Unearthing the discursive politics of mining on Indigenous lands: knowledge, health, contestation, and power in contemporary Canadian regulatory infrastructures

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ABSTRACT

Mining projects have the potential to significantly affect Indigenous Peoples and their health in myriad ways, both in the short term and across generations. During the approval stage for new extractive sites, a projects' anticipated impacts on Indigenous Peoples' health and wellbeing are evaluated using a process called environmental assessment (EA). However, EA is a technocratic process that relies on and advances a very specific and narrow understanding of health— one based in Western colonial cultural understandings and assumptions that can be inappropriate and even harmful for Indigenous communities.

This thesis sought to answer two key research questions: how can extractive projects affect Indigenous Peoples' health, and how is Indigenous Peoples' health represented in environmental assessment? My methods to answer these questions included a scoping review of the literature on extraction and Indigenous Peoples' health, as well as a qualitative document analysis of the final environmental assessment reports for 28 mining projects in Canada. I then interpreted the results of these analyses using critical framing techniques borrowed from infrastructure studies to unpack the broader political implications of EA and the kind of knowledge it contains and perpetuates.

In the scoping review, I identified a set of mechanisms with the capacity to be activated in an extraction context and produce health outcomes, including: engagement in assessment and consultation processes; interaction with government and industry officials; the presence and nature of new work and training opportunities; changes to the economy and an influx of new money; changing social structures and new inequalities; environmental degradation and dispossession; new and longstanding changes to the economy; and lasting effects on land. The variation in these mechanisms across space and time confirms that communities can be affected by resource projects via a wide range of pathways, which proves that a holistic perspective is necessary to adequately measure and understand effects on Indigenous Peoples' health. However, the analysis of the EA reports showed that these varied pathways to health were often not included in the assessment process. And, when indicators related to Indigenous health were included, these methods of assessment were at odds with community health ontologies due to their narrow focus and their inability to consider the complexity and essentiality of human-non-human relations.

The primary conclusion of this thesis is that EA is largely ineffective at fully or accurately assessing effects of extractive projects on Indigenous Peoples' health. Beyond identifying a diverse set of fundamental issues with EA's measurements, I also argue that the process itself leads to a furthering of colonial logics in the public sphere, which is harmful to communities and contributes to asymmetrical power dynamics between Indigenous Peoples and the Crown.

RÉSUMÉ

Les projets d'exploitation minière peuvent avoir des répercussions considérables sur les Peuples Autochtones et leur santé de multiples façons, à court terme et sur plusieurs générations. Au cours de la phase d'approbation des nouveaux sites d'extraction, les impacts prévus d'un projet sur la santé et le bien-être des Peuples Autochtones sont évalués au moyen d'un processus appelé évaluation environnementale (EA). Cependant, l'évaluation environnementale est un processus technocratique qui s'appuie sur une conception très spécifique et étroite de la santé, fondée sur des conceptions et des hypothèses culturelles coloniales et occidentales qui peuvent être inappropriées, et même nuisibles, pour les communautés autochtones.

Cette thèse a cherché à répondre à deux questions de recherche clés: comment les projets d'extraction peuvent-ils affecter la santé des Peuples Autochtones, et comment la santé des Peuples Autochtones est-elle représentée dans l'évaluation environnementale? Mes méthodes pour répondre à ces questions comprenaient une revue de la littérature sur l'extraction et la santé des Peuples Autochtones, ainsi qu'une analyse qualitative des rapports finaux d'évaluation environnementale de 28 projets miniers au Canada. J'ai ensuite interprété les résultats de ces analyses à l'aide de techniques de formulation critique inspirées des études sur les infrastructures, afin de dégager les implications politiques plus larges de l'évaluation environnementale et le type de connaissances qu'elle contient et perpétue.

Dans la revue de la littérature, j'ai identifié un ensemble de mécanismes ayant la capacité d'être activés dans un contexte d'extraction et de produire des résultats sur la santé, y compris: l'engagement dans les processus d'évaluation et de consultation; l'interaction avec les représentants du gouvernement et de l'industrie; la présence et la nature de nouvelles opportunités de travail et de formation; les changements dans l'économie et l'afflux d'argent nouveau; les structures sociales changeantes et les nouvelles inégalités; la dégradation et la dépossession de l'environnement; les changements nouveaux et de longue durée dans l'économie; et les effets durables sur la terre. La variation de ces mécanismes dans l'espace et dans le temps confirme que les communautés peuvent être affectées par les projets d'exploitation des ressources à travers un large éventail de voies, ce qui prouve qu'une perspective holistique est nécessaire pour mesurer et comprendre adéquatement les effets sur la santé des Peuples Autochtones. Cependant, l'analyse des rapports d'évaluation environnementale a montré que ces diverses approches vis-à-vis de la santé n'étaient souvent pas prises en compte dans le processus d'évaluation. De plus, lorsque des indicateurs concernant la santé des Peuples Autochtones étaient inclus, ces méthodes d'évaluation étaient en contradiction avec les ontologies de la santé communautaire en raison de leur orientation restrictive et de leur incapacité à prendre en compte la complexité et le caractère essentiel des relations entre les humains et les non-humains.

La principale conclusion de cette thèse est que l'évaluation environnementale est largement inefficace pour évaluer complètement ou fidèlement les effets des projets d'extraction sur la santé des Peuples Autochtones. Au-delà de l'identification d'un ensemble de problèmes fondamentaux en lien avec les mesures de l'évaluation environnementale, je soutiens aussi que le processus lui-même conduit à un renforcement des logiques coloniales dans la sphère publique, ce qui est nuisible pour les communautés et contribue à une dynamique de pouvoir asymétrique entre les Peuples Autochtones et la Couronne.

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LIST OF ACRONYMS / ABBREVIATIONS

CEAA: Canadian Environmental Assessment Act

CIAR: Canadian Impact Assessment Registry

EA: Environmental Assessment

EARP: Environmental Assessment and Review Process

EIS: Environmental Impact Statement

GHG: Greenhouse gases

MoE: Minister of Environment

NEPA: National Environmental Policy Act

REA: Residual Effects Analysis

RCMP: Royal Canadian Mounted Police

TEK: Traditional Ecological Knowledge

The Agency: Canadian Environmental Assessment Agency (now the Impact Assessment Agency)

UNDRIP: United Nations Declaration on the Rights of Indigenous Peoples

VC: Valued Component

1. INTRODUCTION

Globally, the mining industry represents an interesting case study of extractive capitalism run rampant, with its unequal distribution of wealth and externalities, problematic corporate-government relations, and massive private profits, often gained at the expense of environmental quality and the public good (Fast, 2014). In Canada, resource companies have systematically and efficiently expanded their reach into Indigenous lands over the past decades through establishing new 'critical infrastructure' projects (Coulthard, 2014; Pasternak & Dafnos, 2018; Spice, 2018). These projects have been widely problematized and contested not only because of their harmful effects on the environment, but also because they are seen as infrastructures of settler colonial invasion (Coulthard, 2014; Hall, 2013; Hoogeveen, 2015; Keeling & Sandlos, 2015; Kulchyski & Bernauer, 2014; Pasternak & Dafnos, 2018; Spice, 2018; Willow, 2016). Mining projects operating on Indigenous territories fit squarely into a long history of colonial expansion and Indigenous dispossession, and in some cases, corporate entry onto communities' lands has helped advance the extinguishment of Indigenous title and jurisdiction (Coulthard, 2014; Hall, 2013).

Extraction projects pose a particular risk to Indigenous Peoples' health because they can reactivate trauma, threaten local sources of good health, and physically and discursively separate communities from their lands (Mitchell & Arseneau, 2019; Richmond & Ross, 2009). Indigenous Peoples have distinct health ontologies that extend beyond biomedical paradigms and draw instead on a broader perspective of health, including emotional, physical, spiritual, and mental health (Kolahdooz et al., 2015). Being rooted in place and space and recognizing and honouring connections with the land are of particular importance to maintaining good health for many Indigenous Peoples (de Leeuw, 2018; Hoover, 2017; Lewis et al., al., 2021; Richmond & Big-Canoe, 2018; Watts, 2013; Wiebe, 2016). As such, there are a wide range of direct and indirect pathways through which projects can affect community health (Myette & Riva, 2021). However, extractive projects' impacts on health are evaluated through settler technocratic methods like environmental assessment (EA), a process used by federal and provincial governments to understand how, and to what extent, proposed development projects can negatively affect the environment and surrounding communities (Kuyek, 2005).

Many of the pathways through which extractive projects can affect Indigenous health are overlooked in EA, often because the standard methodology does not allow for sufficient complexity and nuance (Jones & Bradshaw, 2015). Indigenous communities are frequently asked to dedicate considerable time and energy to contributing information and feedback during assessments, but there are few avenues for this knowledge to be meaningfully integrated (Joly et al., 2018; Nadasdy, 1999; Simpson, 2001). Interacting with government and corporate actors as well as trying to effectively translate local knowledge into EA can create intense stress and undue burden on Indigenous communities (Booth & Skelton, 2011; Place & Hanlon, 2011). Still, EA is unable to account for the full breadth of potential impacts of extractive industries on Indigenous Peoples' health, how extraction is situated within a larger history of colonial traumas, and how these projects can further harm communities (Bronson & Noble, 2005; Dendena & Corsi, 2015; Gibson & Klinck, 2005; Jones & Bradshaw, 2015; Jones et al., 2014; Lewis et al., 2021; Noble & Bronson, 2006; Place & Hanlon, 2011; Rixen & Blangy, 2016).

In this thesis, I explore the growth of environmental assessment in Canada for mining projects operating on Indigenous lands. Specifically, I examine how this process functions as a knowledge infrastructure, how it understands and measures impacts on Indigenous Peoples' health, and how it supports a larger social infrastructure predicated on settler colonialism and racial capitalism. My central argument is not only that EA is inappropriate, inaccurate, and insufficient, but also that the problems with this process are not signs of system failure. Rather, I characterize EA as a knowledge infrastructure that seeks to enable and support extraction, the material infrastructures that accomplish it, and the colonial and racial dynamics that imbue it. Edwards (2010) defines knowledge infrastructures as "robust networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (p. 17). The knowledge infrastructures supporting the mining industry play a key role in directing, containing, managing, and reducing the unruly politics and contestation centred at sites of invasion (Barry, 2013). As Barry (2013) explains, these knowledge infrastructures centre certain objects and problems as a matter of public focus, concern, and debate "in the expectation that this will enable the form and intensity of public debate to be contained, by rendering it more rational and informed than it might otherwise have been" (p. 11). As a result, the way that EA captures and transforms public thought is worth closer investigation, as are the implications of these infrastructures for public knowledge creation (Mukherjee, 2020).

1.1. Research questions and thesis overview

Much of the existing work on resource extraction has centred around case studies, which allow researchers to unpack key issues related to mining with depth and nuance. I take a different approach in this thesis, instead looking at a larger set of projects to identify systemic problems that present in more mundane ways, and then situating this analysis within a strong theoretical grounding. By investigating the mechanics of how environmental assessment functions, I hope to answer the call to action from Star (1999): "to restore narrative to what appears to be dead lists" (p. 377). As such, the research questions guiding this thesis are as follows:

1. How can extractive projects affect Indigenous Peoples' health?
2. How is Indigenous Peoples' health represented in environmental assessment?

Surveying the literature for the first research question fills an initial knowledge gap regarding the specific ways that Indigenous Peoples' determinants of health are affected by extractive projects. Answering the second research question supplements existing literature critically examining environmental assessment. By analyzing a larger set of projects together, and by pairing an empirical analysis of assessment measures with specific examples, I hope to highlight structural problems in assessment infrastructure.

This thesis is comprised of seven chapters, including this introduction. In Chapter 2, I provide a critique of mining in Canada, discuss the determinants of Indigenous Peoples' health and the development and current workings of environmental assessment, and give an overview of the concept of knowledge infrastructure. In Chapter 3, I explain the methods used to answer each research question, how I interpreted the results, and the framing techniques used in the discussion. Chapter 4 presents the results of a scoping review that I conducted as part of this thesis, which reviewed literature identifying pathways between mining, oil, and gas projects and a wide range of determinants of health for Indigenous Peoples in Canada (Myette & Riva, 2021). Sections of that manuscript are included throughout the thesis, specifically in Chapters 2, 3, 4, and 7. In Chapter 5, I report the results of my qualitative document analysis of 28 environmental assessment reports for mining projects in Canada. In Chapter 6, I summarize the findings from both results chapters and present some limitations of the thesis. I then interpret these results using framing techniques from critical infrastructure studies, drawing from literature on settler colonialism, racial capitalism, and slow violence to situate the results within a broader historical and social context. Chapter 7 concludes the thesis by describing some implications of the project.

2. BACKGROUND & LITERATURE REVIEW

In this chapter, I provide a critique of mining in Canada, describe the connection between extractive projects and settler colonialism, and discuss some ways that extractive industries can affect— and have historically affected— Indigenous communities. Then, I give an overview of the determinants of health for Indigenous Peoples and how these determinants are affected by extraction. I also discuss how environmental assessment policy has developed in Canada over the past fifty years, provide a description of how current assessment processes measure and analyze impacts, and outline the opportunities for public participation in environmental assessment. Finally, I describe the concept of 'knowledge infrastructure,' a theoretical framing that I use to guide my analysis and interpretation of the results, and briefly review some connections between colonial infrastructures and racial violence.

2.1. Extraction: the reaching arm of settler colonialism in Canada

Colonial infrastructures, and particularly settler colonialism, are intrinsically and closely linked to historical and contemporary natural resource extraction (Bernauer, 2019; Coulthard, 2014; Cowen, 2020; Greer, 2018; Hall, 2013; Hoogeveen, 2015; Innis, 1999; Pasternak, 2017; Sandlos & Keeling, 2012; Willow, 2016). Settler colonialism's goal is to seize control of natural resources, as well as to superimpose a social hierarchy based on racial difference, wherein racialized peoples are assimilated and integrated into the bottom tier (Alfred, 2005; Veracini, 2010; White, 2013; Wolfe, 2006). Further, 'racial capitalism,' an idea developed by Black radical thinker Cedric Robinson, describes the pervasion of racial practice in capitalist expansion as well as in the social structures that arise from capitalism (Robinson, 2000). This formulation asserts that capitalism is not only based on accumulation by dispossession, but that it is also deeply "dependent on slavery, violence, imperialism, and genocide" (Robinson, 2000, p. xiii). Capitalism, colonialism, and extraction are connected historically, but they also continuously coproduce in the present. Capitalist and extractivist logics have guided colonial land grabs, as the survival of the settler colonial project relies on making natural resources and other forms of raw capital available to be turned into commodities to support the state (Moore, 2015; Wolfe, 2006). Both settler colonialism and capitalism more broadly are predicated on continued violence

against racialized peoples, as argued by many scholars over the past decades (McKittrick, 2006; Melamed, 2015; Simpson, 2014).

Consequently, resource extraction has been, and continues to be, a foundational element of colonial expansion in Canada, since early exploration (Coulthard, 2014; Gombay, 2013; Greer, 2018; Hall, 2013; Pasternak, 2017; Veracini, 2010; White, 2013). Throughout the nineteenth and twentieth centuries, as technology improved and allowed for heightened production of gold, nickel, copper, uranium, potash, lead, zinc, iron ore, cobalt, and coal, Canada was solidified as a global supplier of minerals (Cranstone, 2002). Today, Canada is a global hub for resource extraction, with more mining, oil, and gas companies listing on the Toronto Stock Exchange than on any other stock exchange worldwide (Marshall, 2019; TMX, 2020).

Over the past decades, Canadian resource companies have systematically and efficiently expanded their reach to Indigenous lands through establishing extraction projects (Comack, 2018; Coulthard, 2014; Hall, 2013; Hoogeveen, 2015). Legal jurisdictions are often overlapping in these cases, which can create difficulties in understanding rights and responsibilities. While resource development falls under territorial and provincial jurisdiction, Indigenous rights, specifically land rights and title claims, are part of constitutional law and are therefore under federal jurisdiction (Kuyek, 2005; Thériault, 2016). Early legal doctrines in Canada also deny Indigenous jurisdiction and facilitate land theft to advance colonial proliferation and precedence (Yellowhead Institute, 2019). For example, due to Canada's free entry principles, resource companies can ‘stake claim’ on any area of Crown land, including lands traditionally held by Indigenous Peoples, as the Crown holds rights to subsurface minerals and leases these rights to companies (Kuyek, 2005; Panagos & Grant, 2013; Thériault, 2016).

As such, there are important local jurisdictional implications of extractive projects being established and operating on Indigenous lands. First, many Nations without historic numbered treaties have faced considerable pressure to sign modern treaties (comprehensive land claims) in order to facilitate corporate entry and development in their territories (Archibald & Crnkovich, 1999; Kulchyski & Bernauer, 2014; Pasternak, 2017; Samson, 2017). Not only are there physical and legal consequences of signing modern treaties, but the discursive legitimation of state control over the land and extinguishment of Indigenous jurisdiction is innately dispossessing, even if a community is able to capture some material benefits from the negotiation (Coulthard, 2014; Pasternak, 2017; Samson, 2017; Yellowhead Institute, 2019). Additionally, Canada has

outsourced much regulation over extractive activities to companies themselves, creating a private "financialized" regulatory system with a generally lax atmosphere so as to limit corporate financial risk (Cameron & Levitan, 2014; Comack, 2018; Galbraith et al., 2007; Preston, 2013; Stanley, 2016; Zalik, 2015). This supra-regulatory system raises questions about if and how the Crown can deliver on its obligations to Indigenous communities within a nation-to-nation relationship if a corporation is essentially acting as a stand-in for the federal government (Hervé, 2014; Preston, 2013; Yellowhead Institute, 2019).

Canada's legal system often works to negate and invalidate Indigenous jurisdiction and claims that Indigenous Peoples have to resources on their lands (Bernauer, 2019; Kuyek, 2005; Yellowhead Institute, 2019). As a result, communities who want to participate in and receive benefits from resource projects often need to broker deals with outsider companies (Bernauer, 2019; Kuyek, 2005; Yellowhead Institute, 2019). For communities, these deals can manifest in a variety of ways, from complete exploitation on the part of the company to partnerships with more, albeit prescriptive, space for negotiation (Bernauer, 2019; Hitch & Fidler, 2007; Mills & Sweeney, 2013; Slowey, 2008). These company-community agreements, while lauded by provincial and federal governments as proof of industry's capacity to engage with Indigenous communities and marketed as a step toward reconciliation, can be deeply problematic (Cameron & Levitan, 2014; Galbraith et al., 2007; Hitch & Fidler, 2007; Jones & Bradshaw, 2015). Not only do they abound in severe power inequities, but they are virtually unregulated due to their confidential nature and often undermine community rights to free, prior, and informed consent (Cameron & Levitan, 2014; Galbraith et al., 2007; Horowitz et al., 2018; Mills & Sweeney, 2013; Papillon & Rodon, 2017). Even if an Indigenous community does sign an agreement with a company, it may be an act of necessity rather than one of empowerment (Cameron & Levitan, 2014; Coulthard, 2014; Horowitz et al., 2018). Furthermore, Indigenous communities who are against resource extraction projects entirely, either on their lands or in close proximity, are often unprotected in Canada's legal system and have few legal instruments to combat unwanted projects (Coulthard, 2014; Kuyek, 2005; Place & Hanlon, 2011; Yellowhead Institute, 2019).

2.2. The determinants of health for Indigenous Peoples

In order to understand the ways in which extraction can affect Indigenous communities' health, it is essential to situate this analysis within the wide field of literature and theory on

Indigenous health. Drawing upon this knowledge, we can further explore a few facets of health that are particularly important when considering the effects of resource extraction. First, there is no singular model of Indigenous health; many frameworks have been developed by Indigenous scholars and organizations that incorporate different cosmologies, ontologies, and epistemologies. Across the board, these frameworks view health holistically, with an integrated and balanced understanding of the physical, emotional, mental, and spiritual aspects of a person's life (Gracey & King, 2009).

Within Indigenous perspectives and ways of knowing, there is no separation between a person and their environment (Lindberg, 2010; Todd, 2017; Watts, 2013; Wilson, 2008). Rather, the social and natural worlds are intrinsically connected, and there exists a fundamental spiritual connection between people, past and future generations, and the non-human world. Moreover, recognizing and maintaining reciprocal relations with "more-than-human" kin is not only a fundamental part of promoting good health but is also a source of community strength and sovereignty (Hovey et al., 2014; LaDuke, 1994; Lindberg, 2010; Todd, 2017; Wilson, 2008). These ways of knowing and being in the world are distinct from dominant colonial understandings of health. Therefore, non-Indigenous models, even those that try to introduce more nuance and connections, are often unable to account for effects on Indigenous health and wellbeing.

Within a holistic perspective, it is possible to see the various ways in which a person's life and health can be shaped by their surroundings. Reading and Wien (2009) and Greenwood and de Leeuw (2012) use the categories of *proximal*, *intermediate*, and *distal* to define and frame the social determinants of Indigenous Peoples' health. *Proximal* determinants refer to health behaviours and the immediate social and physical environment, such as food security, gender, income, and education. *Intermediate* determinants include community-level resources, infrastructures, and capacities, including environmental stewardship, justice systems, and cultural continuity. *Distal* determinants are related to larger historic, economic, political, and social contexts, such as self-determination or language, culture, and heritage.

There are community-derived sources of strength and resilience within each of these levels which are fundamental for Indigenous health promotion (Delormier et al., 2017; First Nations Health Authority (FNHA), n.d.; Kirmayer et al., 2011). For example, cultural connectedness and continuity, which can include participating in spiritual ceremonies and

healing practices, can lead to community empowerment (Auger, 2016; FNHA, n.d.; Hovey et al., 2014). It can also foster pride, self-esteem, and a strong sense of identity (Auger, 2016; FNHA, n.d.; Hovey et al., 2014). Creating space to share histories and traditions with elders and youth is vital in order to both connect to ancestors as well as to ensure that knowledge of songs, language, stories, foods, and ceremonies are passed along to future generations (Auger, 2016; FNHA, n.d.; Gabel et al., 2016; Hovey et al., 2014; Hunter et al., 2006; Lines & Jardine, 2019).

Additionally, being able to connect with the land is a significant part of engaging with traditions and cultures (FNHA, n.d.; Lines & Jardine, 2019; Parlee & Berkes, 2005). Access to traditional country foods is essential, as is the ability to go out on the land to regain a sense of calm, visit cultural sites, and foster resilience (Kirmayer et al., 2009; Lévesque et al., 2015; Parlee & Berkes, 2005; Redvers, 2020; Tang & Jardine, 2016). Being on the land can also be a source of healing; one participant in a study conducted with Yellowknives Dene First Nation stated that going out on the land "makes you feel good about yourself, you just feel alive" (Tang & Jardine, 2016, p. 221). Engaging in physical and cultural activities on traditional lands is integral to maintaining good health and wellbeing (Parlee & Berkes, 2005; Redvers, 2020).

