminants in air are not likely to be greater than the applicable health-based exposure limits and toxicity reference values at locations where people are expected to be

present for extended periods of time (including overnight stays or beyond), some identified contaminants are non-threshold contaminants meaning any increase in exposure could result in increased risk of adverse health effects (e.g., PM_{2.5}).

- For the North Driftwood River channel realignment, changes in methyl mercury concentration in angling fish compared to current existing is expected to be low (approximately 4%). As such, this change in concentration is not expected to markedly increase potential exposures to methyl mercury through fish consumption due to the North Driftwood River channel realignment. The presence of mercury in fish tissues and methyl mercury exposures due to consumption of fish is already a regional concern (many fish collected in North Driftwood River, West Buskegau River and Jocko Creek watersheds during baseline sampling programs had methyl mercury concentrations greater than the Health Canada standard of 0.5 mg/kg) but Project-related activities are not expected to result in increased concentrations of mercury in the environment.
- Actual or perceived changes in food quality, land use, and aesthetics in the LSA/RSA, could lead to reductions in country food availability and accessibility that may affect physical health through diet and nutritional changes. These changes could also lead to changes in physical health due to reduced recreational experiences.
- Project-related population growth and employment of temporary workers (mainly from the construction phase) from outside of the region may increase competition for Indigenous food harvesting, increase infectious diseases, and increase the cost of living.
- Increased housing rental markets could lead to the most vulnerable populations experiencing higher financial pressures and may have to make difficult decisions about the quality and quantity of food they can afford, which puts them at risk for food insecurity. However, it is expected that independent accommodation providers in the region will provide accommodations for temporary workers as they have for other large projects that will reduce such potential effects.

Canada Nickel recognizes that because of the location of the PA, some effects, such as alteration to the current use of lands and resources may affect Indigenous nations disproportionately in comparison with the non-Indigenous population. Further such assessment is provided in Chapters 25-28 of the Impact Statement.

21.4.5.2 Summary of Positive Residual Effects

In terms of changes on physical health, mental health and social wellbeing, and community safety, and depending on the exposure pathway assessed, positive residual effects are as follows.

- The Project is anticipated to result in positive effects on employment, business, and the economy. Increased employment is expected to have positive effects on Indigenous unemployment rates by increasing income levels for Indigenous individuals (and families) who secure employment with the Project and will provide valuable employment experience that can be leveraged by Indigenous workers to secure employment with other projects/employers following completion of Project-related work. As described above, increased employment rates are linked to better states of health.

- Being part of a community provides several important benefits that contribute to positive mental health and social well-being which are directly related to community safety. Positive mental health and social well-being are closely linked to community safety and crime reduction.
- While increased housing rental markets could lead to the most vulnerable populations experiencing higher financial pressures and may have to make difficult decisions about the quality and quantity of food they can afford, which puts them at risk for food insecurity, residents in the LSA and RSA successful in securing Project-related employment may have reduced financial-related pressures due to employment income, which may bring some families out of food insecurity.
- The presence of the Project workforce during construction and operations may result in positive effects on services and infrastructure because the workforce will contribute economically to the LSA/RSA (through property and income taxes) representing a potential expansion of municipal tax bases. This in turn may help pay for service providers to re-size appropriately for the increased population.

21.4.6 Significance of Adverse Federal Effects

The following provides conclusions of extent of significance (using the definitions in Section 21.1.6).

In terms of changes on physical health of Indigenous peoples, residual adverse effects are estimated to have low or moderate significance, because depending on the aforementioned effect pathways, changes may be largely unchanged from baseline conditions or reduced but not eliminated compared to baseline conditions.

In terms of changes on mental health and social wellbeing of Indigenous peoples, residual adverse effects are estimated to have low or moderate significance, because depending on the aforementioned effect pathways, changes may be largely unchanged from baseline conditions or reduced but not eliminated compared to baseline conditions.

In terms of community safety of Indigenous peoples, residual adverse effects are estimated to have low or moderate significance, because depending on the aforementioned effect pathways, changes may be largely unchanged from baseline conditions or reduced but not eliminated compared to baseline conditions.