Moreover, self-determination, which can include community decision-making power around legal and justice systems, health and education services, title over ancestral lands, self-governance, and cultural sovereignty, has the potential to improve community wellness when communities have sufficient financial resources to support local initiatives (Chandler & Lalonde, 2004; Ladner, 2009). Women play especially invaluable roles in each of these forms of resilience and resistance, acting as stewards of knowledge and culture for the community, maintaining connection to the land, and leading social and political movements advocating for Indigenous communities and livelihoods (Healey & Meadows, 2008; Horn-Miller, 2005; Konsmo & Pacheco, 2016; Yellowhead Institute, 2019).

There are, however, structural and historical factors pressing upon communities which make it hard to maintain good health, despite sources of strength (Gibson & Klinck, 2005). Historically, colonialism has worked to eliminate Indigenous Peoples through disenfranchisement and displacement, forced (re)settlement, residential schools, assimilation, and genocide (Czyzewski, 2011; First Nations Information Governance Centre (FNIGC), 2012; Hovey et al., 2014; MacDonald & Steenbeek, 2015; Nelson & Wilson, 2017; Reading & Wien, 2009; Richmond & Ross, 2009; Sherwood & Edwards, 2006). These policies continue to impact

younger generations due to cumulative intergenerational trauma, and subsequently drive poor mental health, substance use, and suicide in many communities (Bombay et al., 2014; FNIGC, 2012; Hovey et al., 2014; Kolahdooz et al., 2015). Even now, colonial processes play a major part in shaping current sociopolitical contexts and can affect health in countless ways due to their wide-reaching nature, including in ways that are currently unknown or misunderstood (Czyzewski, 2011; FNIGC, 2012; Gracey & King, 2009; Smylie & Firestone, 2015).

2.3. How extraction affects Indigenous health: identifying a knowledge gap

In a recent review, Brisbois et al. (2019) surveyed the state of the literature about resource extraction and health. Of the papers included in their review (n = 2797), which were all published between 1995 and 2015, most focused on physical health outcomes such as respiratory issues (21.7%), cancer (17.6%), poisonings or blood disorders (10.3%), or acute injuries (7.7%). In comparison, mental health outcomes, psychosocial impacts, wellbeing, and quality of life were less studied (6.3% altogether). Most studies employed quantitative methods (84%), focused on health impacts associated with mining activities (85.6%), and concentrated on health outcomes coming from direct exposures to chemicals, radiation, or noise and vibrations (58.3%). In all, the review identified an "overwhelming preponderance of descriptive quantitative studies focused on direct occupational exposures to toxic substances [… and found that] studies of complex social-ecological pathways to health outcomes remain relatively scarce" (Brisbois et al., 2019, p. 251). Of the included studies, only 2.4% (n = 67) focused on Indigenous Peoples and only 16 papers across the entire global sample concentrated on the social determinants of Indigenous Peoples' health. In light of these findings, the knowledge gap regarding the ways in which resource development affects Indigenous Peoples' health is two-fold. First, there is a shortage of research that focuses on how extraction affects health in Indigenous communities (Kirsch et al., 2012). And second, amongst the research that exists, there are few studies specifically examining the impacts of extractive projects on the particular determinants of Indigenous health. This demonstrates, as Brisbois et al. (2019) suggest, a "problematic pattern of neglect" regarding understandings of how extractive projects affect Indigenous health (p. 256).

However, extractive projects pose a particular risk to Indigenous Peoples' health because the causal logic of extraction is innately colonial and exploitative (Willow, 2016). Resource extraction has the potential to compromise community strengths by reactivating trauma and

physically and discursively separating Indigenous Peoples from their lands (Mitchell & Arseneau, 2019). Environmental dispossession is an especially significant process to consider in an extraction context (Lewis et al., 2021). As Richmond and Ross (2009) write, "the health of the land and the health of the community are thought to be synonymous, nurtured through relationships to the physical environment and the cultural, spiritual, economic, political and social roots it provides" (p. 404). By threatening ties between communities and the land, extractive projects can limit a person's balance and control over their life or create a strain on one's social life and available material resources (Richmond & Ross, 2009). Projects can also limit access to the land long-term and can cause irreversible environmental damage, preventing access for future generations and severing the flow of intergenerational knowledge (Paci & Villebrun, 2005).

Additionally, because of their connection to colonial patriarchy, extractive industries can disproportionately affect women by bringing intense violence into communities where they may already face systemic violence (Bourassa et al., 2004; Connell, 2012; Konsmo & Pacheco, 2016; Yellowhead Institute, 2019). As a result, women can be confronted with extreme trauma. First, physical trauma in the form of sexual harassment and assault from workers in nearby man camps— temporary housing facilities built near resource projects to accommodate workers that are predominantly men— and resulting threats to their reproductive and sexual health. Women also face emotional trauma caused by land dispossession and loss of cultural engagement (Konsmo & Pacheco, 2016; Yellowhead Institute, 2019). Situating extractive industries within a colonial context calls attention to the ways in which Indigenous Peoples can be specifically exposed and affected by these projects and to the high stakes of properly accounting for potential health impacts (Lewis et al., 2021).

2.4. Environmental assessment

2.4.1. The environmental assessment apparatus: a historical perspective

Environmental assessment legislation in Canada was based heavily on an American precedent, the National Environmental Policy Act (NEPA) of 1969. NEPA was preceded by a decade of rising public concern about the environment in the United States, as well as increased support for new legislation designed to limit adverse environmental effects (Caldwell, 1998). The most important consequence of the Act was that the federal government would need to

prepare environmental impact statements and environmental assessments for any proposed projects, in order to document possible effects of these projects and suggest alternative actions (Caldwell, 1998). While the legislation was considered very progressive when it was originally passed, scholars have suggested that it has been poorly executed and has failed to reach its regulatory potential in subsequent years (Caldwell, 1998; Lindstrom & Smith, 2008). Lindstrom and Smith (2008) explain that "among the biggest problems with NEPA's effectiveness is not the language of the statute, but rather the lack of judicial and presidential enforcement of NEPA policy goals, and the lack of integrated and cumulative NEPA decision-making processes" (p. 138). Many of the difficulties surrounding NEPA in the U.S. have been replicated in Canada, with multiple revisions of the law expanding and subsequently reducing federal powers and poor judicial backing.

NEPA's visibility had important implications in Canada, where citizens were also becoming increasingly wary of environmental destruction and had "deepening scepticism about Government and corporate reassurances" (Gibson, 2002, p. 153). In 1973, a federal cabinet directive established the Environmental Assessment and Review Process (EARP)— a self-directed assessment process with loose expectations for responsible authorities conducting assessments. Assessors were "left to decide whether, how and when assessment would be appropriate. […] In effect, [making] serious attention to environmental assessment requirements essentially voluntary" (Gibson, 2002, p. 153). EARP was modified and legally finalized in 1984 as a Guidelines Order, still primarily based on self-assessment (Gibson, 2002; Paci et al., 2002).

After five years of development and negotiation in Parliament, the Canadian Environmental Assessment Act (CEAA) came into force in 1995, replacing EARP. Part of the legislation was a mandated statutory review every 7 years, where recommendations and amendments to the law would be submitted and reviewed (CEAA, 1995). CEAA 1995 was overseen by the Canadian Environmental Assessment Agency (the Agency), which sought to "ensure the practices and policies of CEAA are followed by all parties involved, including government" (Paci et al., 2002, p. 114). The fundamental principles that the Agency looked to enforce from the Act included facilitating public participation, ensuring that EAs were completed within a set timeframe, and reducing environmental effects (Paci et al., 2002). The assessment process included two steps, an initial screening and then a more thorough comprehensive study that integrated a regional approach (CEAA, 1995). However, this first iteration of CEAA was

lacking in a few key areas; first, by retaining "an apparently restrictive definition of 'environment' that omits direct socio-economic and cultural effects" as well as by designating assessment as a "largely advisory exercise" (Gibson, 2002, p. 155). And, as with NEPA, the legislation contained "only weak provisions for enforcing compliance with the law and with terms and conditions of approvals," which limited its usefulness and strength (Gisbon, 2002, p. 156).

Starting in 2010, the Conservative government, under Stephen Harper, began making changes to CEAA in an effort to streamline the process and facilitate development projects. These first changes were made by a minority Conservative government, buried in the 2010 Budget Implementation Bill to guarantee they would pass (Doelle, 2012). Then, after winning a majority government in 2011, the Conservative government began rewriting the law in earnest, ignoring crucial steps in the mandated review process, and refusing proposed amendments from other parties (Doelle, 2012). Eventually, a revised version of CEAA 1995 was included in the 2012 Budget Implementation Bill, which limited the potential for open public debate and obscured the proposed changes (Doelle, 2012). This revised version, CEAA 2012, was drastically different than the original CEAA 1995. While the 1995 law required that nearly all projects undergo environmental assessment by employing a legal 'trigger' test that applied to a large number of projects, the new 2012 Act switched to a "designated project" list approach, where only projects that met a narrow set of criteria or that were chosen at the discretion of the Agency or the Minister of Environment would undergo assessment (Doelle, 2012; Hunsburger et al., 2020).

The result of these changes was a greatly reduced number of assessments being conducted under CEAA 2012, compared with CEAA 1995. Additionally, the scope of these assessments was considerably diminished. The two-step process that was originally used was instead combined into one environmental impact assessment that was much narrower in focus than either the screening or the comprehensive phases outlined in CEAA 1995 (Doelle, 2012). Although the definition of an environmental effect was restrictive in CEAA 1995, there was at least an effort to understand the broader implications of biophysical changes, as per the guidelines of the comprehensive study process. In contrast, CEAA 2012 limited this even further, identifying a very small number of components in sections 5(1) and 5(2) that would be included in the assessment. This inevitably restricted the ability of the assessment process to recognize

and understand the wide range of impacts that these projects can have on Indigenous Peoples, presenting a "critical issue" (Doelle, 2012, p. 12).

2.4.2. Current mechanics: what gets counted and how

Under both CEAA 1995 and CEAA 2012, assessment practitioners' primary method for evaluating a projects' impacts is by evaluating effects on Valued Components (VCs) (also called Valued Ecosystem Components). This practice was implemented in Canada in the 1980s to improve efficiency and provide more focus to the scope of impact analysis (Olagunju & Gunn, 2015). VCs are defined as fundamental elements of the environment with economic, physical, social, or cultural importance that might be affected by a project. During the assessment process, project proponents and federal authorities identify VCs to undergo analysis by looking at potential environmental impacts, consulting with scientific experts, and receiving feedback from the public (Olagunju & Gunn, 2015). As part of this public consultation, Indigenous communities can suggest VCs to be included in the analysis. However, information about this process is largely inaccessible and obscure. Once VCs are finalized by project proponents, they undergo a residual effects analysis (REA), which helps identify potential or expected ongoing effects from the project even after mitigation measures are implemented (Olagunju & Gunn, 2015). Proponents provide information about these effects and the results are assessed by both the proponent and the Agency. Practitioners are generally technicians and consultants hired by the proponents, which can introduce bias into the assessment process.

While the VCs are, in theory, based on the assessment requirements outlined in both CEAA 1995 and CEAA 2012, there is no standardized or legally mandated list of VCs that a project must consider. In their study of VC selection for road construction companies, Olagunju and Gunn (2015) found that "most case informants view VC selection as a 'value-ridden' and 'highly subjective' process… based on negotiation (as opposed to scientific evidence) conducted with little regard to the specific context of the project" (p. 210). Campbell et al. (2020) found similar results in their review of assessments documenting the effects of oil sand development on wildlife. The authors stated that the parameters undergoing analysis were "not comprehensive nor standardized between EIAs, despite a high degree of landscape similarity between projects" and that there was "very little agreement" in the indicators measured across the sample (Campbell et al., 2020, p. 129).

The VC selection and measurement process falls especially short for Indigenous communities for several reasons. First, as per CEAA 1995, proponents do not need to take a regional approach in their assessments, meaning that VC measurement is mostly focused exclusively on direct effects stemming from the project site (Ball et al., 2013; Gunn & Noble, 2015). Not only does this reduce the scope of assessments, but it also prevents measurement methods from taking into consideration Indigenous ways of knowing about nature and health, which prioritize balance, interconnection, and relationality (Muir, 2018). In environmental assessment, the complex interrelations between humans and non-humans that are visible with an Indigenous perspective are disregarded (LaDuke & Cowen, 2020; Spice, 2018). Additionally, Ball et al. (2013) explain that assessing impacts on VCs is "largely 'stressor-based'; that is, focused on identifying project-induced stress and predicting the contribution of that stress to a change in baseline conditions" (p. 470). However, this often fails to account for stressors that exist around the site and are cumulative over time, including historical and intergenerational traumas that may be reactivated through extraction and the assessment process itself.

2.4.3. Community participation: opportunities for intervention in EA

A large part of the external optic of environmental assessment is the presence of public participation opportunities and the integration of the public's feedback into the assessment. In reality, there are major issues with this process regarding accessibility and timing. At minimum, proponents are mandated by law to give public notice 15 days before an environmental assessment begins, through the Assessment Registry website. However, it is unclear how much traffic the Assessment Registry website gets from members of the public, meaning that posting public notice on a government website is likely unable to reach all relevant or impacted groups.

Under CEAA 1995, a federal environmental assessment coordinator would "determine the timing of any public participation" in conjunction with federal authorities (CEAA 1995, 12.3(c)). Besides the 15-day notice before an assessment began that was mandated in the Act, there were few formal requirements about how and when to involve communities. Informal guidelines suggested early notification of communities, accessible and appropriate information sharing, co-developing a public participation plan, and flexible and adaptive activities. However, without formal legal directives, it is difficult to assess how thoroughly these suggestions were implemented across projects during the almost 20-year period when CEAA 1995 was

operational. After the role of the assessment coordinator was eliminated under CEAA 2012, opportunities for public participation became fixed— distilled to five set periods for the public and for Indigenous communities to participate and give comments and feedback.

First, members of the public are given 20 days to comment on a Project Description, which is where proponents outline basic information on the proposed project, including timeline, project activities, possible effects and changes, and any public engagement opportunities being planned. The next opportunity for public participation is a 30-day window to comment on the Environmental Impact Statement (EIS) Guidelines. These guidelines, prepared by the Agency, "identify the information that must be included in the proponent's environmental impact statement and specify the nature, scope and extent of that information" (Government of Canada, 2019). After the EIS is completed, the public again has another 30 days to provide commentary on the results, which include a description of the current environment, an analysis of alternative ways to carry out the project, an analysis of potential environmental effects, proposed mitigation measures, a determination of the significance of the residual adverse environmental effects remaining after mitigation, and more (Government of Canada, 2019). Next, the Agency evaluates the EIS and provides recommendations and conclusions on the proponent's analysis of effects and proposed mitigation measures. This is written up into a Draft Environmental Assessment Report, which the public has another 30 days to comment on. The last opportunity for public participation is a final 30-day window for people to provide feedback on the Potential Decision Statement Conditions, which are proposed mitigation measures and follow-up programs that would become legally binding should the project be approved (Government of Canada, 2019).

While these public comment periods are vital to intervening, modifying, and improving the process, they are extremely short. This may inhibit people's ability to participate if they are unable to access, read, and submit their comments in a few weeks. It is also worth noting that these documents are often extremely technical, hundreds of pages long, and generally quite difficult to read. They are filled with tables and appendices, and the format can be quite confusing and circular, especially for someone who has not been previously exposed to reports of this kind. Each of these characteristics pose different issues in terms of accessibility, as people may not be able to digest this type and amount of information in such a short period. Plus, many communities are increasingly facing multiple concurrent development proposals, creating a wave of documentation that can be simply unmanageable (Baker & Westman, 2018). Together, these

conditions make the comment periods not only problematic, but also culturally inappropriate for many communities (Baker & Westman, 2018).

To circumvent these accessibility issues, the federal government created a Participant Funding Program, which gives financial compensation to people who are interested in participating in these public comment periods or consultation activities. However, this money is often not a particularly substantive amount, and is also difficult to obtain. Participant funding is "not available to support review and comment on the draft Environmental Impact Statement Guidelines," which seriously limits participants' capacity, since these guidelines are a key time to suggest changes to what is included in the assessment (Government of Canada, 2018a). Furthermore, the current application for these funds is eleven pages long, contains complicated financial information regarding combinations of various governmental funds, and requires the inclusion of a "valid signed resolution authorizing the Applicant to act on behalf of their organization" (Government of Canada, 2018b, p. 7).

These can all be potential barriers to completing the application itself, seeing as the standard application period is only 20 business days and the resolution must be submitted no later than two weeks after the application is completed. Additionally, those who receive funding must incur at least some eligible expenses before they can apply for reimbursement, meaning that participants must bear some financial load while waiting for payments to process. Also, to be deemed eligible for reimbursement, costs must "directly contribute to activities described in the approved work plan" created by the Agency (Government of Canada, 2018a). Finally, these payments are distributed by direct deposit rather than by cheque, which can be very limiting for those without a bank account with these capabilities or who might prefer to deposit cheques straight to cash (Government of Canada, 2018a).

Moreover, limiting the comment periods to 30 days significantly reduces the window for public actors to effectively organize and intervene in the process, which, as Gabrys (2016) writes, "focuses the complexity of civic action toward a relatively reductive if legible set of actions" (p. 203). Obstacles to obtaining the available funding contributes to this, as those facing financial barriers or who are excluded by the design of this process are further disenfranchised from participation.

2.5. Understanding 'infrastructure'

> "Knowledge infrastructures do not only provide new maps to known territories – they reshape the geography itself." (Edwards, 2013, p. 15)

In this thesis, I characterize environmental assessment as a knowledge infrastructure, drawing upon literature from critical infrastructure studies. In this section, I will introduce this body of literature and discuss some connections between infrastructure and violence, which will later inform my analysis. Although it is difficult to precisely define the term "infrastructure" because of its wide diversity, we can typically understand infrastructures as "extended material assemblages that generate effects and structure social relations, either through engineered (i.e. planned and purposefully crafted) or non-engineered (i.e. unplanned and emergent) activities" (Harvey et al. 2016, p. 5). Infrastructures are not neutral, but rather are embedded within and express certain politics (Benjamin, 2019; Winner, 1980). Material infrastructures of extraction have substantial, often detrimental effects on communities, which has been well documented by scholars (Claire & Surprise, 2021; Coulthard, 2014; Curley, 2021; Hall, 2013; LaDuke & Cowen, 2020; Pasternak & Dafnos, 2018; Spice, 2018). However, these material infrastructures do not exist alone; rather, they are informed by and amplify colonial logics and relations, as explained below by Filion and Keil (2017):

> We cannot consider physical infrastructures independently of the political, organizational, know-how and financial requirements for their design, construction, operation and maintenance. For all their apparent sturdiness, physical infrastructures are transient relative to the societal conditions essential to their existence…Infrastructures cannot be perceived as purely physical artefacts; they must be seen in their broad societal context. (p. 8)

Material infrastructures related to resource extraction are situated within a web of other interconnecting infrastructures, including financial (Stanley, 2016; Stanley, 2019), institutional (Hall, 2013), and knowledge infrastructures (Hoogeveen, 2016).

Knowledge infrastructures are described by Edwards (2010) as "robust networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (p. 17). I frame environmental assessment as a knowledge infrastructure in order to highlight the power it has over knowledge creation and communication. Infrastructures generally are built and maintained through the "intensely political project of

creating and communicating information" (Siemiatycki et al., 2019, p. 9). Operationalizing the term 'knowledge infrastructure' in the context of this thesis helps politicize the ways that knowledge is accumulated, translated, and processed, as well as the infrastructural arrangements that manage, contain, and distribute this information (Edwards, 2015).

In the realm of knowledge creation, much of EA's power relates to the types of knowledge that are prioritized and validated through this process. Important questions about what constitutes data, evidence, expertise, impact, risk, and health are moderated and defined through assessment. This has effects on the actors who participate in the assessment process, but also has real-world politics and implications for social relations and hierarchies (Benjamin, 2019; Peters, 2015). Edwards et al. (2013) explain that "as knowledge infrastructures shape, generate, and distribute knowledge, they do so differentially, often in ways that encode and reinforce existing interests and relations of power" (p. 14). As such, it is vital to understand the broader contexts that these infrastructures are situated within and what logics inform and are reproduced through them (Filion & Keil, 2017).

2.5.1. Infrastructure and violence

Understanding that Canada's past and present is born out of settler colonialism and racial capitalism helps to frame current conversations about the mining industry within a long history of displacement, dispossession, and violence against Indigenous Peoples. The social and material infrastructures that seek to accomplish the settler colonial project are also imbued with racial logics that perpetrate violence against Indigenous Peoples and other racialized communities (Cowen, 2020; Crosby, 2021). This is also true of the infrastructures that support extractive projects on Indigenous lands. Jodi Melamed (2015) uses the term "state-finance-racial violence nexus" to describe:

> The inseparable confluence of political/economic governance with racial violence, which enables ongoing accumulation through dispossession by calling forth the specter of race (as threat) to legitimate state counterviolence in the interest of financial asset owning classes that would otherwise appear to violate social rationality. (p. 78)

In Canada, the state has historically and repeatedly taken action against communities protesting "critical infrastructure" projects; one recent prominent example is the aggressive deployment of Royal Canadian Mounted Police (RCMP) to the Unist'ot'en Camp, where the Wet'suwet'en are

protesting TransCanada's Coastal Gaslink Pipeline (LaDuke & Cowen, 2020; Spice, 2018). Militarized RCMP officers have maintained an exclusion zone around the area since December 2018, after the company filed an injunction against the community, at enormous cost to the federal government ($13 million in expenditures from January 2019 to March 2020 alone, nearly $20 million in total) and despite calls from the United Nations to withdraw the officers (Bellerichard, 2020; Follett Hosgood, 2021; Simmons, 2021). The state's push to secure critical infrastructure projects from so-called 'threats' from Indigenous Peoples asserting sovereignty or protesting jurisdictional violations has repeatedly been used as justification for physical violence against communities (LaDuke & Cowen, 2020; Spice, 2018).

However, there are other less visible forms of violence against Indigenous communities that also seek to undermine Indigenous jurisdiction and reify the settler colonial project, albeit perhaps more covertly. Here, I want to build on Nixon's (2011) conceptualization of slow violence, which he describes as a type of violence "that is neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales" (p. 2). I would assert that environmental assessment qualifies as one such type of violence, in that its infrastructure creates conditions where Indigenous sovereignty can be challenged, and colonial knowledge enshrined and legitimized. Glen Coulthard (2014) contends that "in the Canadian context, colonial relations of power are no longer reproduced primarily through overtly coercive or imposed means, but rather through the asymmetrical exchange of mediated forms of state recognition and accommodation" (p. 62). EA represents one example of asymmetrical exchange, as Indigenous communities are asked to participate in demanding and arduous dialogue with companies and government bodies, often without much ability to disrupt the process or produce a better result (Baker & Westman, 2018). This is not to say that these policies and processes act completely unilaterally— communities have carved out spaces for agency and self-determination within these systems through persistent hard work (Yellowhead Institute, 2019). However, the playing field for these negotiations remains incredibly uneven, meaning that communities can be subject to incredible stress even when engaging in processes where they have more self-determination or influence (Baker & Westman, 2018). While this kind of regulatory policy may seem less egregious than police invasions on Indigenous lands, EA represents a pervasive form of slow violence that accompanies and facilitates these physical invasions (Curley, 2021; Hoogeveen, 2015; Ladner, 2014; Yellowhead Institute, 2019).

Together, these different forms of violence equally contribute to Indigenous dispossession and to accomplishing colonial and capitalist goals (Curley, 2021; Ladner, 2014; Yellowhead Institute, 2019).

2.6. Summary

I began this chapter by discussing the links between extraction, colonialism, and racial capitalism in Canada. I presented various problems with extractive projects in Canada and outlined some of the ways that these projects have affected Indigenous Peoples both historically and contemporarily. I then provided an overview of the determinants of health for Indigenous Peoples and outlined various sources of good health for communities, along with some ways that colonial processes and systems can create challenges to maintaining good health. Next, I discussed the ways that extraction can affect these determinants of health and highlighted a knowledge gap resulting from a lack of research investigating the complex connections between extraction and Indigenous health determinants. I then provided a brief history of environmental assessment (EA) policy and how it has changed through its various iterations in the past decades. I also gave an overview of current EA processes, namely the valued component (VC) testing process and its various problems when used to assess a project's impacts on Indigenous Peoples. I then discussed community participation opportunities and the ways that public comments and feedback are integrated into EA. Finally, I discussed the body of literature supporting my characterization of EA as a knowledge infrastructure and explained the link between these infrastructures and other types of state violence against Indigenous Peoples.

3. METHODOLOGY

In this chapter, I provide information on my study design, methods, and the process of data selection, collection, and analysis. To restate, the research questions guiding my thesis are two-fold: 1) how can extractive projects affect Indigenous Peoples' health, and 2) how is Indigenous Peoples' health represented in environmental assessment? For my first research question, I conducted a scoping review of the literature about extractive industries and their impacts on Indigenous Peoples' health. This allowed me to identify various pathways through which extractive projects can affect communities' health. To answer my second research question, I utilized a qualitative document analysis approach, combining elements of thematic and content analysis over an iterative process of data extraction and interpretation (Bowen, 2009). To interpret this data, I drew upon the conceptual framework outlined in section 2.5. and incorporated critical framing techniques from the field of infrastructure studies. After discussing my positionality as a researcher, I will outline the methods for each of my results chapters, including my rationales for sample selection and the data collection and analysis techniques. Then I will provide more detail on the methods used to interpret the results.

3.1. Researcher positionality

Before starting this project, I spent four years working on issues related to mining projects in various settings. While I had done academic research on this topic prior to entering this graduate program, much of my early work around mining was at the intersection of research and advocacy, concentrating on communities experiencing extreme violence and human rights abuses— often perpetrated by mining companies and governments. This previous work has undoubtedly coloured my perspective on the mining industry, and on Canadian companies specifically. When creating the study design for this project, I was aware of this bias and found methods that both provided empirical rigour and allowed me to continue exploring issues that I had investigated in my previous work. Also, I am a non-Indigenous settler. This of course limits my capacity to understand how assessment affects Indigenous Peoples and the effects that participating in this process can have on communities. To account for this gap, I have tried to cite and directly quote Indigenous scholars and communities where possible, both in the results and throughout the thesis in general.

3.2. Methods for research question 1: scoping review of the scientific literature

Scoping reviews aim to systematically map the literature available on a topic, identifying the key concepts, theories, sources of evidence, and gaps in the research, and set the knowledge garnered within policy and practice contexts (Arksey & O'Malley, 2005). This was deemed an appropriate method for the research question as it generated in-depth results across a broad range of topics and allowed for analysis of emerging issues and areas for future research.

My scoping review further incorporates a realist perspective, which seeks to understand the underlying mechanisms (M) that determine how interventions work in certain contexts (C) and how they can generate certain outcomes (O) (the CMO framework) (Pawson et al., 2005). Specifically, a realist approach is interested in understanding the causality driving this process (Pawson et al., 2005). In my review, the intervention under investigation is resource extraction. The CMO framework is helpful to determine how the contexts surrounding extraction can trigger mechanisms that impact a wide range of determinants of health and specifically produce health outcomes for Indigenous Peoples. For Pawson and Tilley (1997) mechanisms "explicate the logic of an intervention" and are considered the intervention's engine of change because they "pinpoint the ways in which the resources on offer may permeate into the reasoning of the subjects" (p. 7). Dalkin et al. (2015) further suggest that "resources and reasoning are mutually constitutive of a mechanism" and that "differentiating between resource (the component introduced in a context) and reasoning therefore helps distinguish between relevant context and mechanism" (p. 4).

In my analysis, I refer to resources (M1) as those changes stemming directly from extractive activities with the potential to impact health— the components introduced as a result of the intervention that change what is "on offer" and affect communities, such as an influx of strangers. On the other hand, responses (M2) highlight the various community reactions to and consequences of these changes, like increased alienation and displacement. The distinction between M1 and M2 provides space for a multi-level look at causal processes linking resource extraction to health (Dalkin et al., 2015). Together, the heterogeneous nature of these mechanisms shows the variety and complexity in these processes. Finally, I use the term 'pathway' to refer to the whole CMO process, so how outcomes are connected to contexts via mechanism(s). This can be seen in **Figure 1**, which details the adapted model employed in this

review.

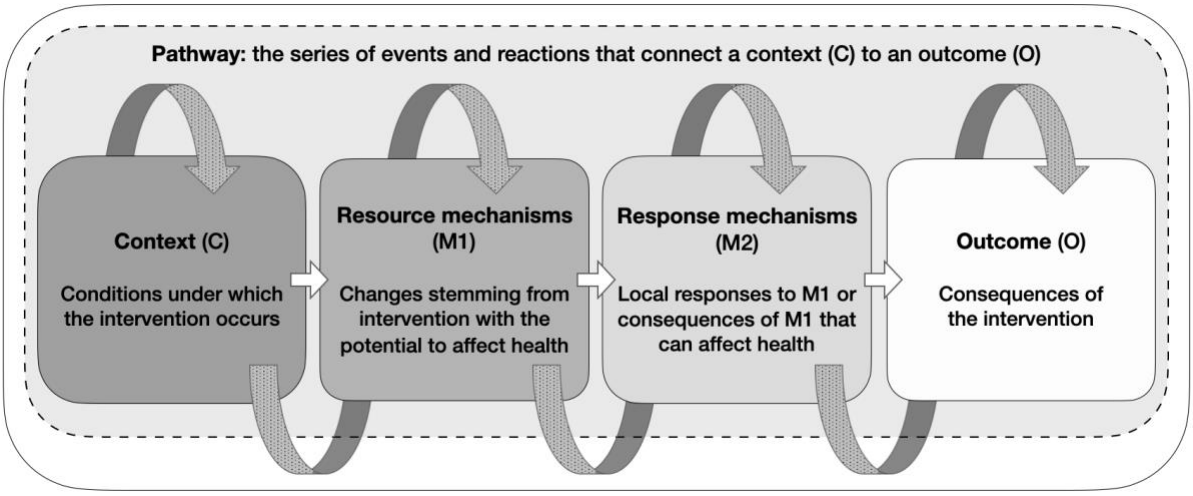

Figure 1. Model of the adapted CMO process.

3.2.1. Search strategy and inclusion/exclusion criteria

Web of Science, PubMed, and Scopus were searched on January 8, 2020, with keywords related to Indigenous Peoples, resource extraction, and Canada (**Table A.1.** in the appendix). Since this review employs a model of health that is broadly defined and includes the social determinants of health, I kept the search as wide as possible and therefore did not include specific keywords related to health or to the determinants of health. This allowed for articles focused on a wide range of determinants of health to be included in the search results. The inclusion and exclusion criteria were developed throughout the reviewing process and are summarized in **Table A.2.** in the appendix. To be included, papers had to be peer-reviewed, with a clearly described empirical study design. Reviews, book chapters, grey literature, organizational reports, and conceptual papers were excluded. Studies needed to focus on Indigenous populations, either as the sole focus of the study or in comparison to non-Indigenous populations. There are complicated and divergent understandings around the word 'extractive' and whether this constitutes extraction solely in a physical, resource-based sense or also in a broader context that includes extraction of labour and so forth. To create a definable unit of analysis, I followed the example of Brisbois et al. (2019) and decided to concentrate specifically on mining, oil, and gas projects. As the focus of the review is on the mechanisms linking extractive projects to health, papers had to include a discussion of the social-ecological context. There were no restrictions on date or language of publication.

3.2.2. Article screening

The search yielded a total of 2540 articles, of which 2325 were unique peer-reviewed articles. After screening by title, 1754 articles were excluded, leaving 571 records to be reviewed by abstract. After applying the inclusion and exclusion criteria, 397 articles were removed. The full text of the remaining 174 articles was reviewed. In scoping reviews, the process of selecting studies for inclusion is iterative rather than linear (Arksey & O'Malley, 2005). Each paper selected for full text review went through four rounds of reading and data charting, and as the scope of the review became clearer, fewer articles were deemed relevant. In all, 14 articles were included in the review. This process is documented in the flow chart adapted from PRISMA (**Figure 2**) (Moher et al., 2009).

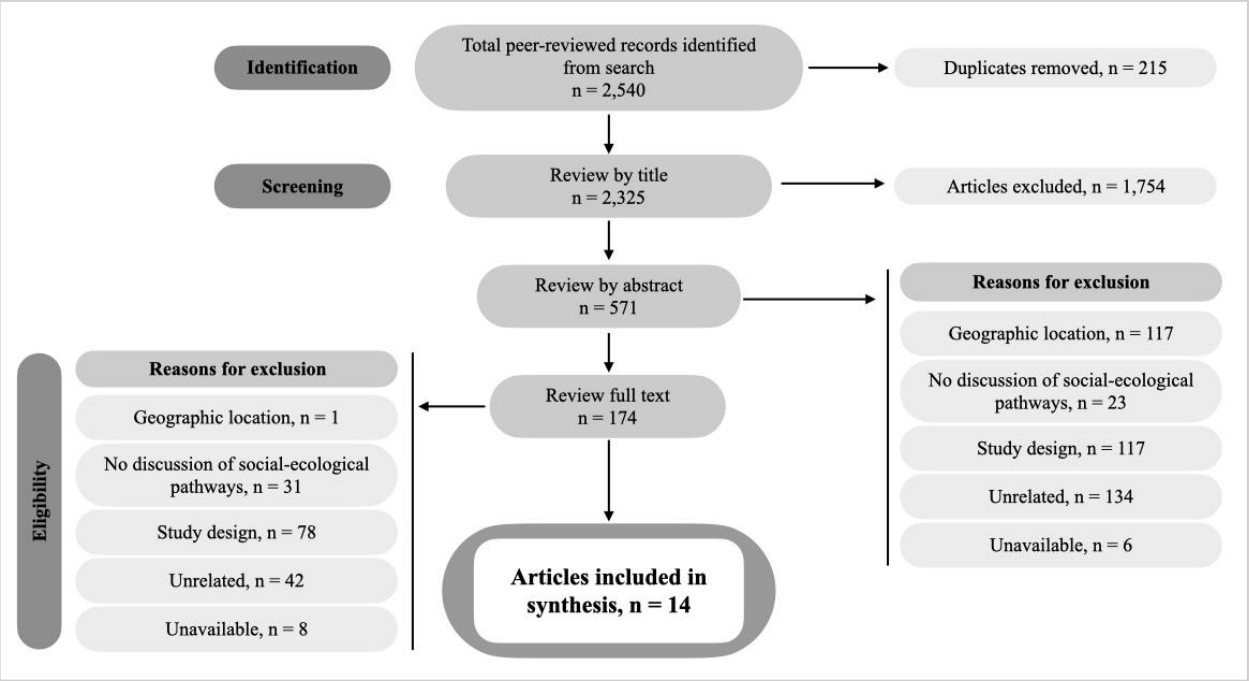

Figure 2. Flowchart of search strategy adapted from PRISMA.

3.2.3. Data extraction, charting, and synthesis

Each article underwent several rounds of inductive coding. Extracted data included the study's methodology and research objectives, as well as any mechanisms of change identified by the authors or study participants. In order to extract data on mechanisms, I coded articles based on how authors and their participants understood changes to the local environment that could affect health across the life of an extraction project, as well as on community responses to these

changes. Many of these mechanisms were included in the authors' discussions of their results as they explained causal factors affecting health, as well as in quotes from participant interviews. After this data was coded and extracted, it was categorized based on project phase (consultation, active, or post-closure) and underwent thematic grouping. Similar thematic codes (such as 'new jobs' and 'new apprenticeships') were grouped to better understand common patterns across the sample (Levac et al., 2010). Using this data, I identified two sets of common mechanisms—resources (M1) and responses (M2). Overall, eight resource mechanisms were identified, as well as 45 response mechanisms, all of which interconnect and overlap in various ways.

This iterative approach to the analysis created space to include a more exploratory and interconnected vision of potential health impacts. Because many of the pathways had both positive and negative consequences for health, a narrative analysis of the collated data allowed for a more nuanced explanation. Chapter 4 presents the resource and response mechanisms as identified in the reviewed papers.

3.3. Methods for research question 2: document analysis of EA reports

After identifying the pathways through which extractive projects can affect determinants of Indigenous health, I turned to the final environmental assessment reports of various projects to analyse how these pathways were included or not. Because VCs are the primary method by which a project's effects are assessed, I concentrated on analyzing the VCs measured in each assessment. By focusing on if and how Indigenous Peoples' health (or determinants of health) appeared in the measured VCs, I could analyze how Indigenous health was included in the assessment process overall.

3.3.1. Sample selection

The documents that were analyzed for this thesis were the final environmental assessment reports for mining projects, that are submitted to the Federal Minister of the Environment for approval at the end of the assessment process. I chose these types of reports as the data source because of their comparability. The type of data assessed and presented was generally quite similar across all the reports, making it easier to understand what was included and how. Also, the contextual significance of these reports makes them interesting— in the reports, proponents and agency representatives are able to describe and frame the results of a year's worth of

community engagement and testing for the Minister's office. To be included in my sample, projects needed to have undergone an environmental assessment (under CEAA 2012) or a comprehensive study (under CEAA 1995) and needed to have been completed by the federal government. Each project also needed to have received a subsequent decision statement from the Minister of the Environment regarding the approval status of the project. While this criterion eliminated projects still undergoing assessment, limiting projects to those with completed assessments provided interesting information about which types of projects garner approvals and denials from the Minister.

Although provincial governments are often in charge of environmental assessments for projects within their jurisdiction, there are instances where a project's characteristics 'triggers' a federal assessment of the proposal. As explained in section 2.4.1, under CEAA 1995, most projects were required to undergo federal assessment. On the other hand, CEAA 2012 uses a 'designated project list' approach, where only a narrow set of project types are assessed by the federal government under the discretion of the Agency and the Minister of Environment: if the federal government proposes the project, if it provides any financial assistance to help facilitate the project, if it needs to issue an authorization or permit for the project to proceed, or if the project takes place on federal lands. I decided to focus specifically on federal assessment because there is a uniform set of standard guidelines about what needs to be included in an assessment at the federal level, versus provincial governments, each of which have their own frameworks and regulations. This internal consistency enabled further cross-examination of project reports. Additionally, federal agencies, such as Fisheries and Oceans Canada, Transport Canada, Environment Canada, and Natural Resources Canada, are consulted on these assessments, and input from departments like Health Canada provides a window into the direct messaging from the federal government regarding what constitutes health and wellbeing for Indigenous Peoples.

Information about these projects is stored online on the Canadian Impact Assessment Registry (CIAR). The CIAR holds final assessment reports for these projects, along with news releases, comments, decision papers, and various other forms of documentation from across the assessment process. Using the search filters available on the CIAR site, I was able to find 31 metal and mineral projects which matched my sample criteria. Three of these projects were removed because they did not match the criteria— all were assessed using a different regulatory process so there were no similar projects in the sample to compare them with. One was the

Kemess Underground Project, a gold-copper mine proposed in British Columbia, which was assessed by the provincial government rather than the federal government through a process called EA by substitution. The other two reports that were removed were proposals for the Prosperity Gold-Copper Mine and subsequent New Prosperity Gold-Copper Mine. These proposals were both assessed by an external review panel, which conducts its assessment independently from the government. EAs by review panel have different procedures and timelines than standard EAs or comprehensive studies and are also much less common due to the resources and time required. After removing these three cases, 28 projects were left in my sample to be analyzed; in total, the environmental assessment reports for these 28 projects comprised 5,160 pages of material.

3.3.2. Data collection and analysis

While document analysis is an iterative process, there are generally three phases in implementing this methodology: "skimming (superficial examination), reading (thorough examination), and interpretation" (Bowen, 2009, p. 32). First, I read five reports in full to better understand the formatting, without extracting any information. Then, in my first pass at the material, I extracted into Excel any relevant sections of the documents that I thought might be pertinent, along with basic data about the projects. The areas that I originally intended to explore after this first pass included: the valued components (VCs) included in each of the assessments; the expected residual effects, i.e., effects that would be present after mitigation measures were implemented by the proponent; and, whether these effects were designated as significant by the project proponents. After identifying these sections, I went back to the reports for another thorough read-through. While collecting data on the sections I initially identified, I picked up on some other related parts of the reports that were also interesting and extracted data on these sections as well. These included the way that significance of effects is defined, and the level of confidence that practitioners had in their significance ratings in the residual effects analyses. I also went through the appendices of each report in detail to look more closely at the results of the residual effects analyses and any comments and questions provided by communities across the assessments.

When analyzing the extracted data, I primarily used qualitative content analysis. My first goal was to understand how Indigenous Peoples' health was represented in the measured VCs. In

both CEAA 1995 and CEAA 2012, impacts on Indigenous Peoples are defined as "an effect occurring in Canada of any change that may be caused to the environment on […] health and socio-economic conditions […] physical and cultural heritage […] the current use of lands and resources for traditional purposes, or […] any structure, site or thing that is of historical, archaeological, paleontological or architectural significance" (CEAA, 1995 5(1), 2012 5(1)).

A list of VCs chosen for measurement was included in each report. By treating each VC as a code and grouping similar codes under higher order headings, I divided the VCs measured across the whole sample into six categories: (1) animals and their habitats, (2) ecosystem quality and resources, (3) Indigenous land use and heritage, (4) Indigenous health and wellbeing, (5) atmospheric conditions, and (6) tourism and socioeconomic conditions. It is important to note that while Indigenous Peoples' health ontologies are holistic and encapsulate tenets related to each of these categories, environmental assessments depart from that understanding and instead categorize effects on humans separately from other facets of the environment. VCs under the category of 'animals and their habitats,' for example, did not include indicators related to Indigenous Peoples or livelihoods. For that reason, I focused my sub-analyses on the categories of Indigenous land use and heritage and Indigenous health and wellbeing. These categories were used throughout the rest of the document analysis to describe how determinants of Indigenous health are represented in EA. Chapter 5 presents the results of the qualitative document analysis.

3.4. Critical integration and interpretation of the results

In order to interpret my results and put them in conversation with the conceptual framework I have just outlined, I used an 'infrastructural inversion' method. Popularized by historian of science and technology Geoffrey C. Bowker, 'infrastructural inversion' is a method that focuses on "[looking] closely at technologies and arrangements that, by design and by habit, tend to fade into the woodwork" (Bowker & Star, 1999, p. 34). Infrastructures are generally invisible, and their key role in mediating political acts and practices often recedes into the background (Star & Ruhleder, 1996). Infrastructural inversion, as a practice, helps create a critical framework for analyzing infrastructures, their histories, and their functions. As Bowker and Star (1999) explain, this means "recognizing the depths of interdependence of technical networks and standards, on the one hand, and the real work of politics and knowledge production

on the other" (p. 34). As discussed earlier, infrastructures are built not only of physical materials and technology, but also of interlocking forms of classification systems, standards, and relations.

The methodological exercises related to practicing infrastructural inversion aim to "go backstage," to recognize the choices and processes that have resulted in infrastructures (Goffman, 1956). The four techniques that I used when analyzing this infrastructure included: (1) recognizing the ubiquity, interdependence, and integration of various classification schemes and standards, (2) highlighting the material and symbolic nature of these classifications and standards, (3) revising knowledge of the past to seek out different voices and silences, and (4) "uncovering the practical politics of classifying and standardizing" (Bowker & Star, 1999, p. 44). These methods have been used by other scholars in critical infrastructure studies to unpack the embeddedness of infrastructures and their surrounding systems (Jensen, 2008; Kaltenbrunner, 2015; Morita, 2017).

My infrastructural inversion focused on implementing these four techniques in order to provide a deeper understanding of the development of environmental assessment policy and of the representation of Indigenous Peoples' health in the assessment process. Using this method can bring to the forefront knowledge infrastructures like environmental assessment, whose critical importance and weight is sometimes overlooked in relation to extraction, relative to the physical prominence of other material and technological infrastructures. EA's place as a site of political significance in the realm of mining development is only further emphasized when interpreting the results alongside the previously outlined conceptual framework, literature review, and background. The discussion chapter (Chapter 6) situates the results from Chapters 4 and 5 within a critical examination of EA as a knowledge infrastructure, framed by the four methods outlined above.

4. RESULTS I:
Identifying effects of extractive projects on Indigenous health

In this chapter, I answer my first research question: how can extractive projects affect Indigenous Peoples' health? To do so, I conducted a scoping review with the aim to identify broad pathways through which extractive development projects— specifically mining, oil, and gas projects— can affect a wide range of determinants of Indigenous Peoples' health. After applying my inclusion and exclusion criteria, 14 articles were identified. I extracted data from these articles to identify various resource and response mechanisms with the capacity to be activated in an extraction context and produce health outcomes.

4.1. Study characteristics and summary of findings

Table 1 describes the characteristics of the 14 articles included in the review, including study location, the project's life phase (consultation, active, post-closure), the study aim, and an overview of the study methods. The degree to which the methods were described varied between studies. Also included is information on Indigenous community involvement compiled from each article, broadly including: community partnership, input in study design, and consent or consultation; any mention of study results being presented back to the community; whether there were Indigenous research teams or authors; any Indigenous-specific ethical or data holding guidelines that were followed; or any funding the project received from Indigenous organizations. There were various levels of reporting on Indigenous community involvement, with some studies providing a substantive description of their interactions with communities and some providing little to no information. Eleven studies concentrated on mining, two on oil and gas, and one on both. Nine of the studies had a qualitative design and five employed mixed methods. One study focused specifically on women and another two focused on youth; the remaining eleven articles did not concentrate on a sub-population group. Two articles concentrated on effects identified during consultation processes, ten studied active extraction sites, and two articles focused on possible effects on health post-closure. Four studies each were conducted in British Columbia, in the Northwest Territories, and in Nunavut, with another study in Alberta, and one in Québec.

Table 1. Description of the included studies.