21.5 Prediction Confidence

The level of confidence in the assessment of residual environmental effects on the Atmospheric Environment (Chapter 12), Acoustic Environment (Chapter 13), Surface Water (Chapter 15), Social Conditions (Chapter 22), Economics (Chapter 23) and Indigenous Interests (Chapters 25-28) of the Impact Statement, upon which the assessment of health is based, are either moderate or high. As such, the level of confidence in the inputs used in the assessment of residual effects on health is also moderate to high.

The assessment of residual effects on health uses both quantitative and qualitative methods.

- For residual effects related to changes in environmental quality (those associated with biophysical determinants of health), the assessment was primarily quantitative in nature, with conclusions drawn from comparisons of estimated environmental changes to regulatory thresholds. The level of confidence in the assessment of residual effects on health based on quantitative evaluations is high.
- For residual effects related to changes on traditional land use, population dynamics, and employment conditions (those primarily associated with social determinants of health), the assessment was qualitative in nature with conclusions based on professional judgment informed by academic, government, and industry literature, as well as input from potentially affected Indigenous nations and the public health unit. The level of confidence in the assessment of residual effects on health based on qualitative evaluations is moderate to high.

21.6 Potential Effects on Federal Lands

There are no federal lands within the footprint of the Project. The closest lands under federal jurisdiction are the Taykwa Tagamou Nation Reserve lands located approximately 37 km northeast (straight line) from the Project site (14 km southeast of Cochrane). No additional mitigation measures beyond those identified here are specifically required for federal lands.

21.7 Assumptions

Health as a VC is linked to other VCs, including:

- Atmospheric Environment, Chapter 12 of the Impact Statement
- Acoustic Environment, Chapter 13 of the Impact Statement
- Surface Water, Chapter 15 of the Impact Statement
- Social Conditions, Chapter 22 of the Impact Statement
- Economics, Chapter 23 of the Impact Statement
- Indigenous Interests, Chapters 25-28 of the Impact Statement

In some instances, data limitations necessitated that a conservative approach be taken to accommodate uncertainty for the assessment of residual effects. Assumptions relied on in each of the aforementioned VCs are found in Section 12.7, 13.7, 15.7, 22.7, 23.7 and 25.5-28.7. In addition, specific assumption for the atmospheric, noise and HHERA are provided in Appendices C.1 (Air Quality Assessment), C.2 (Light Assessment), C.3 (Noise and Vibration Assessment) and C.7 (HHERA) respectively. Specifically, as it pertains to the assessment of health, key assumptions are that the academic, government, and industry literature, input from potentially affected Indigenous nations and the public health unit adequately reflect the effects pathways associated with the Project.

21.8 Follow-up and Monitoring

Chapter 34 of the Impact Statement includes additional details on follow-up and monitoring programs proposed by Canada Nickel.

- As it relates to noise and vibration, Canada Nickel will implement follow-up and monitoring programs to verify the accuracy of effects and to evaluate the effectiveness of mitigation measures, the results of which will be used to identify and implement adaptive management measures, as appropriate. Canada Nickel will develop a follow-up and monitoring program to monitor noise at key Project locations during various project phases and activities. Monitoring data will be used to verify and confirm the estimated effects identified in Chapter 13 of the Impact Statement.
- As it relates air quality, Canada Nickel will implement follow-up and monitoring programs to verify the accuracy of effects and to evaluate the effectiveness of mitigation measures, the results of which will be used to identify and implement adaptive management measures, as appropriate. An Air Quality Follow-up Program will be developed for Project construction and operations. The Air Quality Follow-up Program will specify the proposed ambient air quality monitoring program including the type of monitoring, the chemicals to monitor and the frequency of monitoring.
- As it relates to surface water, Canada Nickel will monitor surface water watercourse flows and/or waterbody levels and surface water quality at key Project locations during construction, operations, decommissioning and closure.
- As it relates to fish and fish habitat, fish tissue samples will be monitored in comparison to the provincial and federal guidelines for arsenic, mercury, and methylmercury for the protection of human health and wildlife consumers of aquatic biota.