Authors, *Location* (Stage of mine) - *Study design or approach* (Year of data collection). Aim of study. - Data collection methods - Data analysis methods	Indigenous community involvement in research *
Blangy and Deffner 2014, *Qamini'tuaq, Nunavut* (Active)	
- *Mixed methods: Participatory action research* (2008 – 2018). Assess the importance of traditional activities, including caribou hunting, and identify "factors of change"; study the impacts of the mine on the community, particularly on livelihood activities, and understand the costs and benefits of mining; and explore strategies to improve quality of life. - Small workshops of 4-10 people (n = 25) with over 50 participants of different groups (women, hunters, elders, youth, and families) to establish research themes. In these groups, researchers used the 'radar wheel' and Cartesian graph methods to have participants identify and rate major concerns related to mining. Results were paired with findings from semi-structured interviews, participant observation, informal discussions, public meetings, narratives, logbooks, expert reports, and literature reviews. Notes from public consultation meetings run by mining company Areva in 2013 were also incorporated. - Methods for data analysis not reported.	Idea for the TUKTU project came from conversations with community members. Project goals were discussed and updated every year with Elders and the larger community in public meetings, priorities were decided by mutual agreement. Built into the project were material community outputs (i.e., revitalizing Inuit language instruction at summer camp, creating an exchange program between Inuit & Sami youth). Each year a researcher travelled for a period of 1-2 months and worked in close collaboration with a local research assistant. A community counsellor was a research collaborator and was very involved in both data collection and analysis. Local women were trained to take over the interviewing.
Booth and Skelton 2011, *Treaty 8, British Columbia* (Consultation)	
- *Qualitative* (Summer and fall of 2008). "Explore the perceptions of two indigenous peoples of Canada regarding their understanding of the consequences of industrial resource extraction upon themselves as people and as cultures with deep ties into the land upon which they depend." - Semi-structured interviews (n=31). Focus groups (n = not reported). Authors also attended three cultural events and were available for informal conversations. - Data analysed using content analysis.	Grant developed collaboratively with communities with study goal coming from communities. Methods were also negotiated with communities and codified in a research protocol approved by both Band Councils and the university's Research Ethics Committee. Memorandum of Understanding with Treaty 8 Tribal Association guided methodology creation. Researchers hired a GIS technician from a local land use department. No reports back to the community mentioned. Financial support provided by Treaty 8 Tribal Association.
Dana et al. 2008, *Inuvik, Northwest Territories* (Active)	
- *Qualitative* (Timeline not reported). "To learn how Inuvialuit people feel about the oil and gas activities on their land." - "Interviews [n= not reported] were administered to a stratified sample, on Inuvialuit land. Participants included: Inuvialuit elders; entrepreneurs; public servants; employees of the private sector; managers of oil companies; unemployed persons; housewives; the mayor of Inuvik; and the first aboriginal woman leader in Canada." - Methods for data analysis not reported.	Indigenous community involvement not reported.
Dana et al. 2009, *Sahtu region, Northwest Territories* (Active)	

- *Qualitative* (2005). "Give an account of what Dene residents of the Sahtu Region have to say about oil and gas development." - "In-depth interviews [n= not reported] with people across the Sahtu Region are conducted," informants were identified through snowball sampling. - Methods for data analysis not reported.	Indigenous community involvement not reported.
Davison and Hawe 2012, *Behchokǫ̀, Northwest Territories* (Active)	
- *Qualitative: Ethnographic study* (June 2004 - March 2005). "Gain a better understanding of how diamond mine developments in the NWT might be affecting the well-being of Tłı̨chǫ young people, directly or indirectly. … what impact mining may be having on the health and family life of youth and how mining may be changing educational and employment patterns." - Ethnographic methods, including field notes from participant observation, informal discussions, public presentations, and more over seven months of fieldwork. Other data included semi-structured interviews (n=21) and focus groups (n=3), archival documents, and interview transcripts from previous studies. - All documents (n=40) underwent coding and thematic analysis.	Study was undertaken in partnership with the community. Researcher consulted the community throughout the study and hired a local youth as a research assistant. Findings were shared and discussed with participants and the larger community, including the Tłı̨chǫ Government, the study school, and the NWT Department of Education, Culture and Employment. Researchers followed CIHR guidelines for research with Indigenous Peoples. Study was approved by university ethics board and the Aurora Research Institute.
Hodgkins 2017, *Wood Buffalo, Alberta* (Active)	
- *Qualitative: Empirical case study* (Fall 2010 and spring 2011). Understand challenges facing youth participating in a pre-apprenticeship training program for a mining company, "as well as their socialization into the world of work." - Semi-structured interviews with students (n=10), stakeholders (n=10), and focus groups (n=2). Researcher followed a cohort over six months, observing classes and having ongoing conversations with students. Follow up interviews were conducted at the end of the cohort study. - Methods for data analysis not reported.	Participants were able to verify the accuracy of their interview statements.
Kunkel 2017, *Cariboo Chilcotin region, British Columbia* (Active)	
- *Mixed methods: Community based research with a hybrid methodology that combines grounded theory with Indigenous ways of knowing* (During environmental assessments in 2010 and 2013). "Exploring the relationship the Tsilhqot'in people have with their Native Space, and offering explanations for why they have resisted resource development." - Conducted participant observation at community gatherings (n=2), informal conversations, and semi-structured interviews (n = 5). Also reviewed were court case files for Tsilhqot'in Nation vs British Columbia, two federal Environmental Assessments, and transcripts of hearings. - Data underwent thematic coding and content analysis.	Informed consent was obtained from the Tsilhqot'in National Government and the Xeni Gwet'in community prior to conducting the study. Author self-identifies as Indigenous. OCAP principles were applied.
Laneuville 2014, *Qamini'tuaq, Nunavut* (Active)	
- *Qualitative* (2011). Understand the link between Inuit and their territory in a mining context by exploring the daily experience of Inuit as hunters and as employees. - Ethnographic methods during two-month trip to the field, semi-structured interviews (n = 19) with Inuit hunting men and women, and visits to the Meadowbank mine (n=2). - Methods for data analysis not reported.	The research was approved by the Nunavut Research Institute.
LeClerc and Keeling 2015, *Deninoo (Fort Resolution), Northwest Territories* (Post-closure)	

- *Qualitative* (Timeline not reported). "Examine the relationship between Pine Point's post-mining landscape and the contemporary land use of Aboriginal land users from Fort Resolution." - Interviews (n=18) followed a 'map biography' method, adapted to use a semi-structured format. - Interview data underwent thematic coding and analysis. Spatial data was compiled to make maps of land use.	There was a research agreement with Deninu Kue First Nation in Fort Resolution as well as a Northwest Territories Scientific Research License.
Nightingale et al. 2017, *Qamini'tuaq, Nunavut* (Active)	
- *Mixed methods: Participatory action research with an Inuit-specific gender-based analysis* (2012 – 2014). "Explored Inuit women's experiences with a newly developed gold mine, the effects on their well-being, that of their families, and the socio-cultural and -economic impact on their community." - Conducted in-depth interviews and focus groups to identify key issues and develop a survey (n=62), which was administered by local research assistants. - Methods for data analysis not reported.	Pauktuutit was asked by Inuit women to undertake research on the gendered impact of resource extraction. There was a workshop in February 2013 to train local women as research assistants and collaboratively develop research instruments. Ten women were trained, and all participants were compensated. One article contributor is a local community researcher. Pauktuutit built on an approach for research with Indigenous women from the National Aboriginal Health Organization and tailored it for use in an Inuit cultural context.
Place and Hanlon 2011, *Tse Keh Nay, British Columbia* (Consultation)	
- *Qualitative* (2006). Research asked: "Do the First Nations involved in this study feel that their environmental values and perceptions of risk are acknowledged in the resource development approval process and what are the implications of this to their overall health and wellbeing?" - In-depth semi-structured interviews (n=16) with Elders, trap-line holders, and Chief and Council members. Policy documents, reports, press releases, and technical studies from the provincial government and Northgate were also examined. - Interview data was triangulated with participant observation and informal conversations that took place during four trips to the study communities. Data underwent thematic analysis, and conclusions were validated by community leaders.	Findings were presented in each participating community, which was deemed to be an appropriate data validation strategy by community leaders.
Rixen and Blangy 2016, *Qamini'tuaq, Nunavut* (Post-closure)	
- *Mixed methods: Participatory approach* (April - May 2014). "How do Qamani'tuaq residents define local wellbeing? How might gold mine closure impact well-being? What strategies can be adopted to ease the transition after mine closure?" - Community workshop (n = 40 participants) to define research priorities, a series of participatory workshops [focus groups] (n = 12), some of which (n = 7) focused on future mine scenarios. During future scenario workshops, participants created a "Wheel of Wellbeing" (n=5) and or used timelines/storytelling (n=2) to imagine post-closure scenarios. Semi-structured interviews (n = 10) were conducted with local representatives. - Data analysis integrated quantitative data (participants scores on Wellbeing Wheels) and qualitative data (participants' explanations of their rating choices and transcripts of workshop discussions and semi-structured interviews). These were cross-referenced for themes and were cross-referenced with results from other workshops, informal conversations, and field notes.	Permission was obtained from the Nunavut Research Institute. Participants signed informed consent forms (in English and Inuktitut) and received compensation for their participation in the workshops. Translations in the workshops were provided by community members. Study results were distributed back to residents through a variety of means. A summary report illustrated with photos and graphics was distributed via Facebook and email to the community before and after field research.
Rodon et al. 2013, *Nunavik, Québec* (Active)	

- *Qualitative* (Fall 2012). Examine whether Inuit communities are better positioned now to benefit from mining developments on their territory, compared with fifty years ago, and to investigate the social impacts of the Raglan mine. - Interviews (n = about 50) in Kuujjuaq, Salluit, and Kangiqsujuaq asking for Inuit perceptions of the Raglan project, along with results of follow up surveys from the Raglan mine on the communities of Salluit, Kangiqsujuaq, Puvurnituq, Quaqtaq, and Kangirsuk. - Methods for data analysis not reported.	Interviews were conducted with the help of Inuit co-investigators. Permission to conduct the interviews used in this article was obtained from the Makivik Corporation, the Northern villages and the Salluit Landholding Corporations, and Kangiqsujuaq.
Shandro et al. 2017, *Quesnel Lake, British Columbia* (Active)	
- *Mixed methods: Community-based participatory research* (Communities were first contacted September - November 2015 to participate). "(1) Review available environmental, industry, and community health data; (2) identify potentially impacted communities; (3) identify probable community-level impacts on determinants of health linked to the Mount Polley Mine tailing dam breach; (4) undertake a gap analysis based on existing literature to highlight existing data and identify additional evidence required for the full HIA; and (5) identify interim measures to reduce ongoing health impacts and risks for affected First Nations." - Researchers followed the Health Impact Assessment method for screening and scoping phases, which included reviewing baseline community demographic and health information, project-related documents for the Mount Polley Mine tailings dam breach, and water and fish sampling studies. This was paired with observational and field notes, as well as semi-structured interviews conducted with key informants to assess views on community-level and individual-level health effects stemming from the Mount Polley tailings failure. - Authors completed a gap analysis to determine needs for further baseline data collection.	First Nations Health Authority commissioned this study. Research team participated in Nation assembly meetings, chiefs' meetings, chief and band council meetings, and lunches with elders. Community-based coordinators assisted with the research, facilitating site visits, gathering locally available data, and reviewing project findings. Member checks occurred in real time (during interviews). Once the findings had been synthesized and reported on, each Nation received a draft version of the report and a short summary and had an in-person presentation of findings by the research lead. The presentations varied and were developed to meet the needs of each specific First Nation. The project adhered to Canada's federal Tri-Council Policy Statement for research involving Aboriginal Peoples of Canada and applied First Nations OCAP (1) data principles. Funding was provided by First Nations Health Authority.

***** This includes community partnership, input in study design, consent or consultation; indications of results being presented back to community; Indigenous research teams or authors; Indigenous-specific ethical or data holding guidelines followed; or funding from Indigenous organizations.

Table A.3. in the Appendix details the resource and response mechanism codes pulled from each article and how these were connected in each study. The table is divided in three sections based on the phase of the extractive project being investigated in the study: consultation (which includes exploration and planning), active (operation), and post-closure (reclamation and remediation). This was done to draw attention to how pathways to health can differ over the life course of the extractive project. Dividing this table by project phase also centres the realist perspective within the analysis. Many articles (n = 10) outlined pathways specifically in relation to the project phase at the time of the study. However, some studies (n = 4) forecasted pathways for a subsequent phase (Dana et al., 2008, 2009; Kunkel, 2017; Rixen & Blangy, 2016). In these studies, for example, data collection could have happened during the consultation phase of the project but included asking participants about effects they expected to see during the active phase.

4.2. Pathways connecting resource extraction to Indigenous Peoples' health

Pathways connecting resource extraction to Indigenous Peoples' health are represented in **Figure 3**. The pathways illustrate how contextual factors trigger mechanisms and eventually lead to health outcomes. The adapted CMO framework (**Figure 1**) is visible on the left-hand side of the figure. Contextual factors in relation to resource extraction include, for example, the social and political history of the community, existing legal frameworks for resource governance, the community's previous interactions with extractive activities, socio-economic and health conditions pre-extraction, outcomes from negotiated agreements, and more. The reporting of local context was uneven and often limited across the included studies. It was therefore not possible to conduct a thorough and uniform analysis of the context for each study with the information that was provided. Thus, the sole contextual factor considered in this review is the phase of the project: consultation, active, and post-closure. It is important to note that extraction is a boom-bust industry, and many closed sites are reopened in future years as technological advances allow developers to extract less accessible deposits. Therefore, it should be expected that the consultation-active-post-closure cycle, although expressed here as a linear process, could repeat multiple times at the same site. Within the active phase, there are three subsections, which are meant to represent the various ways a project can affect health: in the workplace, by driving community change, and by causing environmental stress.

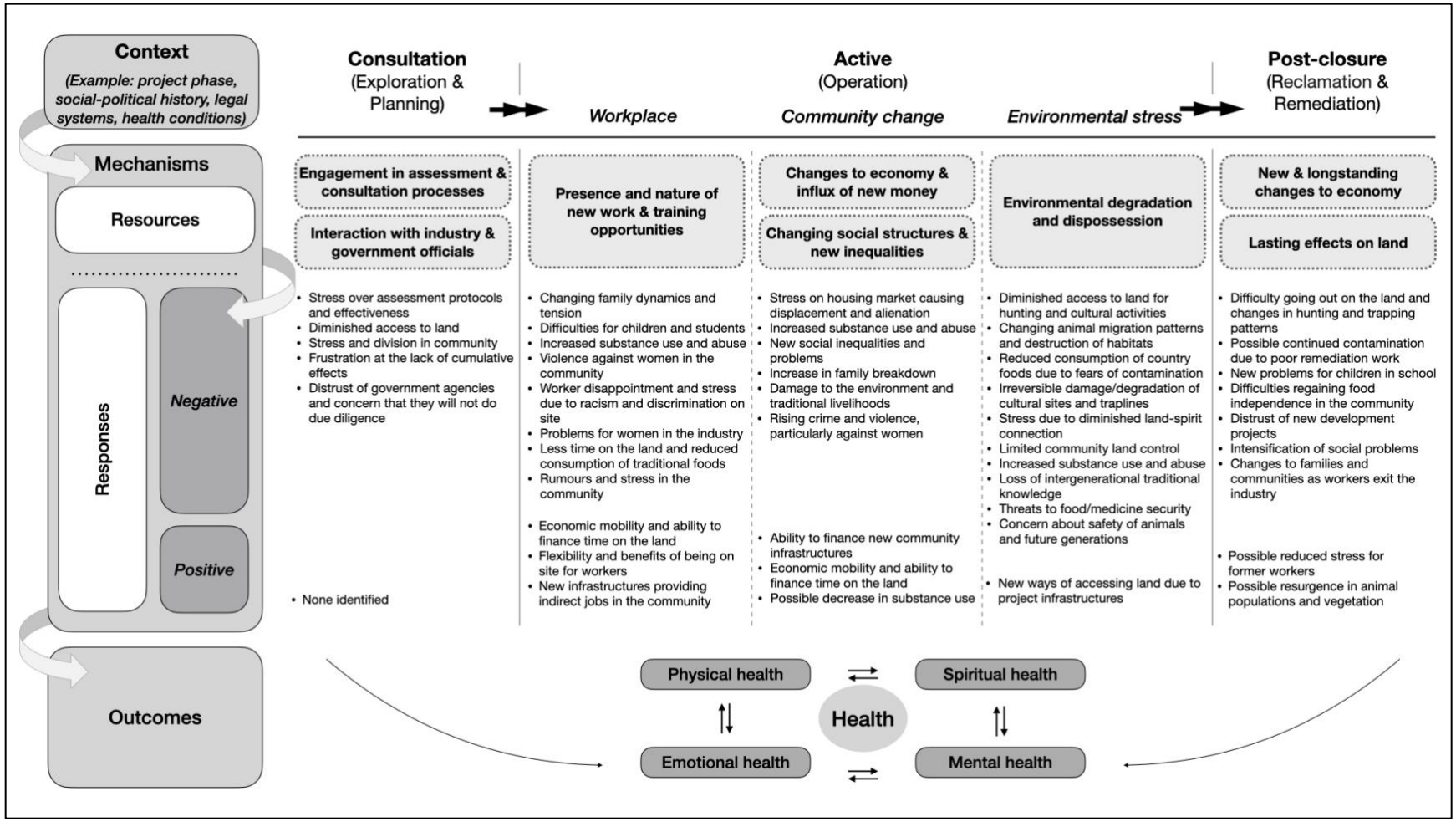

Figure 3. Pathways (left-hand side, adapted CMO framework) through which extractive industries affect Indigenous Peoples' health across the life cycle of a project.

Resource and response mechanisms were collated and organized by project phase. The eight resource themes that emerged from the included articles were: engagement in assessment and consultation processes; interaction with government and industry officials; presence and nature of new work and training opportunities; changes to the economy and influx of new money; changing social structures and new inequalities; environmental degradation and dispossession; new and longstanding changes to the economy; and lasting effects on land. Common response mechanisms included: diminished access to land for hunting and cultural activities, and reduced consumption of traditional foods; community stress due to separation from traditional lands; division and stress in the community and new social problems; changing family dynamics leading to tension and breakdown; economic mobility and ability to finance time on the land; difficulties for children and students; increased violence against women; and increased substance use and abuse.

The changes brought on by these mechanisms have the capacity to influence a range of physical, mental, emotional, and spiritual health outcomes. My objective was to detail the various mechanisms that connect extraction to the determinants of Indigenous Peoples' health, as well as to situate these mechanisms within a larger context and examine possible effects. In the following sections, I unpack the pathways between extraction and health for each of the three project phases. Then, in the discussion, these results are interpreted within the context of my research question.

4.2.1. Consultation phase of extractive projects.

Two articles discussed the effects that communities face during the exploration and planning phase of an extractive project. Engaging with the extractive sector itself and its various consultation and assessment processes can create stress for communities (Booth & Skelton, 2011; Place & Hanlon, 2011). One common issue identified was that multiple levels of government oversee operations, which makes jurisdiction over operationalizing Indigenous rights complicated for locals and can lead communities to feel as though their rights are being violated (Booth & Skelton, 2011). Additionally, traditional use studies, which companies assembling project proposals can be mandated by law to conduct, can further disenfranchise communities by failing to properly document land use. Improper evaluation of land use by companies can limit community access to the land and impede fulsome assessment of extractive

activities (Booth & Skelton, 2011). In addition, community members can experience feelings of distrust, hopelessness, and powerlessness toward the industry and toward government agencies, which can foster pervasive stress (Booth & Skelton, 2011; Place & Hanlon, 2011). These feelings can create doubt that assessment processes will be effective and can generate concern that governments will not properly monitor active sites or reclamation efforts (Booth & Skelton, 2011; Place & Hanlon, 2011).

In response to this uncertainty, communities can both feel frustration at not being included in assessment processes as well as frustration at being constantly asked to participate without any actual power (Booth & Skelton, 2011; Place & Hanlon, 2011). Some communities feel that Indigenous values and knowledge are not being respected in assessment processes. On the other hand, constant participation in consultative processes can create division in the community and consistent interactions with industry officials can cause psychological distress for community members (Booth & Skelton, 2011). In general, there is common frustration over assessment processes, particularly that assessments often fail to take into consideration cumulative effects, meaning the compiled effects of extractive industries over time and in addition to other sources of historical trauma and distress (Booth & Skelton, 2011; Place & Hanlon, 2011).

4.2.2. Active phase of extractive projects

The results in this section are divided into three subsections: extractive site as a workplace, as a driver of community change, and as an environmental stressor. Each section represents a different manner through which a site can affect community health during the active phase.

Extractive site as a workplace. Many articles discussed how new jobs at the project site can affect workers and the larger community. Across the studies, there was a general consensus that extractive projects can create more jobs and training opportunities (Davison & Hawe, 2012; Nightingale et al., 2017; Place & Hanlon, 2011). For workers who are able to secure employment, they and their families can enjoy increased material wellbeing, reduced economic stress, and increased ability to purchase equipment to facilitate time out on the land (Laneuville, 2014; Nightingale et al., 2017). Women who are able to gain employment can have more

autonomy and can feel more confident in their ability to hold a job or to finish school (Nightingale et al., 2017). However, these work and training opportunities can also create tension in the community, as some students are increasingly incentivized to leave school early and seek employment at the project site (Blangy & Deffner, 2014; Davison & Hawe, 2012). Although the industry encourages students to stay in school, this tension can put pressure on schools to create curricula aimed at preparing students specifically to enter the extractive labour market (Davison & Hawe, 2012). Along with a growth in employment possibilities are new training programs being established by companies to equip youth with the skills they will need to work at the project site (Hodgkins, 2017). However, participants in these programs can still have difficulties overcoming deficits in their education and skills (Hodgkins, 2017). Additionally, students in training programs can face intense challenges, including financial pressures caused by being away from home, increased drug and alcohol abuse due to the lifestyle at work, and trouble fulfilling familial responsibilities, particularly for women with dependents (Hodgkins, 2017).

Despite an increase in employment opportunities, these jobs are often inaccessible to Indigenous communities, and workers can face sizeable difficulties navigating the workplace (Davison & Hawe, 2012; Place & Hanlon, 2011). Workers can experience racism and discrimination at work, stemming from a lack of comprehension of Indigenous cultures in the workplace and language barriers with non-Indigenous workers and management (Blangy & Deffner, 2014; Rodon et al., 2013). This can fuel tensions between Indigenous workers and workers of other racial or language identities (Rodon et al., 2013). These workplace conditions can drive decreased interest in employment at the site and a high job turnover rate (Blangy & Deffner, 2014; Rodon et al., 2013). Compared to men, women face considerably increased hardships and diminished opportunities (Davison & Hawe, 2012). Women are confronted with an increased risk of sexual harassment and assault, particularly for those working at the bottom of the occupational hierarchy (Nightingale et al., 2017). Additionally, many women are not made aware of their rights as workers and are more likely to be pushed out of the industry if they are not provided with benefits that allow them to provide for their dependents, like childcare (Nightingale et al., 2017).

As a result of new work requirements such as rotational shift scheduling, workers are in a constantly transient state, which can negatively impact both workers and their families (Davison & Hawe, 2012). The working family member often spends a lot of time away from home and

from their responsibilities and are exhausted or engage in risky behaviours or substance use when they return (Davison & Hawe, 2012; Nightingale et al., 2017; Rodon et al., 2013). Time away from home can be difficult for families and, coupled with gossip and stress, can change family dynamics, create tension, and even lead to family breakdown (Blangy & Deffner, 2014; Booth & Skelton, 2011; Nightingale et al., 2017; Rodon et al., 2013). Workers may even leave their jobs in order to be reunited with their families (Rodon et al., 2013). Family tensions can also be exacerbated by changing gender dynamics within the family, as some women working in the industry become primary breadwinners (Nightingale et al., 2017). Hunting is a particularly important issue, as workers who are away from home have less time to go out on the land, harvest country foods, and fulfil central cultural roles and expectations (Nightingale et al., 2017). Children are particularly vulnerable when one or both parents follow a rotational shift schedule, as a decreased adult presence in the home can be disruptive to child development (Davison & Hawe, 2012; Nightingale et al., 2017). Also, when workers are home from the site, children are likely to miss school to spend time with their parents (Rodon et al., 2013). However, this decreased parental presence could also lead to grandparents spending more time with children as they take over childcare duties (Davison & Hawe, 2012). While this may mean that more Indigenous languages are spoken at home, grandparents may be unable to help children with their schoolwork (Davison & Hawe, 2012). Additionally, workers without access to family care may have difficulty finding childcare and be forced to leave children unsupervised at home (Blangy & Deffner, 2014; Nightingale et al., 2017). In this case, children can be exposed to violence and substance abuse, or be likely to miss school (Blangy & Deffner, 2014; Nightingale et al., 2017).

Some articles identified various benefits associated with more disposable income for workers' families, including the ability to finance going out on the land and increased access to appropriate housing and adequate food (Davison & Hawe, 2012; Nightingale et al., 2017). Workers also have flexible hours on a rotational shift schedule, which may facilitate more time out on the land and improve food security (Blangy & Deffner, 2014; Laneuville, 2014). Time away at the work camp can give workers respite from challenging or overcrowded homes, providing them with personal space (Rodon et al., 2013). Women working at the project site can build financial independence and greater autonomy (Nightingale et al., 2017). However, an increase in income for workers and their families can deepen social inequities within the

community (Davison & Hawe, 2012). Substance abuse amongst workers and in the community at large can increase due to growing amounts of disposable income and a rise in legal permits and bootlegging of banned substances (Booth & Skelton, 2011; Nightingale et al., 2017). This can increase violence, particularly against women (Nightingale et al., 2017).

Extractive site as a driver of community change. Some articles examined how the presence of an extractive project can lead to changes not only for workers, but for the entire community. Financial revenue for the community can rise due to benefits coming from the company, third-party funding, and royalty payments (Blangy & Deffner, 2014; Rodon et al., 2013). This money can facilitate the creation of new infrastructures and services, and indirectly lead to more jobs for community members (Blangy & Deffner, 2014; Davison & Hawe, 2012; Nightingale et al., 2017; Rodon et al., 2013). When royalty payments are given directly to community members themselves rather than to the community administration, family living conditions can improve due to increased participation in traditional activities and time out on the land (Rodon et al., 2013). However, Rodon et al. (2013) note that the distribution of royalty payments to community members directly can also lead to a disinterest in work when cheques are handed out. An increase in money can drive myriad social problems, including abuse, violence, family breakdown, and substance use, similar to those experienced by workers and their families (Blangy & Deffner, 2014; Dana et al., 2008, 2009; Rodon et al., 2013). However, one participant predicted that a broader economy might keep community members busy and reduce time to be spent engaging in substance use (Dana et al., 2008).

Some articles also discuss that these social problems can be due in part to an influx of outsiders, changing the social dynamic of the community (Dana et al., 2008). This can alienate community members, potentially leading to an increase in crime, violence, and suicide rates (Dana et al., 2008). An influx of outside labour can also drive rents up in the community, reducing the availability of affordable housing and increasing overcrowding (Booth & Skelton, 2011; Dana et al., 2009). Escalating housing prices can lead to higher numbers of displaced people and push community members to move away (or back to) their community (Booth & Skelton, 2011; Dana et al., 2008, 2009). Moreover, the influx of outsiders can further put a strain on existing services and infrastructures (Dana et al., 2008; Nightingale et al., 2017).

Extractive site as an environmental stressor. Many articles explored how environmental degradation and dispossession associated with extractive projects can negatively affect surrounding communities. Specifically, communities face the loss or contamination of important plant and animal species due to chemicals and dust pollution from the project (Blangy & Deffner, 2014; Laneuville, 2014; Rodon et al., 2013). Animals' migration patterns may also be affected, making country foods less accessible (Blangy & Deffner, 2014). Together, these factors can pose a severe threat to food and medicinal security for communities (Kunkel, 2017). New projects can degrade traplines, animal habitats, and cultural sites, which can cause irreversible land change and compromise people's ability to hunt, fish, and harvest (Blangy & Deffner, 2014; Dana et al., 2009; Kunkel, 2017; Laneuville, 2014; LeClerc & Keeling, 2015; Shandro et al., 2017). This degradation is compounded by changing access patterns to land, as communities also lose territory where they can hunt and fish (LeClerc & Keeling, 2015). Overall, environmental degradation can lead to a decline in consumption of traditional foods, cause poor physical health, and affect a community's spiritual relationship with the land (Blangy & Deffner, 2014; Booth & Skelton, 2011; Dana et al., 2009; Place & Hanlon, 2011; Rodon et al., 2013; Shandro et al., 2017).

Communities can face serious fears that ground water, plants, and animals could be contaminated from extractive projects, which can also decrease consumption of country foods (Booth & Skelton, 2011; Place & Hanlon, 2011; Rodon et al., 2013). Communities experiencing uncertainty and distrust can feel a decreased sense of safety in the community, concern for future generations, and intense emotional stress (Booth & Skelton, 2011; Shandro et al., 2017). This can be compounded in cases where extractive industries are situated on important cultural sites, such as ancestral graves (Laneuville, 2014). Knowing that ancestors' spirits are being disturbed by the project can generate intense fear and anxiety for community members and Indigenous workers operating on site (Laneuville, 2014).

New roads providing access to the project site can interfere in animal migration routes (Laneuville, 2014). Increased traffic and road infrastructures can diminish access to land, leading to a reduction in traditional land-based activities that promote physical health, respite, and wellness, connecting people to their traditions, cultural values, and to others (Booth & Skelton, 2011; Place & Hanlon, 2011; Shandro et al., 2017). Reduced engagement in traditional activities can also spur an increase in substance use and abuse (Place & Hanlon, 2011). Furthermore,

changing access patterns to land can affect who is able to engage in traditional activities and can alienate certain segments of the community from participating in activities like harvesting (Blangy & Deffner, 2014). Even in cases where new roads facilitate land access, communities are still confronted by limited decision-making power over their territories (Blangy & Deffner, 2014; Laneuville, 2014). Environmental dispossession as a whole represents a threat to traditional knowledge and can potentially break intergenerational knowledge transfer (Kunkel, 2017).

4.2.3. Post-closure phase of extractive projects

Only two articles focused on how communities would be affected in the long term after the closure of an extractive project, specifically the lasting effects of a project on the community's economy and environment. Regarding the economy, participants in one community forecasted that after the mine closure, job losses may lead to closer family relations and more time on the land learning traditional skills (Rixen & Blangy, 2016). Participants also thought that there would be an intensification of social problems such as alcohol abuse, familial tension, and suicide due to stress (Rixen & Blangy, 2016). However, they agreed that there would likely be lower stress on workers with dependents as they left rotational shift scheduling (Rixen & Blangy, 2016). It was suggested that future unemployment could exacerbate social inequalities as it would disproportionately affect families with members formerly employed at the project site (Rixen & Blangy, 2016). Additionally, participants expected that household overcrowding would intensify (Rixen & Blangy, 2016). Community members also anticipated a persistence in the mixed economy (both subsistence and wage labour) (LeClerc & Keeling, 2015).

In relation to lasting environmental effects, one community discussed the possible re-emergence of caribou populations in the area post-closure (Rixen & Blangy, 2016). However, participants also expected that access to the land might continue to be difficult due to road closures and a lack of income to maintain hunting equipment, which would change trapping patterns (LeClerc & Keeling, 2015; Rixen & Blangy, 2016). There is a possibility that residue from project activities will continue to make country foods unsafe and that overall, food independence would likely still be difficult to attain (Rixen & Blangy, 2016). Another community identified that poor remediation work has been a source of community discontent and of local safety concerns (LeClerc & Keeling, 2015). Continued contamination from the

project has also inhibited vegetation regrowth and fostered a general distrust of any new development projects (LeClerc & Keeling, 2015).

4.3. Summary of scoping review

The purpose of this scoping review was to identify the complex social-ecological pathways through which extractive development can affect the determinants of Indigenous Peoples' health and wellbeing. By adopting a realist perspective, I identified resource and response mechanisms from the reviewed articles with the capacity to be activated in an extraction context and produce health outcomes. Eight resource mechanisms were related to changes stemming from extraction sites across the three project phases (consultation, active, and post-closure): engagement in assessment and consultation processes; interaction with government and industry officials; presence and nature of new work and training opportunities; changes to economy and influx of new money; changing social structures and new inequalities; environmental degradation and dispossession; new and longstanding changes to the economy; and lasting effects on land. Common examples of response mechanisms included community stress due to separation from traditional lands; division and stress in the community and new social problems; changing family dynamics leading to tension and breakdown; economic mobility and ability to finance time on the land; and increased substance use and abuse. Each of these mechanisms can affect the physical, mental, emotional, and spiritual health of Indigenous communities in myriad ways.

One important finding from this review is that extractive projects can create both benefits and challenges for Indigenous families and communities, and that context is key to understanding the impacts that a project can have on a community. Extractive projects can multiply other determinants of health for Indigenous communities in both positive and negative ways: while strengths can increase due to more material resources and potential opportunities, existing challenges to good health can also be compounded and severely aggravated, especially those related to land dispossession and ongoing colonial relations and legacies. In the next chapter, I compare the pathways I identified in this review with the content of the assessments for the 28 projects in my sample to determine if and how these mechanisms are considered.

5. RESULTS II:
Examining Indigenous health in environmental assessment

In this chapter, I present results of my analysis of 28 environmental assessment (EA) reports for new mining projects and explain how Indigenous health is represented within the assessment process. Results from the scoping review were used as a jumping off point for understanding how Indigenous Peoples' health is represented in EA, as I cross-referenced the pathways identified in the literature with the VCs that were measured for the projects in my sample. After extracting data from the 28 assessments that met my inclusion criteria, I used qualitative content analysis to group VCs into six categories: (1) animals and their habitats, (2) ecosystem quality and resources, (3) Indigenous land use and heritage, (4) Indigenous health and wellbeing, (5) atmospheric conditions, and (6) tourism and socioeconomic conditions. I then paired my analysis of these VCs with examples and quotes from the report texts to further investigate the EA process.

5.1. Description of projects in sample

Table A.4. (Appendix) describes the characteristics of the 28 projects included in my sample, including the proponent, location of the project, type of material extracted, type of assessment conducted and when the assessment was completed, proposed mine life and production capacity, whether (and which) Indigenous communities were consulted, and whether the project was granted approval. The projects in this sample have undergone two different types of assessment under two EA laws: comprehensive studies (n = 15), which were finished between April 2012 and February 2018 under CEAA 1995, and environmental impact assessments (n = 13), which were finished between April 2016 and August 2019 under CEAA 2012. There was a broad geographic range across the sample (**Figure 4**), with projects located in British Columbia (n = 8), Québec (n = 7), Ontario (n = 6), Nova Scotia (n = 2), Saskatchewan (n = 2), Newfoundland and Labrador (n =1), and New Brunswick (n = 1), with one additional project split between Québec and Newfoundland and Labrador. Of the 28 projects, only one was denied following the assessment— the Ajax Mine project (British Columbia). Also, of the projects that passed, three were found likely to cause significant damage to the environment or to Indigenous

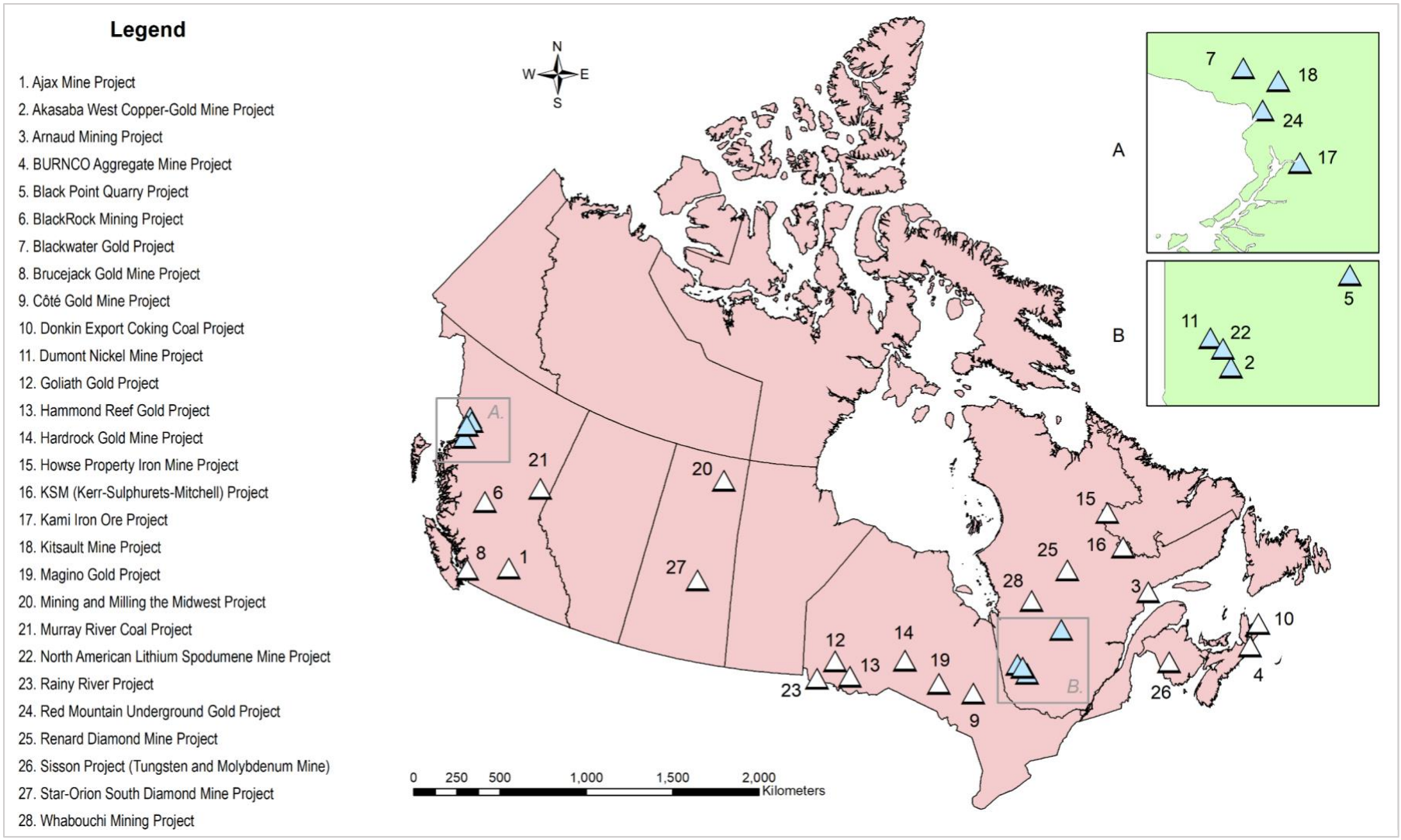

Figure 4. Map of proposed locations of mining projects included in the sample.

communities by the Minister of Environment, but the damage was deemed 'justified' in each circumstance.

5.2. Selection of Valued Components within assessment process

Valued components (VCs) are physically, economically, socially, or culturally important parts of the environment that might be affected by the project. VCs are chosen for analysis in environmental assessment by proponents and federal agencies, in consultation with other experts and members of the public. By measuring and evaluating indicators related to each VC, assessment practitioners determine a project's potential impacts on the surrounding environment, including on Indigenous communities and their health. Through coding (using the methods described in section 3.3.2.), I identified six categories of commonly measured VCs across the sample. These included: 1) animals and their habitats, 2) ecosystem quality and resources, 3) Indigenous land use and heritage, 4) Indigenous health and wellbeing, 5) atmospheric conditions, and 6) tourism and socioeconomic environment.

'Animals and their habitats' was the most evaluated category, with 68 VCs related to this topic being measured across the projects. VC subcategories within this topic included effects on fish and fish habitats, migratory birds, wildlife, species at risk, and birds and bird habitats. The second most evaluated category was 'ecosystem quality and resources,' with 49 related VCs assessed across the sample. These subcategories included impacts on the marine environment, the terrestrial environment, and wetlands. The next most assessed category was 'Indigenous land use and heritage' at 43 evaluated VCs. Subcategories for this topic were impacts on current use of land for traditional purposes, on physical or cultural heritage, or on both. Next, with 30 assessed VCs, was the category of 'Indigenous health and wellbeing,' which included subcategories related to socioeconomic and health conditions as well as human health. There were 23 VCs related to 'atmospheric conditions,' with subcategories assessing impacts on transboundary effects and greenhouse gases, air quality, noise and vibrations, and the atmospheric environment more generally. The last category was 'tourism and socioeconomic environment' with 11 VCs. Subcategories related to this topic included measured effects on tourism, recreation, and commercial resource use, as well as socioeconomic conditions. **Figure 5** shows the VCs assessed across the sample, along the six VC categories and their subcategories.

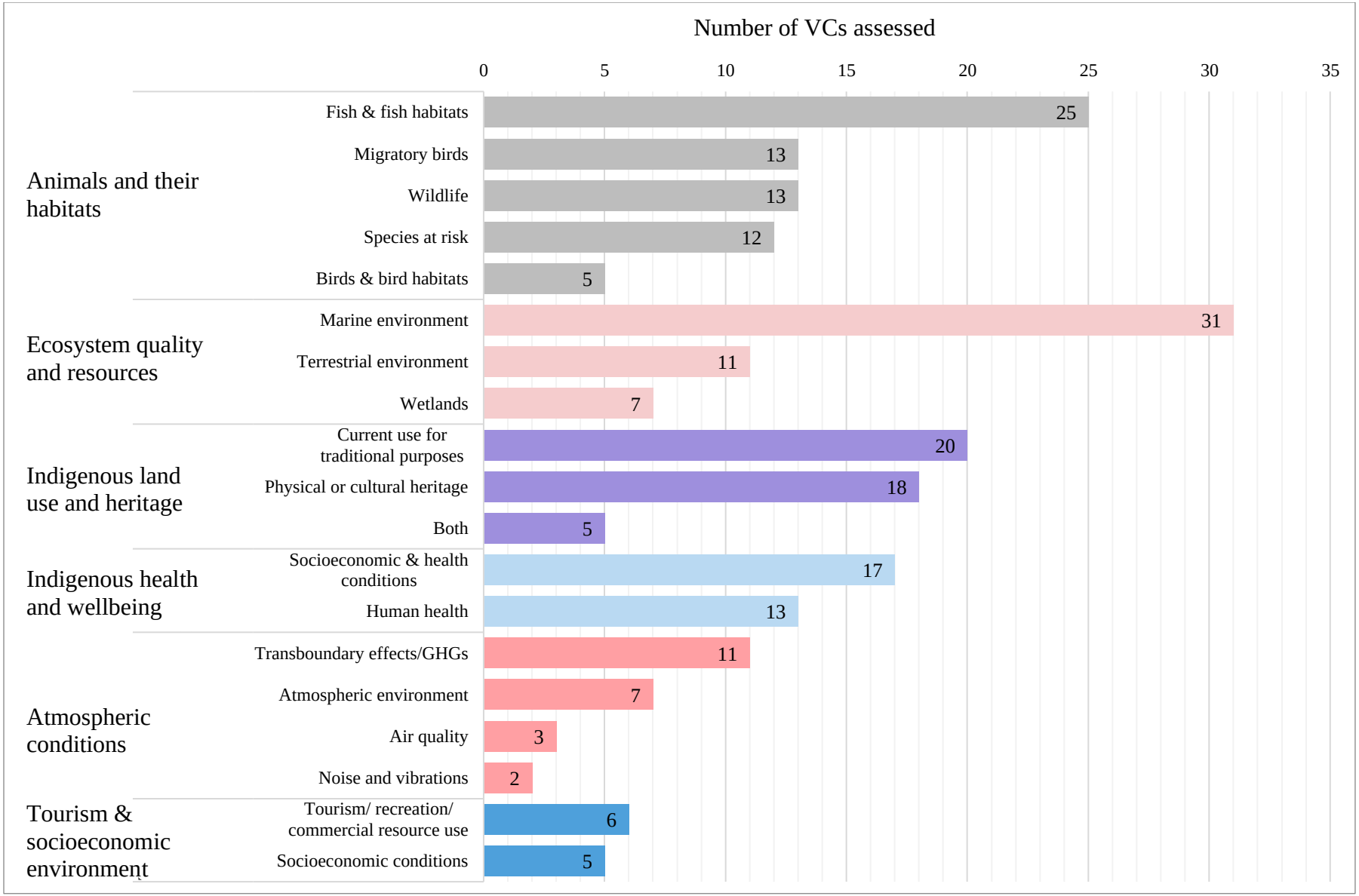

Figure 5. Number of assessed Valued Components (VCs) by category and subcategory for 28 projects.

One issue with the VCs chosen for inclusion is that these categories are often not in line with Indigenous communities' stances on areas with potential impacts, which means that important animal habitats, sections of land, plant species, and so on may not be included in the analysis.[1] **Figure 6** presents a breakdown of the type of assessed VCs across the whole sample by percentage. The most frequently assessed VC category overall was 'animals and their habitats' at 30.4%, and the least assessed was 'tourism and socioeconomic environment' at 4.9%. The VC categories concerning Indigenous Peoples were relatively less measured across all projects, with 'Indigenous land use and heritage' and 'Indigenous health and wellbeing' together adding up to 32.6% of the total sample.

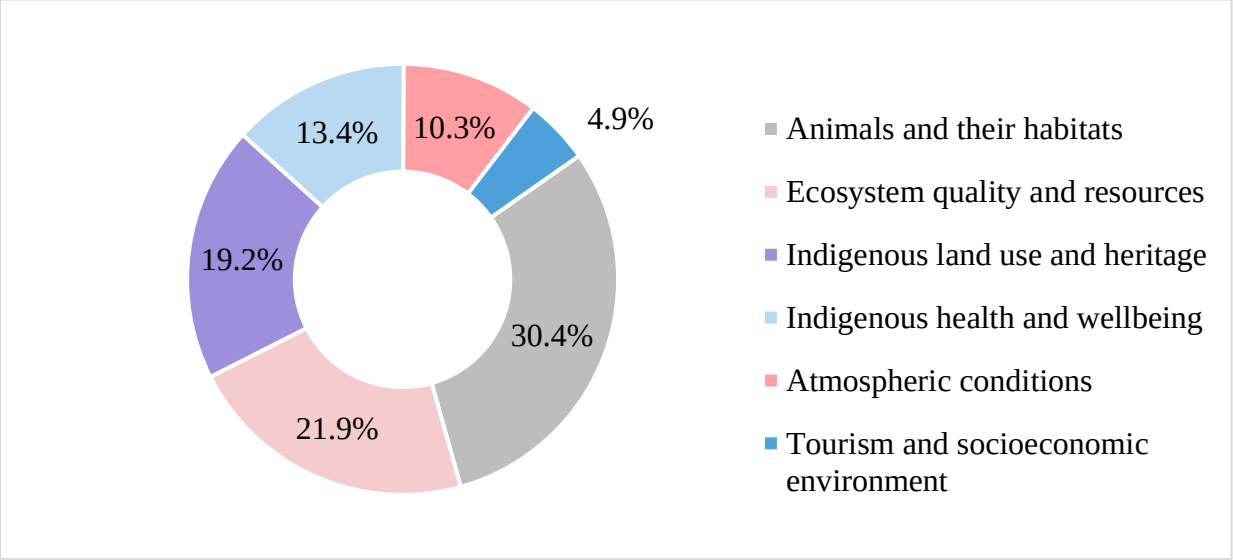

Figure 6. Percentage breakdown of VCs measured across 28 project assessments, by category.