21.9 References

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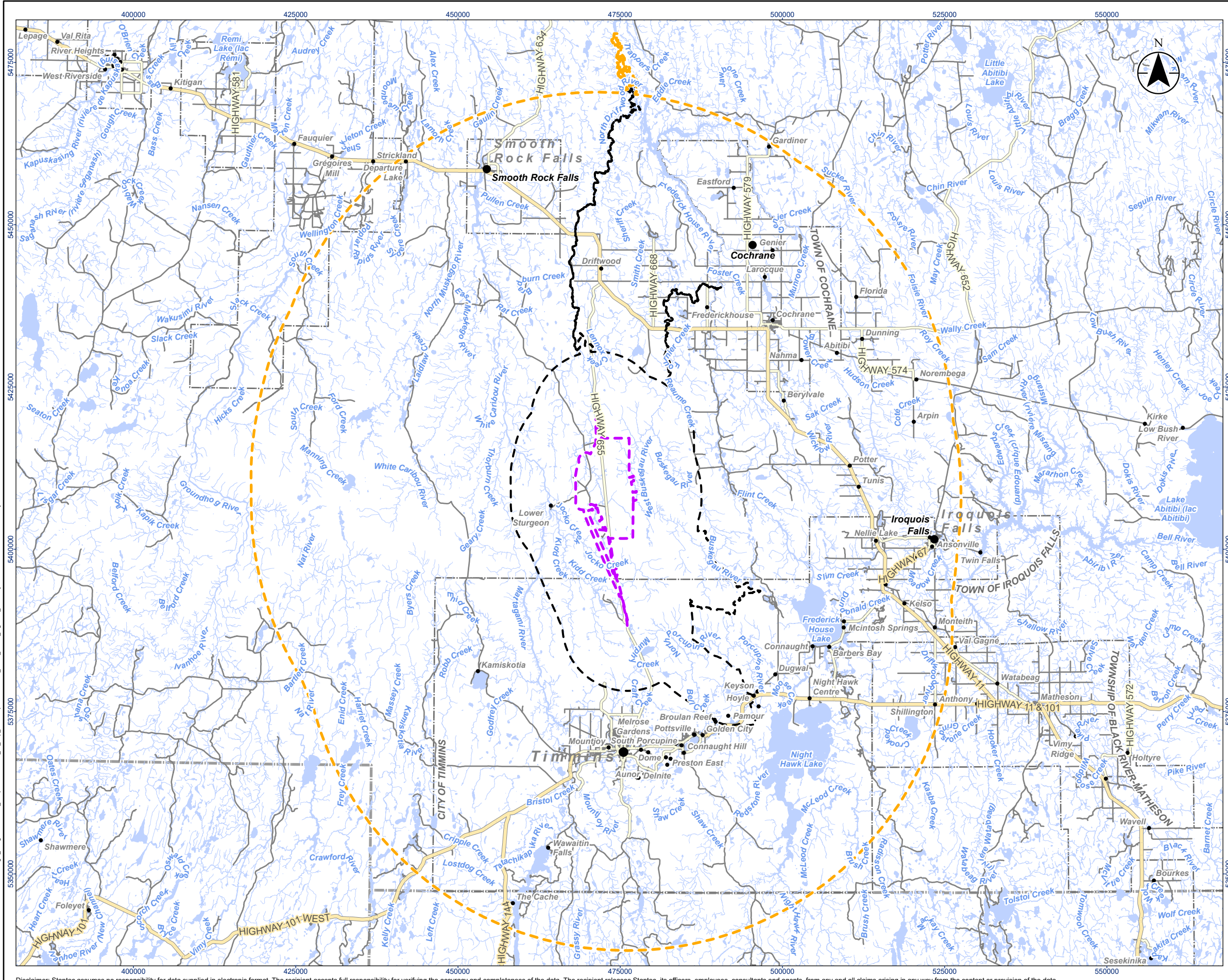
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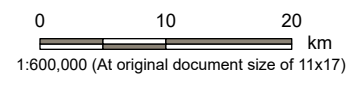
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21.10 Figures



Legend

-  Project Area
-  Local Study Area
-  Regional Study Area
- Base Features**
-  Expressway / Highway
-  Major Road
-  Minor Road
-  Watercourse
-  Waterbody
-  Municipal Boundary - Lower Tier



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 17N
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location: Timmins, Ontario
 Prepared by: awhite on 2024-11-12

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **21.18**
 Title **Biophysical Determinants of Health Local and Regional Study Areas**

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