A core problem with assessing effects with VCs is that this method breaks up a projects' impacts into individual, often mutually exclusive, parts. Beyond reducing the complexity of effects on an entire ecosystem, this approach also provides an incomplete view of impacts on Indigenous communities. This is especially important when assessing effects on Indigenous Peoples' health, as this separated perspective is fundamentally at odds with the holistic visions of health held by Indigenous communities. So not only are Indigenous Peoples' health less represented in terms of the share of VCs dedicated to this topic, but the worldview that informs Indigenous health ontologies is discounted by the method used in assessment.

[1] See: BURNCO Aggregate Mine Project, Murray River Coal Project, Sisson Project

Several communities cited concerns related to a lack of holistic assessment throughout the reports.[2] One example is Stk'emlupsemc te Secwépemc Nation (SSN)'s comment in the Ajax (British Columbia) report:

> SSN submitted written reports to the Agency and [Environmental Assessment Office (EAO)] summarizing the outcomes of its community-based panel hearings, submitted written comments, and participated in numerous meetings with the Agency and EAO. SSN communicated the interconnectedness between environment and culture, the need for a more holistic approach to the EA which considers the importance of Pípsell, including the hunting blind complex, and the role of the Trout Children Story in SSN culture. SSN expressed their view that [KGHM Ajax Mining Inc.]'s assessment of Indigenous heritage should have included intangible/invisible aspects of SSN heritage. (Ajax Mine Project, p. 245)

Selected indicators often fail to properly examine connections across different VCs, which is especially detrimental to proper assessment of cumulative effects. This was another common concern among the communities who provided comments on the reports in my sample.[3] This is especially relevant considering that many projects are near deposits being developed by other companies, which means that a community can be confronted with multiple concurrent projects infringing on their space. In 2001, Natural Resources Canada estimated that about 1200 Indigenous communities were within 200km of a mineral or metal development, with the Assembly of First Nations adding that 36% of First Nations communities were within a 50km proximity of a mine (Hipwell et al., 2002; Keeling & Sandlos, 2009). One example of this is the Hammond Reef Gold Project (Ontario), which was near two closed mines, an active biomass facility, two active wood processing facilities, and three proposed mines at the time that the assessment was completed (p. 96). Or, in the case of the Howse Property Iron Mine Project (Newfoundland and Labrador), the site was close to 25 other past, present, or future mines, smelters, dams, or rail lines, causing countless cumulative effects fir nearby Indigenous communities (p. 97). These cumulative effects can have important intergenerational impacts on communities' health, so not accounting for concurrent or subsequent projects in the same area limits the accuracy of the assessment.

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[2] See: Ajax Mine Project, Akasaba West Copper-Gold Mine Project, BlackRock Mining Project, Blackwater Gold Project, BURNCO Aggregate Mine Project, Murray River Coal Project

[3] See: Akasaba West Copper-Gold Mine Project, Arnaud Mining Project, BlackRock Mining Project, Blackwater Gold Project, Brucejack Gold Mine Project, BURNCO Aggregate Mine Project, Côté Gold Mine Project, Goliath Gold Project, Howse Property Iron Mine Project, Kami Iron Ore Project, Murray River Coal Project, Rainy River Project, Sisson Project, Whabouchi Mining Project

5.3. Assessing residual effects

The primary method for understanding a project's impact is completing a residual effects analysis (REA), where a series of indicators related to each VC are measured against a set of criteria in order to establish what potential effects will remain after all mitigation measures are implemented by the proponent. **Table A.5.** (Appendix) presents the expected residual effects identified by practitioners during this part of the assessment. The table shows a complete list of VCs tested for each project, the number of indicators that were found significant, and then an abridged list of potential residual effects for the VC categories related to Indigenous Peoples, their land and heritage, and their health and wellbeing. The table demonstrates that the residual effects determined by assessors are either incredibly specific and limited or very broad, which makes it hard to know how exactly communities will be affected.

The baseline data used in REAs was widely criticized by communities across the sample for being incomplete and detached from community knowledge about local conditions.[4] The methods used in REAs were similarly criticized for not being aligned with community science and ways of knowing, including health ontologies.[5] This wariness puts the results of the entire assessment into question for many communities, as seen here in the report for the Blackwater Gold (British Columbia) project:

> From the perspective of Ulkatcho and Lhoosk'uz Dené, the proponent's baseline studies that informed their impact assessment, and the resultant mitigation measures it proposed to offset the impacts, contain considerable information gaps and areas of substantial uncertainty. As such, we lack confidence in the proponent's assessment of impacts. (Blackwater Gold Project, p. 157)

Several communities were specifically dissatisfied with the proponent and Agency's definition of health and how this affected the health indicators that were included.[6] In the assessment for the BURNCO Aggregate (British Columbia) project, Tsleil-Waututh Nation commented that they "[requested] an assessment on Indigenous community health and well-being that takes into

[4] See: Ajax Mine Project, Akasaba West Copper-Gold Mine Project, BlackRock Mining Project, Blackwater Gold Project, Côté Gold Mine Project, Goliath Gold Project, Kami Iron Ore Project, Magino Gold Project, Murray River Coal Project, Rainy River Project, Sisson Project, Star-Orion South Diamond Mine Project

[5] See: Ajax Mine Project, BlackRock Mining Project, Blackwater Gold Project, Brucejack Gold Mine Project, BURNCO Aggregate Mine Project, Côté Gold Mine Project, Goliath Gold Project, Kami Iron Ore Project, KSM (Kerr-Sulphurets-Mitchell) Project, Magino Gold Project, Mining and Milling the Midwest Project, Murray River Coal Project, Rainy River Project, Red Mountain Underground Gold Project, Sisson Project, Star-Orion South Diamond Mine Project, Whabouchi Mining Project

[6] See: Ajax Mine Project, Blackwater Gold Project, BURNCO Aggregate Mine Project, Murray River Coal Project

consideration overall cultural, mental, emotional, and spiritual impacts" (BURNCO Aggregate Mine Project, p. 141). The Agency's response only proves the narrow scope of human health consideration in assessment:

> The Agency considered Project effects on human health through changes in water quality, air quality, noise, and vibration levels. The Agency incorporated, to the extent possible, perspectives and advice from Indigenous groups in its analysis of potential environmental effects to human health. Health Canada has advised the Agency that the proposed mitigation measures and follow-up would adequately address the potential effects on human health. With Health Canada's recommendation the proponent is required to meet human-health related conditions as part of the provincial Certificate conditions. (BURNCO Aggregate Mine Project, p. 141)

Additionally, the mitigation measures suggested by proponents were often seen as inappropriate and were subject to community concern and criticism.[7] The communities who participated in the Murray River Coal (British Columbia) project assessment— Salteau First Nations, West Moberly First Nations, and the McLeod Lake Indian Band— described the mitigation measures proposed by the proponent as "poorly defined, unenforceable, and disconnected from actual environmental performance" (Murray River Coal Project, p. 179). Mitigation measures centred around financial compensation or long-term reclamation efforts were also often seen as insufficient to help communities recover post-closure:

> The James Smith Cree Nation, the Métis, the Muskoday First Nation, and the Wahpeton Dakota Nation also stated that the proposed mitigations are insufficient to address project effects on traditional land use. They dismiss progressive reclamation as mitigation because it would take more than a generation for the site to be reclaimed for appropriate traditional use. Further, they noted that reclamation success and length of time for the site to be reclaimed to traditional land use is highly uncertain and that this multi-generational interruption to traditional land use would therefore have a permanent effect on intangible aspects of cultural heritage. The James Smith Cree Nation stated that mitigations of sponsoring cultural programs and replacement initiatives are wholly inappropriate, and would not equally or fully compensate the project effects on culture and traditional land use (Star-Orion South Diamond Mine Project [Saskatchewan], p. 52).

5.4. Determining significance of effects

After potential effects are identified during the residual effects analysis, these impacts are designated 'significant' or 'not significant' by practitioners. If a project's impacts are designated significantly adverse on the environment or on a particular VC, this can lead to a project being

[7] See: Brucejack Gold Mine Project, Howse Property Iron Mine Project, Murray River Coal Project, Sisson Project, Star-Orion South Diamond Mine Project

denied an environmental assessment certificate, meaning that the project cannot proceed. Effect 'significance' is determined by practitioners by measuring impacts against a set of five criteria: magnitude, extent, duration, frequency, and reversibility (Canadian Environmental Assessment Agency, 2018). I calculated the total number of effects assessed for all 28 projects across all VC categories, as well as the number of these effects that were designated significant. Out of 652 effects identified across all 28 projects, only 2 were designated significant, amounting to only 0.03% of the total sample. In some of the reports, communities disagreed with the significance ratings assigned by the proponent and Agency. This quote from the Murray River (British Columbia) report shows communities' palpable frustration at the inconsistency of the Agency's recognition of Indigenous health determinants:

> Despite understanding that '*Aboriginal groups value the relationship between the landscape and their traditional language, oral history, and teachings between generations of Aboriginal peoples,*' (Page 80, Para 5) the Agency has still concluded that there are no significant adverse effects. Given that the land around the project area will not be usable to the local First Nations in a way that is free of disturbance, noise and visual distracts so that community members can connect with the land, hunt, harvest, and pass on language and culture to other generations, this is a significant loss. The Agency should reconsider its conclusions on this topic, and take the view from the perspective of First Nations users. (Murray River Coal Project, p. 212)

About one third of the reports (10/28, 35.7%) also included the significance grade given to each residual effect by assessment practitioners, detailing how significant the effect is. These grades are ranked on a scale ranging from negligible, very low, low (or minor), medium (or moderate), high, to very high. Only effects graded as high or very high are designated significant, as outlined in CEAA (CEAA 1995, CEAA 2012). **Figure 7** charts ratings for VCs related to Indigenous Peoples on a scale from negligible to medium. A large share (52.6%) of the effects designated non-significant were deemed to have a 'low or minor' significance level. However, 36.8% of these effects were deemed medium, meaning that these effects are only one level below significance designation.

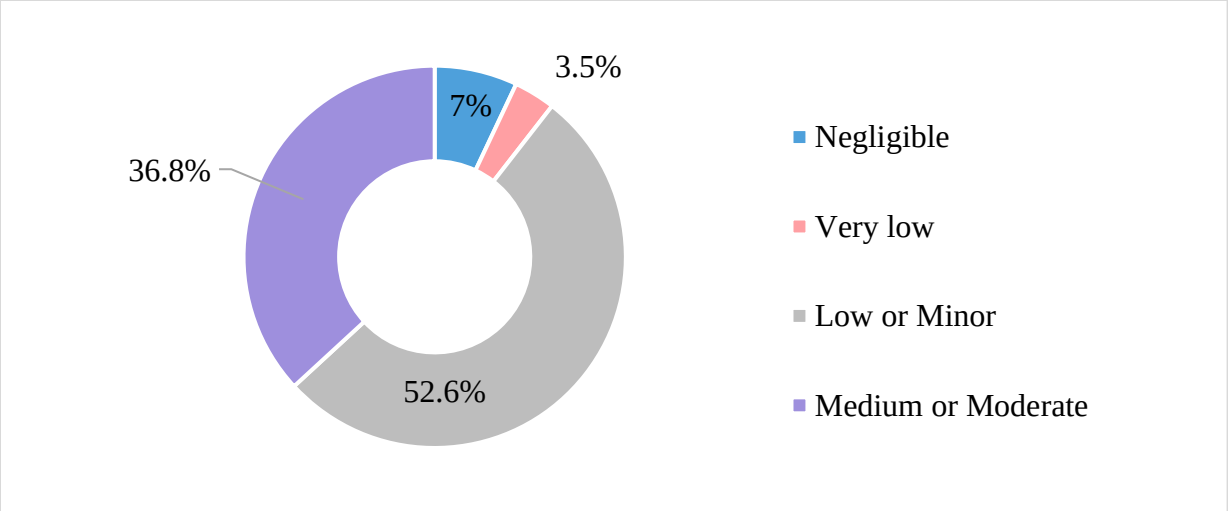

Figure 7. Subclassification of significance level for VCs designated ‘not significant’ across 10 projects.

These ratings warrant further investigation, particularly because many of these effects are close to being deemed significant and are contested by communities involved in the assessment process. The most important criterion is magnitude— broadly defined as the importance of the effect— because it is the primary factor in the determination grids used to assess significance. Regardless of other criteria, indicators with low magnitude are automatically designated not significant, as per CEAA legislation. However, the distinction between medium and high magnitude has important repercussions on whether an effect is likely to be deemed significant or not. In each report, there is typically a definition of how magnitude is assessed for each VC.

After compiling these definitions, I identified the factors that upgraded an effect’s magnitude from medium to high for each definition, and then grouped similar factors under higher order headings (this data is seen in **Table A.6.** in the Appendix). **Figure 8** shows these factors for the three VC categories related to Indigenous Peoples: ‘current use of lands and resources for traditional purposes’ (definitions included in 17 reports), ‘health and socioeconomic conditions’ (definitions in 15 reports), and ‘physical or cultural heritage’ (definitions in nine reports). Eight of the projects did not provide specific definitions for medium and high magnitude, but rather provided one general definition for all the VCs. The factors for this category are included under the ‘generic’ column in the figure.

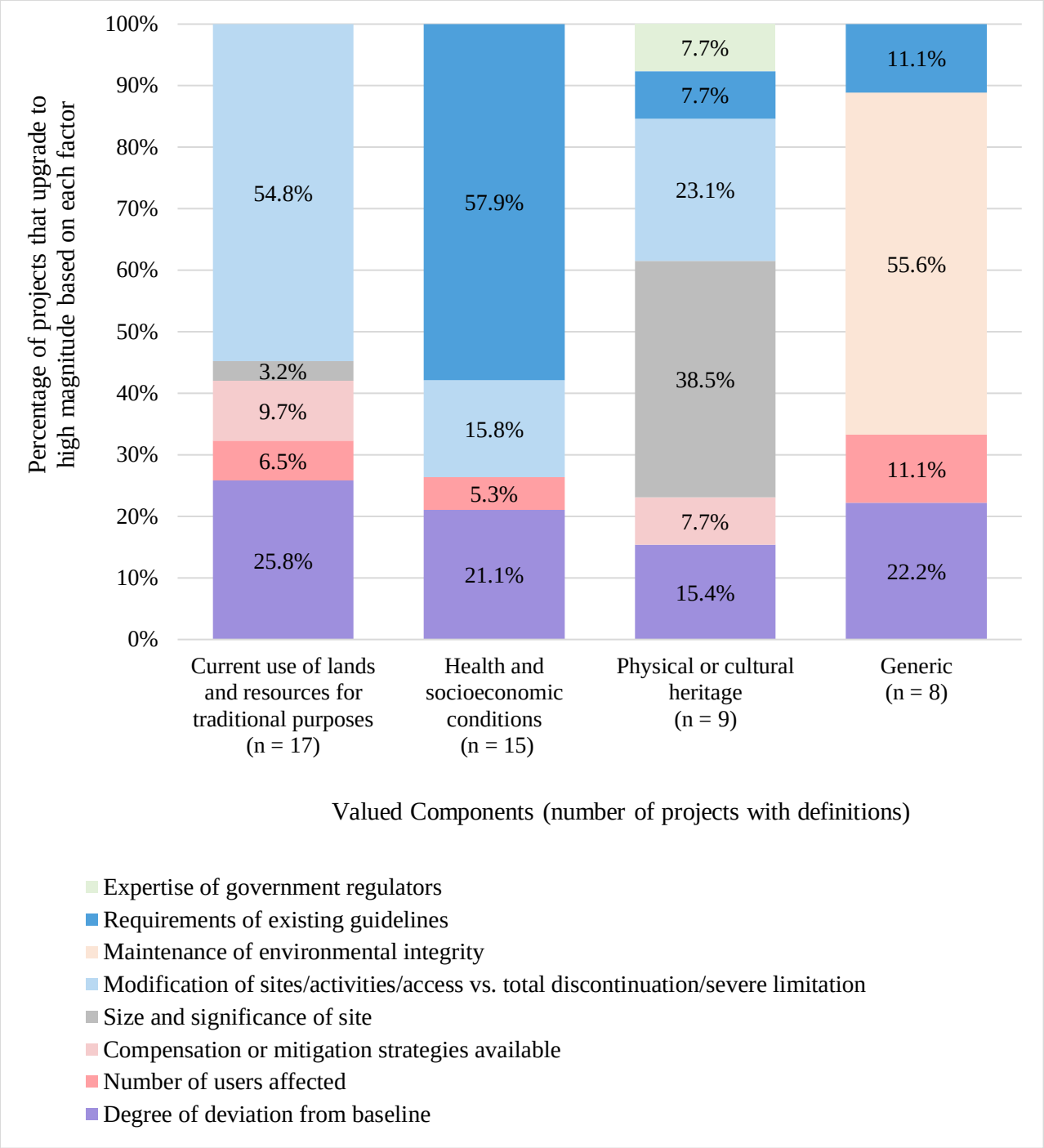

Figure 8. Factors determining medium versus high magnitude for VCs related to Indigenous communities, for 28 projects.

As seen in the left bar, the most common factor contributing to high magnitude designation under 'current use of lands and resources' is whether access, activities, or sites are modified or stopped altogether because of project operations. Under this definition, projects can

change local conditions significantly, but as long as people are still able to access sites or participate in activities in a reduced or modified capacity, these effects are deemed moderate magnitude. The second most common factor is the degree of deviation from baseline, meaning the amount of change demonstrated compared with baseline conditions. For 'health and socioeconomic conditions,' the most important factor by far is the requirements of existing guidelines, such as recommendations to limit exposure to air particulates or to contaminants in the water. For 'physical or cultural heritage,' the size and significance of the site was an important factor for determining if an effect was of medium or high magnitude. The most common criteria across the standard definitions (meaning that there were no specific definitions for each VC) was the maintenance of environmental integrity, with little focus on human activity or experience.

These factors are contentious because most of them are not centred in community ontologies, values, or knowledge, especially about health. Rather, these factors draw upon assessors' ideas about what constitutes high impact, which calls into question their validity when assessing effects on Indigenous Peoples and their health.[8] For example, why does considerably limiting or modifying the ability of a person to go hunting or harvesting not constitute high magnitude? Or, who decides the threshold for the number of users affected, which separates medium and high magnitude? During the Mining and Milling the Midwest (Saskatchewan) assessment, proponents based their assessment on information from the community that two local trappers would be affected by the project. This might seem like a small number of users, but, as communities responded to the proponent:

> [This] is an example of misinterpretation of information provided by the communities. A project of this size will not simply affect 2 trappers, but a whole generation of possible land use. Please provide us the methodology that was used to determine this, instead of subjective, inaccurate explanation. For example, one trapper prevented from trapping represents the loss of spiritual, health, cultural aspects. As well as inter-generational loss of experience and educational opportunities. (Mining and Milling the Midwest Project, p. 227)

[8] In the Goliath Gold Project assessment, the Métis Nation of Ontario, Naotkamegwanning First Nation and Asubpeeschoseewagong Netum Anishinabek specifically brought up way that magnitude is defined, highlighting their concern about "the assessment criteria for determining 'magnitude'…related to current use of lands and resources for traditional purposes by Aboriginal peoples. Disagreed that traditional territory is extensive in the local and regional study areas and that impacts on continued Indigenous use would be minimal" (Goliath Gold Project, p. 204-205).

Additionally, the focus on deviation from baseline can be difficult, if not impossible, to operationalize due to a lack of accurate baseline data, which is a concern for many communities.[9] As a result, some effects may be designated as medium magnitude when they really have a high impact. Similarly, there are not sufficient federal and provincial guidelines designed to protect Indigenous health determinants, making the 'requirements of guidelines' largely ineffective.

Besides magnitude, another criterion that was broadly criticized by communities was reversibility. Many communities took issue with proponents' and the Agency's understandings of reversibility, which can fail to account for the extended amount of time that returning an area to pre-project conditions can take, if this damage is able to be remediated at all.[10] The relationship that Indigenous communities have with ancestral lands has a drastically different temporal scope than that of proponents or the Agency, lasting since time immemorial. Taking this into account, community understandings of what constitutes reversible or fully remediated often deviates from proponents' definitions. In the Rainy River Project (Ontario) assessment, communities "raised concerns that closure objectives [from the proponent] do not relate to the restoration of land use that has been identified by the traditional land use studies" (Rainy River Project, p. 53). Similarly, communities who participated in the Mining and Milling the Midwest (Saskatchewan) assessment asserted that "the area can no longer support development which uptakes critical habitat for significant amounts of time, only to state that it will be re-established afterwards. This would take at a minimum 50-60 years post mine to return to old growth forest" (Mining and Milling the Midwest Project, p. 226). Reducing the amount of time that it takes to reclaim the site is vital for communities, as remediation efforts continue to limit access to land for traditional use, impacting communities' health in both the short and long term. In the Goliath Gold (Ontario) project assessment, Asubpeeschoseewagong Netum Anishinabek "raised concerns that the length of time for revegetation during decommissioning and abandonment could result in a permanent loss in place-based knowledge" (Goliath Gold Project, p. 32).

[9] See: Ajax Mine Project, Akasaba West Copper-Gold Mine Project, BlackRock Mining Project, Blackwater Gold Project, Côté Gold Mine Project, Goliath Gold Project, Kami Iron Ore Project, Magino Gold Project, Murray River Coal Mine, Rainy River Project, Sisson Project, Star-Orion South Diamond Mine Project

[10] See: BlackRock Mining Project, Brucejack Gold Mine Project, Goliath Gold Project, Howse Property Iron Mine Project, Magino Gold Project, Mining and Milling the Midwest Project, Rainy River Project, Sisson Project, Star-Orion South Diamond Mine Project, Whabouchi Mining Project

5.5. How assessment "knows"

The data presented up to this point highlights that many of the issues with EA relate back to a common problem: that practitioners, proponents, and the Agency are largely unwilling or unable to meaningfully integrate Indigenous ways of knowing about land, health, and community into the assessment process. In the sampled reports, there are multiple examples of communities trying to communicate their concerns and thoughts with proponents and the Agency and having their perspectives misunderstood by assessors.[11] One example is in the assessment for the Arnaud Mine (Québec) project, when the Innu Takuaikan Uashat Mak Mani-Utenam (UM) and Matimekush-Lac John (MLJ) communities explained the impact that the project will have on their way of life:

> Implementation of the Project will have significant adverse cultural, spiritual, social, community and economic consequences on the way of life of the Innu of UM-MLJ. The Project will irreparably and irremediably transform the natural environment of the traditional lands of the Innu of UM-MLJ. The spiritual link with part of the land would be broken and there would be a reduction in the consumption of traditional meat, and a loss of traditional knowledge as well as of the places for teaching that knowledge. (Arnaud Mining Project, p. 120)

The Agency wrote in reply:

> The Agency considers that there will be residual environmental effects, in particular relating to the 167 ha within the lands used for traditional purposes that will be permanently lost in part of the local study area (area of the pit). However, the Agency notes that the majority of the areas will be only temporarily lost (87% restored). The Agency is of the opinion that these losses of use of the territory will not compromise the use of the lands for traditional purposes and will have a minor impact on the continuity of the way of life of the Innu Nations of Uashat mak Mani-Utenam and Matimekush-Lac John. (Arnaud Mining Project, p. 120)

In this comment, the Agency misunderstood the Innu's statement that they require continual use of the land for traditional purposes, redirected the recognition of effects to the quantifiable amount of land that will be permanently lost, and dismissed the communities' assertion that there will be significant adverse effects, instead reiterating that there will only be a minor impact. There are other instances comparable to this one throughout the sample, all with similar types of mistranslation and aversion on the part of the proponent and the Agency. For example, one point

[11] See: Ajax Mine Project, Akasaba West Copper-Gold Mine Project, Arnaud Mining Project, Black Point Quarry Project, Côté Gold Mine Project, Hardrock Gold Mine Project, Kami Iron Ore Project, Star-Orion South Diamond Mine Project

of contention in the reports relates to the long temporal relationship between communities and their environments that was discussed in the previous section. In the Kami Iron Core (Québec/Newfoundland and Labrador) assessment, the Innu Nation, Innu-takuaikan Uashat mak Mani-utenam, NunatuKavut Community Council, and Naskapi Nation of Kawawachikamach shared their:

> Concern over the Project's effects on woodland caribou, particularly the Project's contribution to cumulative effects and its detraction from recovery efforts. Concern that, regardless of whether or not caribou are currently present in study area, the land and resources affected by the Project will result in loss of productive and potentially viable habitat for an extended period of time. (Kami Iron Ore Project, p. 83)

In their response, the proponent disregarded the communities' concern for the future health and recovery of the caribou population and restated data showing that the caribou were not currently in the area. And, they stated that there is a small chance of caribou ever being able to survive in the area regardless of the project going ahead, due to other industrial projects:

> Regardless of the quality of habitat within the [regional study area (RSA)] for caribou […], it is unlikely that the Project will have an impact on the capability of the lands within the vicinity of the Project to support caribou. Studies suggest that nearby herds do not use the project area, and caribou were not observed in the vicinity of the Project during ground-based or aerial surveys. Interviews with local area residents and stakeholders indicate that caribou are not using the area. In considering the potential effects of the Project within the context of the RSA, the project area is located within the existing industrial area of Western Labrador that includes several existing mining developments within the municipalities of Labrador City and Wabush, Labrador and Fermont, Québec. Given the existing developments in the surrounding area, it is unlikely that lands within the vicinity of the Project would support caribou in the future. (Kami Iron Ore Project, p. 83)

Being constantly confronted with this kind of difference in knowing can be extremely frustrating for communities (Booth & Skelton, 2011). To try to bridge this divide, many communities present traditional ecological knowledge (TEK) to proponents and to the Agency for consideration and use in the assessment. However, if and how this knowledge is operationalized by practitioners can be unclear, leading communities to feel that their contributions are ignored or misused.[12] This confusion is compounded by a feeling from some

[12] See: Blackwater Gold Project, Goliath Gold Project, Hammond Reef Gold Project, Howse Property Iron Mine Project, Magino Gold Project, Mining and Milling the Midwest Project, Rainy River Project, Star-Orion South Diamond Mine Project, Whabouchi Mining Project

communities that assessment as a whole lacks transparency.[13] In one case, communities pointed out mistakes with how the proponent was using a land use map that they had provided, writing that "TEK has far more value than just identifying Land Use. This map should be a starting point and an aide, not the only TEK used in the EIS" (Mining and Milling the Midwest Project [Saskatchewan], p. 226). This comment also signals that oftentimes proponents and the Agency will tokenize TEK, using it in sparse ways to provide the project with political credibility without actually giving that knowledge the consideration, respect, and weight it is due (Joly et al., 2018; Nadasdy, 1999; Sandlos & Keeling, 2016; Simpson, 2001). While traditional ecological knowledge represents a part of traditional knowledge, it does not encapsulate the entirety of it. For this reason, integrating traditional knowledge throughout the entire assessment process is a fundamental first step to understanding effects on communities and their health, as described here by Abitibiwinni First Nation in the North American Lithium Spodumene Mine (Québec) report:

> As part of the Canadian environmental process, no appropriate study on the traditional use of lands by the Abitibiwinni Algonquin First Nation has been conducted. A study on the practices and traditional knowledge is an essential element of the consultations. The gathering, sharing and evaluation of traditional knowledge are an essential step in understanding the concerns of a First Nation. This Algonquin Nation would have liked to see independent studies conducted under their direction in order to identify and understand the technical data and the potential repercussions on their rights. (North American Lithium Spodumene Mine Project, p. 96-97)

The proponent's response to this seemed completely unrelated:

> The proponent and the representatives of the Algonquin Nations have signed an agreement which states that the communities claim Aboriginal and territorial rights to the land where the mine is constructed. In fact, the study area overlaps the boundaries of the lands of the two communities" (North American Lithium Spodumene Mine Project, p. 96-97).

The lack of congruence between community and practitioner ways of knowing reframes other aspects of the assessment process as well, creating further doubt about whether significance and magnitude ratings are accurate or relevant for local communities at all. The Stk'emlupsemc te Secwépemc Nation (SSN) effectively highlighted the specific ontological problem embedded within assessment methodologies:

[13] See: Black Point Quarry Project, Hardrock Gold Mine Project

> SSN disagrees with the manner in which the effects of Ajax on their current use of lands and resources for traditional purposes have been assessed by [KGHM Ajax Mining Inc. (KAM)]. SSN views all aspects of Pípsell as being interconnected and that KAM's assessment serves to fragment impacts into components which are related to pathways. SSN stated that these components or pathways were never agreed upon, and that the application of western value component methodology and current use assessment does not adequately convey the impact as it relates to SSN's interests. (Ajax Mine Project [British Columbia], p. 238)

In my sample, 5 out of the 28 documents (17.9%) also reported the level of confidence that assessment practitioners had in their scientific predictions of significance. **Figure 9** presents a breakdown of assessment practitioners' confidence levels and shows that assessment practitioners had a high level of confidence in their prediction less than half of the time (47.2%).

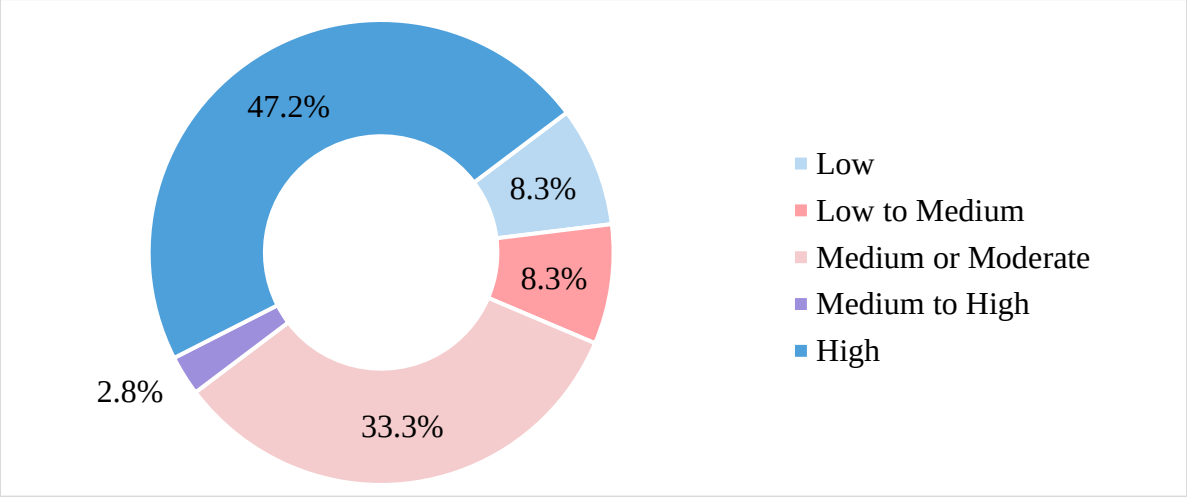

Figure 9. Level of scientific confidence in the significance prediction for VCs related to Indigenous communities across 5 projects.

However, even high confidence levels can be problematic if practitioners' methods are not in line with community ways of knowing. In the case of the Blackwater Gold (British Columbia) project, practitioners rated their confidence in the assessment of socio-economic conditions and human health as moderate and high, respectively. A collaborative assessment was also completed by Ulkatcho First Nation, Lhoosk'uz Dené Nation, and the Carrier Sekani First Nations (Nadleh Whut'en First Nation, Saik'uz First Nation, and Stellat'en First Nation) in partnership with British Columbia's Environmental Assessment Office and the Agency. In their assessment, communities wrote:

> The baseline information provided by the proponent contained inaccurate and outdated background information and data regarding health services capacity in the region and did not adequately characterize the Project's likely socio-economic and health effects […] Following review of mitigation measures and prior to condition development, our Nations felt that work remained to be completed with respect to the health these non-biophysical health values, specifically with respect to monitoring and adaptively managing changes in crime (including domestic violence), impacts to vulnerable community members, impacts to mental health, and substance abuse issues. Our Nations feel that these concerns were not accurately reflected in the federal or provincial conditions (in draft form), and as such, concerns remain within our communities regarding the health of our people. (Blackwater Gold Project, p. 160)

Disconcertingly, these communities had considerable concerns about the accuracy of the proponent's data, methodologies, and conclusions in the health and socio-economic assessment, despite the assessment practitioners having a medium-high level of confidence in their own work. This trend is troubling, particularly because this project had a high level of local engagement and support and utilized a collaborative assessment approach that was "precedent-setting" and had a "more effective" community consultation process than many other projects included in the sample (Blackwater Gold Project, p. 162). And still, even with this level of engagement, communities were "not able to conduct a vote by Chief and Council or provide […] concluding views on the Project" due to "[feeling] that the process is not complete" (Blackwater Gold Project, p. 162).

Although only a small number of projects reported information about confidence, the mismatch in perspectives is concerning given that a large share of practitioner predictions is just under the threshold for being designated significant (**Figure 7**). It can also erode any trust that communities have in proponents and in the Agency, a sentiment expressed by some communities in the sample.[14] Even passing comments in these reports highlight the complicated and fraught history between extractive industries and Indigenous communities; in the Dumont Nickel Mine (Québec) project report, the Abitibiwinni First Nation wrote, "due to past mining projects, land users no longer dare to eat the resources they harvest in some regions. Is there a risk of contamination of resources harvested by the AFN?" (Dumont Nickel Mine Project, p. 83). Statements like this frame and situate conversations about local impacts within a long history of distrust, breaches of faith, and cumulative effects.

[14] See: Arnaud Mining Project, Dumont Nickel Mine Project, Hammond Reef Gold Project, Murray River Coal Project

5.6. Community intervention and contestation

Consultation and engagement with communities is a large part of the public optic around assessment (as seen in section 2.4.3), but consultation processes are often inaccessible, inflexible, and extremely draining for participants. This was highlighted by many communities across the sample, with several reports containing direct and intense criticism about the ways and degree to which communities were involved.[15] In some cases, communities wanted to participate more fully, even proposing alternative methods for engagement, but were unable to implement new consultation strategies or revisit previous stages of the assessment analysis due to inflexible legislated timelines.[16] One overarching comment from the Innu Takuaikan Uashat Mak Mani-Utenam and Matimekush-Lac John was that "the consultation has mainly taken the form of communication of information" (Arnaud Mining Project [Québec], p. 119), which as true for many of the projects. Some other communities highlighted specific accessibility issues they faced:

- "The proponent's method of transmitting information prevented the [Cree Nation of Mistissini] band council and community from fully participating in the consultation process and properly understanding the extent and scope of the environmental effects. The proponent did not transmit key elements of its impact statement in a timely manner during the consultation process (geochemical study, railway, hydrological study, air emissions model). Very little time was allotted for review. A number of documents were produced only in French by the proponent. Few Crees read or speak French fluently." (BlackRock Mining Project [Québec], p. 92)

- "The [Athabasca Denesuline] community leadership does not have readily available internet, with no computers. However, the Regulatory Agencies continue to post links and cite websites for information to consult. Paper documents are highly technical and community leaderships do not have the capacity to decipher the documents. Communication should be clear, concise, plain language and translated into the Dene language. Open-houses and community meetings are poorly attended and should not be considered as consultation." (Mining and Milling the Midwest Project [Saskatchewan], p. 216-217)

[15] See: Ajax Mining Project, Arnaud Mining Project, BlackRock Mining Project, Côté Gold Mine Project, Goliath Gold Project, Hammond Reef Gold Project, Hardrock Gold Mine Project, Kami Iron Ore Project, Magino Gold Project, Mining and Milling the Midwest Project, North American Lithium Spodumene Mine Project, Rainy River Project, Sisson Project, Star-Orion South Diamond Mine Project, Whabouchi Mining Project

[16] See Goliath Gold for example: Asubpeeschoseewagong Netum Anishinabek and Naotkamegwanning First Nation "expressed concerns with the supplemental assessment due to its pan-Aboriginal approach; instead underscoring their interest in a bilaterally co-developed methodology" (Goliath Gold Project, p. 130). The Agency's response was that "given the legislated timelines in CEAA 2012, the Agency was not able to facilitate a bilaterally co-developed approach as the requests were received in 2019 while the Agency was working to complete its review of the proponent's documents and prepare the draft of this report" (Goliath Gold Project, p. 130).

The Stk'emlupsemc te Secwépemc Nation (SSN) articulated many points of criticism about the assessment process in general in the Ajax Mine (British Columbia) project report, including:

> The capacity challenges associated with multiple consultation processes related to Ajax, including the EA, permitting, and government to government discussions; the concurrent development of the consultation processes (both federal and provincial) while conducting the EA and the strain this placed on SSN's capacity; the timelines associated with the EA limit SSN's ability to participate in the EA; inadequate capacity funding from the Crown to allow for SSN's full participation in the EA and consultation process…The EA process is not an appropriate process to use for consulting on and assessing impacts to SSN's Aboriginal rights because it does not take a holistic approach, nor does the process capture the interconnectedness of the environment, Aboriginal rights, and impacts of Ajax to the satisfaction of SSN; and the federal and provincial EA and consultation processes do not constitute meaningful consultation, particularly in relation to the United Nations Declaration on the Rights of Indigenous Peoples (Ajax Mining Project, p. 280).

Several communities took a similar approach, using consultation processes to call attention to overarching problems with EA.[17] For some communities, this took the form of reasserting their relationships with the land and the rights and obligations they have to protect and use ancestral territories.[18] Others, like the Athabasca Denesuline, criticized the dismissal of Indigenous knowledge and the favouring of information from industry partners: "[the Proponent] AREVA needs to work with the communities, not only the Saskatchewan Mining Association regarding the woodland caribou. This strategy does not compare to the lifetimes and generations of

[17] See: Ajax Mine Project, Akasaba West Copper-Gold Mine Project, Blackwater Gold Project, Goliath Gold Project, Howse Property Iron Mine Project, Kami Iron Ore Project, Mining and Milling the Midwest Project, Murray River Coal Project, North American Lithium Spodumene Mine Project, Star-Orion South Diamond Mine Project, Whabouchi Mining Project

[18] Selected examples include: "The Lac Simon and Kitcisakik First Nations reiterate that the historical occupation of the land and Aboriginal rights are not extinguished and that any form of land development must align with their uses and concerns. In addition, even if the traplines on the beaver reserve are outside the study area, the Aboriginal rights recognized by the Supreme Court of Canada in R. v. Adams allow Indigenous people to exercise their traditional activities anywhere on the land" (Akasaba West Copper-Gold Mine Project, p. 144); "The creation of Indian reserves, the assimilation policies of the Indian Act, the implementation of beaver reserves and colonization of the lands in the Barraute sector are all factors that have pushed the Lac Simon Anishnabeg to mainly occupy the land further to the north of the Lac Simon reserve. Nevertheless, the Lac Simon Anishnabeg still consider themselves the guardians of the land for the benefit of future generations and have expressed a real desire to have their Aboriginal rights recognized, over the entirety of the land they once occupied, including the site of the North American Lithium mine" (North American Lithium Spodumene Mine Project, p. 97); "AREVA and the Federal and Provincial Crown continue to ignore and disrespect our Athabasca Land Use Vision in its environmental assessment process. Athabasca residents' aspiration and vision to manage the land and its resources involves as to where, when and how development should proceed on our current land use and resource use for current and since time immoral… It is our duty to exercise our Aboriginal and Treaty Rights and the right to access our lands for resource use for our way of life and as First Nation Peoples of this land without direct or indirect infringements from proposed developments" (Mining and Milling the Midwest Project, p. 228-229).

knowledge amassed by the Athabasca Denesuline" (Mining and Milling the Midwest Project [Saskatchewan], p. 225).

Regardless, complaints about community engagement and consultation were generally answered by the Agency in sterile and standardized ways, like when the Cree Nation of Nemaska outlined some of their concerns about being unable to adequately and fully access consultation activities to provide their comments.[19] In response, the Agency wrote that they "[took] note of this concern. However, the comments provided by the Cree Nation of Nemaska were always taken into consideration during the process. The Agency transmitted the concerns pertaining to the environmental assessment process to the Minister of the Environment." (Whabouchi Mining Project [Québec], p. 142). Again, this is missing any engagement with the core issue brought up by the Cree Nation of Nemaska, namely the inaccessibility of the process, not whether their comments were considered when they were able to participate.

In some cases, communities had to intervene in the reports to correct inappropriate statements and assertions from proponents and the Agency. For example, in the Kami Iron Ore (Québec/Newfoundland and Labrador) project assessment, the proponent had originally described land use among NunatuKavut Community Council (NCC) members as follows:

> NCC members live and work in the Labrador West area, and currently undertake a number of recreational land and resource use activities throughout the region, including hunting, trapping, camping and general travel. As "traditional use" is, however, generally understood to mean activities that have been exercised (and are being exercised) by an identifiable Aboriginal community since before European contact or control of a specific area, these land and resource use activities may not be considered traditional in that they are not necessarily a continuation of ancestral activities that took place historically within this area of western Labrador (although they do reflect local knowledge and use of the area). (Kami Iron Ore Project, p. 86)

Communities called attention to this and asked for the statement to be amended:

> The Proponent states that the use of the land in Western Labrador by NCC members may not be Traditional Use. The NCC disagrees with this statement, as NCC ancestors used and sustained themselves off areas in the Height of Land and Western Labrador for countless generations and this has continued on into today's contemporary land use by NCC members in Western Labrador. (Kami Iron Ore Project, p. 86)

[19] Full quote from Whabouchi report: "The Cree Nation of Nemaska raised many questions with regard to the environmental assessment process, particularly on the timelines that it found inadequate, the lack of financial resources to adequately respond in the first two the first two consultation phases (project description and guidelines)" (Whabouchi Mining Project, p. 142).

Not only must it be frustrating for communities to read this kind of dismissing language from assessors, but this also puts an incredible onus on communities to be monitoring assessment activities and materials to catch and correct this kind of misinformation.

5.7. Issues with internal consistency and tone

There are many inconsistencies in standards and in tone across several of the reports, at varying scales. In some projects, certain VCs are excluded despite their obvious relevance and despite communities saying that they are important to assess.[20] As mentioned both in Chapter 2 and earlier in the results, VCs are subjective and often do not align with community knowledge. Still, some of these inclusion/exclusion decisions are even more questionable in the full context of the report, like in the Brucejack Gold Mine (British Columbia) project. In this project, the Tsetsaut/Skii km Lax Ha brought up concerns about a glacier that covers much of their traditional territory and would inevitably be affected by the project, which is acknowledged by the proponent earlier in the report. The community suggested implementing a glacier management plan based on the data the proponent planned to collect on glacial melt over the mine's life course. In response, the Agency wrote:

> The federal environmental assessment considers the potential for significant adverse environmental effects on areas of federal jurisdiction, as described in CEAA 2012. A glacier management plan has not been proposed as it is not a requirement under CEAA 2012. Any details with respect to the development and administration of such a plan fall outside of the scope of the assessment. (Brucejack Gold Mine Project, p. 145)

Here, the Agency ignored the community's suggestion, which is confusing given that in other sections of the assessment, impacts on the glacier were discussed. In other cases, the proponent and the Agency will completely disagree on the interpretation of the residual effects analysis, with one party saying that an effect is negligible while another says it is a significant effect.[21]

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[20] See: Brucejack Gold Mine Project, Murray River Coal Project

[21] For example, see the Sisson Project. The proponent writes that "the assessment determined that the Project, in combination with other past, present, or reasonably foreseeable projects and activities, would not cause significant cumulative environmental effects on First Nation use" (Sisson Project, p. 206). In contrast, the Agency writes that they are "aware that the Crown land block within which the Project would be located is considered to be one of the last remaining large areas accessible… for traditional uses with valued resources in Maliseet territory. Further, within the remaining Crown land blocks, use by these First Nations is limited by other existing land uses. Given this context, the loss of the cultural value of the project site and its important contribution to current use of lands and resources by Maliseet First Nations, would exacerbate the effects on current use that are currently being experienced at a regional scale. The Agency concludes that the effects of the Project on the current use of lands and resources for

One example that highlights these two issues is the Murray River Coal (British Columbia) project. In this case, the proponent originally "did not predict residual effects to caribou" because, although caribou were present in the area, the proponent "considered caribou a high-elevation species while the Project is located at a low elevation" (Murray River Coal Project, p. 59). The Saulteau First Nations, West Moberly First Nations, and McLeod Lake Indian Band criticized this approach. First, because the caribou do have habitats at lower elevations, but also because caribou is a culturally significant species, and communities have done considerable work to help the caribou population recover.[22] The Agency disagreed with the proponent's decision to exclude caribou from consideration in the initial residual effects analysis and affirmed the perspective of Saulteau First Nations, West Moberly First Nations, and McLeod Lake Indian Band about the importance of the species. Still, they wrote that "the Project is likely to cause an adverse but not significant residual effect to hunting and trapping success for caribou from the loss or alteration of critical habitat" (Murray River Coal Project, p. 66). And again, this translation of communities' spiritual and cultural connection with caribou into a framing of "hunting success" is another example of ways of knowing being misaligned in assessment.

After receiving this criticism from the Agency, the proponent included caribou in their cumulative effects analysis.[23] In their assessment, the proponent "concluded that residual cumulative effects on high elevation core habitat in the Quintette Local Population Unit are not expected to occur" because the project "would not contribute any additional habitat disturbance" (Murray River Coal Project, p. 116). Communities "deemed the proponent's assessment of cumulative effects to caribou inadequate and considered the absence of any additional mitigation

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traditional purposes by Maliseet First Nations, in combination with the cumulative environmental effects of other projects and activities, are likely to be significant" (Sisson Project, p. 206).

[22] Quote from the report: "Concerns that the assessment of effects to caribou did not consider low-elevation caribou habitat. Caribou is an important harvest species for food, social and cultural reasons and Saulteau First Nations have identified caribou habitat that overlaps with the Project footprint. Have not hunted caribou in over 40 years, due to declining population numbers. This has resulted in the erosion of cultural and spiritual relationships. Ongoing concern regarding caribou, do not agree with the assessment of no residual effect. Request that assessment of direct and indirect effects utilize mapping developed by our communities" (Murray River Coal Project, p. 188).

[23] Description from the report: "At the request of the Saulteau First Nations, West Moberly First Nations, and McLeod Lake Indian Band, the proponent also assessed cumulative effects on the Quintette herd of southern mountain caribou despite their own conclusion that the Project would have no residual effects on caribou and its habitat. Effects to high elevation winter and/or summer habitat, described as core habitat, as well as Type 1 winter and summer matrix habitat were evaluated using habitat suitability and resource selection modelling. However, the proponent did not consider the effects to low elevation core winter and summer habitat, which the Recovery Strategy and Aboriginal groups have identified as being important to the Quintette herd" (Murray River Coal Project, p. 115).

to address uncertainty of effects to caribou as unsatisfactory" (Murray River Coal Project, p. 118). Again, the Agency agreed with the communities, and also acknowledged that the "residual cumulative environmental effect of the Project in combination with other physical activities that have been or will be carried out on the current use of caribou by Aboriginal peoples is likely to be significant" (Murray River Coal Project, p. 123). In their final analysis of the assessment, the Agency found that the project was "likely to cause significant cumulative adverse effects to the use of caribou by Aboriginal Peoples" and that the project "in combination with other physical activities that have been or will be carried out, will undermine the survival and recovery of the Quintette herd of southern mountain caribou" (Murray River Coal Project, p. iii). When this decision was sent along to the Minister of the Environment, it was referred to the Governor in Council, who found that the effects were "justified in the circumstances" and approved the project regardless (McKenna, p. 1). In all, these inconsistencies in what is selected, how is it analyzed, and the implications of effects being designated significant make assessments harder to trust and harder to understand.

Beyond that, there is a lot of writing in the reports that comes across as tonally harsh or odd, in a way that can be disenfranchising to the reader, and specifically to Indigenous communities who participate in consultation.[24] For example, in the Hammond Reef Gold (Ontario) project report, the proponent wrote that "despite the negligible effects of the Project on traditional use plant gathering, [they] committed to accommodating Indigenous groups by inviting their youth to the project site to harvest traditional plants located there before the site is cleared" (Hammond Reef Gold Project, p. 112). The quality of this writing gives off an impression that communities' request to visit the land is unreasonable, and that the proponent has been very generous to allow communities to harvest before they completely clear the site.

Another example would be the Red Mountain Underground Gold (British Columbia) project, when the Nisg̲a'a Lisims Government "commented that the assessment should identify the potential risks to Nisg̲a'a citizens who choose to exercise their right to hunt, trap, fish, gather food, and live in the Bitter Creek area for their entire lives" (Red Mountain Underground Gold Project, p. 200). In response, the proponent "acknowledged the right of Nisg̲a'a citizens to

[24] See: Ajax Mine Project, Arnaud Mining Project, Hammond Reef Gold Project, Hardrock Gold Mine Project, Howse Property Iron Mine Project, Magino Gold Projct, North American Lithium Spodumene Mine Project, Red Mountain Underground Gold Project, Renard Diamond Mine Project

occupy the land in the Bitter Creek area, but is of the view that the assumption that exposures are not occurring at all times is reasonable" (Red Mountain Underground Gold Project, p. 200). They went on to state that their exposure scenarios were based on what could be considered "reasonable" maximum exposure levels and that "one of the challenges with risk assessment is arriving at a selection of receptors and exposure scenarios that are agreeable to all parties" (Red Mountain Underground Gold Project, p. 200).[25] Again, the response here asserts that it is 'unreasonable' for Indigenous communities to expect they will be able to access their traditional lands in the ways they always have, which is dismissive and condescending. One last example of this kind of tone is in the Hardrock Gold Mine (Ontario) project. In that report, Animbiigoo Zaagi'igan Anishinaabek, Aroland First Nation, Ginoogaming First Nation, and Métis Nation of Ontario highlight some concerns that they have about the project and how it will affect land use:

> Indigenous users may avoid traditional activities and cultural sites due to fear of contamination, perceived air quality or noise effects or visual quality disturbances. The resulting impact to the overall well-being of these communities could be devastating in terms of impacts to health (mental and physical) and nutrition. A monitoring program in conjunction with Indigenous groups is identified to be potentially helpful to address this. (Hardrock Gold Mine Project, p. 142)

The proponent writes an almost shocking comment in response to this:

> The proponent believes that the word 'devastating' is an exaggeration for a Project that reclaims an area with historical mining and delivers a significant overall reduction in arsenic loading to Kenogamisis Lake compared to present day conditions and where a conservative and scientifically defensible Human Health and Ecological Risk Assessment concludes the Project will have a negligible risk. (Hardrock Gold Mine Project, p. 142-143)

Again, there is an implication in this statement that Indigenous communities sharing their thoughts about the project is somehow detrimental to the proponent or to the project, and not a reasonable sharing of concerns, considering that the community will soon be affected by the site for decades.

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[25] Full quote: "The proponent acknowledged the right of Nisga'a citizens to occupy the land in the Bitter Creek area, but is of the view that the assumption that exposures are not occurring at all times is reasonable. The proponent indicated that the exposure assumptions represent reasonable maximum exposure scenarios and noted that one of the challenges with risk assessment is arriving at a selection of receptors and exposure scenarios that are agreeable to all parties and reflect reasonable, likely exposure scenarios. … The proponent recognized the possibility of unique scenarios with potentially extreme outcomes (e.g. an individual disobeys signage and engineered controls to enter an area where high exposure to chemicals is likely and, as a result, places them in a situation of high risk). This type of scenario is a low probability/high consequence risk and is typically handled quite differently from typical regulatory risk assessment efforts" (Red Mountain Underground Gold Project, p. 200).

5.8. Unpacking Ajax: why was it denied?

The Ajax Mine in British Columbia was the only project in the sample to be denied an environmental assessment certificate. Because of this, I want to bring attention to this specific case and the circumstances that led to the project being denied. The assessment was co-conducted by the Agency at the federal level and by the Environmental Assessment Office (EAO) at the provincial level. These two offices coordinated their efforts on the assessment because they both had jurisdiction over the project, but the provincial and federal governments had to make independent decisions about whether the project was approved. Put plainly, the reason this project was denied was due to years of hard work and advocacy from the Stk'emlupsemc te Secwépemc Nation (SSN), the community that was in closest proximity to the proposed mine. In 2008, the proponent, KGHM Ajax Mining Inc. began conversations with SSN while prospecting the area. The Agency and EAO started consultation activities with SSN in 2011, when the environment assessment process formally began for the project. Throughout 2012 and 2013, SSN regularly participated in consultation activities with the proponent and with the Agency/EAO, including attending meetings, sharing knowledge, and providing comments on drafts.

Based on the information provided by SSN during these activities, in 2015 the Agency and EAO asked KGHM to modify their assessment to also include the VC Current Use of Land and Resources for Traditional Purposes. This would allow for consideration of project impacts on Pípsell, an area of great cultural and spiritual importance for SSN. As an aside, the fact that this VC was not originally included seems like a major oversight, considering that KGHM asserts that they had started consultation with SSN eight years prior. Unhappy with the assessment methodology, SSN requested an external review panel to assess the project or the implementation of a health impact assessment. Both requests were denied by the Agency. As a result, SSN announced in 2015 that they would perform their own community-led assessment process, using a "walking on two legs" approach that combined traditional knowledge with Western science. Later in 2015, SSN submitted a title claim to the B.C. government, asserting jurisdiction over their entire ancestral territory, including Pípsell. In 2016, the Minister of Justice fervently rejected this land claim because private property was included in the claimed area:

> The B.C. Government will vigorously oppose a declaration that has the potential to create uncertainty over the land base and for private property owners across this territory. At the same time, government will continue to work collaboratively with First Nations to ensure

> they have a meaningful role in land and resource management, and that they share the resulting benefits and economic opportunities. While these efforts will continue, government must and will always defend, with conviction, the sanctity of private land and private land rights. ("Province files response to First Nations title claim," 2016).

On March 4th, 2017, the SSN Joint Council announced the completion of the SSN Assessment Process and stated that SSN would not give free, prior, and informed consent to the Ajax Mine based on the results. The community received broad support from other organizations and communities, with many citing the SSN-led assessment as a historic step forward and precedent for future assessments. The project went on to be rejected by the provincial government in December 2017 and was later rejected by the federal government in 2018. The Provincial Minister of Environment George Heyman acknowledged that the SSN assessment helped inform the province's own assessment of the project, saying that "we tried to conduct the assessment in concert with the SSN and ensure the joint federal-provincial and SSN reports informed each other's work" (Linnitt, 2017). After the project was rejected at the provincial level, Tk'emlúps te Secwepemc (one of the two communities represented by SSN Chief Fred Seymour said:

> We Secwepemc have never ceded or surrendered our rights or title… The British Columbian Government, in choosing to refuse KGHM Ajax's environmental assessment, are enacting their commitment to uphold the United Nations Declaration on Indigenous Rights and to implement the 94 calls to action from the Truth and Reconciliation Commission. (Linnitt, 2017)

In a press conference after the rejection, Minister Heyman quickly clarified that this decision did not amount to a legal precedent on Indigenous self-determination in relation to resource projects: "I would not say this decision paves the way for [Indigenous] vetoes or even that, were this decision made solely on the United Nations Declaration on the Rights of Indigenous Peoples, which it wasn't, that it constituted a veto" (Linnitt, 2017). Even if this early rejection of the project by SSN was not considered a veto as per the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the community's efforts to complete their own assessment clearly helped create evidence that informed the government's assessment. While this effort led to a success in this case, it is also important to acknowledge the amount of time and work done by SSN over an extended seven-year assessment process. Although many might look to this project as an example of what all communities dealing with new projects in their areas should

do, many communities simply do not have this kind of capacity to be able to organize, manage, and fund an independent assessment of this kind.

5.9. Summary of document analysis

The results of this document analysis highlight several important issues with assessment and how it affects Indigenous Peoples' health. First, the VCs that considered Indigenous Peoples and their health were narrow in focus and failed to consider the complexity of human-non-human relations, meaning that they were insufficient to properly assess the wide range of pathways through which Indigenous Peoples' health can be affected by extractive projects. Among the VCs related to Indigenous Peoples that were measured, almost none of the indicators were found significant, which calls into question the definitions and categories informing these significance designations. Furthermore, a large share of these assessed indicators fell right below significance designation, and many assessment practitioners did not feel confident in their predictions for Indigenous communities. Moving into the discussion, I analyze these results in conjunction with the results from the scoping review and interpret these findings using the framing techniques outlined in Chapter 3.

6. DISCUSSION

Two primary objectives guided this project: to identify how extractive projects affect Indigenous Peoples' health, and to evaluate how Indigenous Peoples' health is represented in environmental assessment. I will start this chapter by summarizing the results presented in Chapters 4 and 5, and then I will discuss the strengths and limitations of the project. Following this, I will interpret these findings through my critical framing of "infrastructural inversion," using the four-pronged approach explained in section 3.4. This includes: (1) recognizing the ubiquity, interdependence, and integration of various classification schemes and standards, (2) highlighting the material and symbolic nature of these classifications and standards, (3) revising knowledge of the past to seek out different voices and silences, and (4) "uncovering the practical politics of classifying and standardizing" (Bowker & Star, 1999).

6.1. Summary of results

6.1.1. How can extractive projects affect Indigenous Peoples' health?

By completing a scoping review of the literature about extractive industries and their effects on Indigenous health, I was able to identify many complex social-ecological pathways through which extractive development can affect Indigenous Peoples' health and wellbeing. For the review, I decided to focus on a smaller body of literature that specifically analyzed these complex and varied pathways to health. This allowed for a broader understanding of health to be built into the analysis and for a more comprehensive, albeit intertwined, set of impacts to be identified. Parsing out these impacts also makes it possible to better understand how projects can affect individuals and communities cumulatively over time, the importance of which is becoming increasingly understood (Brisbois et al., 2019; Parkes et al., 2019).

During the consultation phase, the identified resource mechanisms included engagement in assessment and consultation processes, as well as interaction with government and industry officials. In the active phase, mechanisms included the presence and nature of new work and training opportunities; changes to the local economy and an influx of new money; changing social structures and new inequalities; and environmental degradation and dispossession. For the post-closure phase, new and longstanding changes to the economy and lasting effects on land were notable mechanisms. The response mechanisms varied widely, but some common examples

were community stress due to separation from traditional lands; division and stress in the community and new social problems; changing family dynamics leading to tension and breakdown; economic mobility and ability to finance time on the land; and increased substance use and abuse. These mechanisms all have the potential to affect Indigenous Peoples' health by changing the conditions of peoples' lives as well as various determinants of their health. Importantly, the variation in these mechanisms across space and time shows that there is a wide range of pathways through which communities can be affected by resource projects, demonstrating that a broad perspective is necessary to adequately measure and understand effects on Indigenous Peoples' health.

6.1.2. How is Indigenous Peoples' health represented in environmental assessment?

The results of the document analysis, combined with examples from the reports, show the fallibility of EA and the structural barriers to accurate assessment that many Indigenous communities face. The assessed VCs in general were narrow in focus and failed to consider the complexity of human-non-human relations, which are vital for Indigenous Peoples' health. Furthermore, these VCs were often not aligned with Indigenous worldings or ontologies and did not integrate a holistic perspective about the environment or health. Moreover, there was often little regard for communities' recommendations about what should be included in the assessment, meaning that community understandings of health were alienated by assessors. Across the sample, there was minimal consideration of Indigenous communities' health, and even when indicators related to Indigenous health were included, the metrics and measurements used in the EA process were often at odds with community health ontologies.

Along with these systemic problems with EA, other more specific issues with this process were also identified. For example, among the indicators that were measured in residual effects analyses, almost none were found significant. Also, communities often criticized the baseline data, methods, indicators, and mitigation measures included in these analyses. The way that significance was determined was controversial, with many communities disagreeing with the significance criteria used by assessors, including the magnitude and reversibility criteria. A large share of measured indicators fell right below significance designation, based on definitions that failed to account for complicated and asymmetrical historical and political contexts. There were many complications due to differences in ways of knowing between practitioners and

communities, which were compounded by misinterpretation of traditional knowledge and a lack of transparency. Furthermore, assessment practitioners did not feel especially confident in their predictions for Indigenous communities. Besides the methodology, there were also significant issues with consultation and communities' ability to engage in the assessment process generally, leading to frustration on the part of many communities. The inconsistency in many of the reports created doubt about what was assessed, and the writing was often overly combative in a way that could alienate communities. Lastly, the highlighted case study showed how communities can assert agency to counter unwanted projects, albeit in a specific set of circumstances. Based on these results, it seems as though this infrastructure is not designed to serve Indigenous communities, or that it can only serve communities in limited ways.

6.1.3. Research limitations

Firstly, one limitation is that I am a non-Indigenous author, which necessarily limits my ability to analyse how extraction can affect Indigenous health. However, in the absence of embodied experience, I tried to provide a substantive literature review and background to ground and guide the analysis.

There were limitations in the scoping review, including the focus on peer-reviewed articles, which may have excluded important pieces of grey literature. As I selected articles and charted the data alone, there is also a chance of bias in the inclusion and extraction process. Moreover, the reporting of local context was uneven and often limited across the included studies. Future attempts at integrating a realist approach could be strengthened by finding external sources to supplement our understanding of local contexts and histories. Similarly, information on Indigenous community involvement was uneven throughout the papers. This signals a need to improve methods and/or to improve reporting of community involvement in research (Kinchin et al., 2017). Along the same lines, there is a possibility of participant or author bias within the included studies. As an external reviewer, it was difficult to systematically identify which mechanisms were generated by participants or by study authors, making it hard to distinguish between community and researcher perspectives.

Additionally, regarding the content analysis, there were a few notable limitations. First, there were no projects from the Northwest Territories, Yukon, or Nunavut included in the sample, which limits my ability to assess what happens in the territorial North. Also, because

research on this project was carried out during the COVID-19 pandemic, there were limited opportunities to use a broad range of methods; instead, document analysis became the most feasible way forward. Future research would be strengthened by incorporating fieldwork and interviews to triangulate results from document analysis.

6.2. Critically analyzing the results with an infrastructural lens

Together, the results from the review and the document analysis show some of the fundamental failings of environmental assessment. Through the scoping review, I was able to identify myriad pathways through which extractive projects can affect the health and wellbeing of Indigenous Peoples. However, almost none of these pathways were represented in the measured Valued Components from my document analysis project sample. And, beyond this, diving deeper into the assessment procedures operationalized in EA shows that the process is heavily flawed in so many other ways that even when Indigenous health determinants are included, it is in extremely limited ways and in ways that can hurt communities and cause undue stress. Despite this, the literature on impact assessment mainly focuses on fixing indicators and on improving the EA process without identifying these other structural problems, including the general assumptions guiding EA or the way power is embodied and expressed through EA.

In this final part of my thesis, I want to discuss the broader political implications of EA by analyzing the results within a critical framework based in critical infrastructure studies (described in section 2.5.). The politics that surround and impact Indigenous Peoples are important for communities' health and wellbeing because these politics change the conditions of peoples' lives and histories. For this reason, I argue that understanding the context surrounding environmental assessment is vital to understand how the assessment process can potentially affect Indigenous Peoples' health. The infrastructure of assessment is not suited to properly evaluate effects on Indigenous communities' health, as shown in Chapter 5. However, there are other political consequences of the assessment infrastructure that do have the potential to impact communities in the long term, and this is what I will now be focusing on. The four techniques I will be using to highlight these infrastructural elements of environmental assessment are as follows: (1) recognizing the ubiquity, interdependence, and integration of various classification schemes and standards, (2) highlighting the material and symbolic nature of these classifications and standards, (3) revising knowledge of the past to seek out different voices and silences, and

(4) “uncovering the practical politics of classifying and standardizing” (Bowker & Star, 1999, p. 44).

The first technique, recognizing ubiquity, is about unpacking the classifications that inform the infrastructure. In this case, that means examining the understandings of health, risk, and value that are perpetuated through EA and how this can disenfranchise Indigenous knowledge and reinforce colonial logics. For the second technique, material and symbolic nature, the focus is on identifying the material and symbolic value and significance of the infrastructure. The material force for EA is that the success of this process allows projects to proceed, and that this process creates and supports a side industry of assessors. The symbolic value, on the other hand, is much broader. EA helps define public understanding of site, creates knowledge that reinforces unequal dynamics, and helps provide legitimacy to companies’ endeavours. The third technique, revising knowledge of the past, makes us rethink the history of the infrastructure and how and why it came to be. For EA, that means recognizing that assessment policy was developed within a settler colonial system that is not concerned with Indigenous Peoples’ needs, or on the needs of communities of colour in general. Not only does this clarify current problems with the infrastructural design, but it also highlights the persistent inequalities that will continue without substantive systemic action. Finally, for the fourth technique, uncovering practical politics, the goal is to highlight who benefits from the infrastructure and to provide a critical lens for discussing successes and failures of the infrastructure. In this case, the success of EA is simply its ability to efficiently manage information. However, the failure of this process is felt most strongly by communities who try to participate but face a multitude of barriers when trying to represent their interests, due to the intense structure and speed of the process.

Having given a brief overview of these techniques, I will now go into each in more detail.

6.2.1. Recognizing ubiquity

This method is concerned with identifying and unpacking classifications and how they are interconnected, forming an infrastructural web of sorts. Because I am framing environmental assessment as a knowledge infrastructure— one that reproduces colonial power relations by first facilitating the material infrastructures of resource extraction and then by creating and disseminating knowledge that validates those arrangements—classifications hold even more weight. Quite literally, the foundational classifications of EA, such as ‘effects,’ ‘significance,’

'health,' and 'value,' have wide reaching consequences. Assessment, as a technology, is a space where science and power interact, which has implications for knowledge production. As seen throughout the results, and in section 5.5. specifically, assessment classifies knowledge in configurations that dismiss and discount Indigenous ways of knowing. This is due to the inherent bias that informs EA, based in colonial logics that assume the superiority of Western science.

It is important to note that there is a substantive and political divergence between Indigenous Peoples' and assessment practitioners' ways of knowing, not simply a lexical one. The community comments cited throughout the results are not just a different set of words that are expressing the same idea, they represent a fundamentally different perspective about how to be in the world— a perspective that encompasses 'all our relations.' However, practitioners often show disinterest in taking seriously Indigenous Peoples' knowledge about their communities and their environments, despite communities' continued assertion that the classifications used in the process are inappropriate and irrelevant. This can clearly be seen in the number of communities that lodge complaints or highlight concerns about the accuracy of the assessment, the responses that these comments receive, and the near negligible changes seen in the EA process or in the outcome following community interventions.

Biases programmed into these classifications have similarly harmful impacts on communities, and severely limit EA's ability to accurately measure effects. For example, the understanding of health advanced in the assessment is mostly constrained to the biomedical health model, although there is some consideration of socio-economic conditions in many cases. However, understandings of impact, risk, and health are socially constructed, politically negotiated, and based in community ontologies (Bury, 2001; Dake, 1992; Lang, 1989; Stanley, 2015, 2016). This bias toward Western biomedicine prevents Indigenous Peoples' holistic visions about health from being properly understood and considered, despite the incredible relevance and importance of these ontologies to communities. Colonial logics that are often grounded in "largely unarticulated assumptions privileging imperial vision, grand territorial ambitions and the 'mastery of nature'" inform what is included and how in the assessment (Siemiatycki et al., 2019, p. 5). These assumptions appear in pernicious ways; even the idea that the selection and measurement of "valued" components is somehow objective feels incredibly ironic, given that value is inherently subjective.

Beyond this, there are many visible holes in assessment science which compound these problems. Barry (2013) explains, "scientists concerned with the problem of environmental impacts do not aim to grasp such issues in all of their complexity; their work is expected to enact impacts in forms that render them amenable to management… impacts are abstractions" (p. 118-119). Rather than allowing for a wide scope of analysis in the assessment, potential impacts on VCs are distilled to establish testable effects, such as the amount of a certain toxin in the air or the percentage of habitat lost due to drilling. In reducing complexity and nuance, processual efficiency is prioritized over substantive engagement with Indigenous communities and values, and over thorough scientific method. Not only is this detrimental to communities in that their perspectives are actively devalued in EA, but there are also important implications of recognizing and affirming a type of scientific knowing about impact, risk, and health that is characterized by limitations and incuriosity.

6.2.2. Material and symbolic nature

In this section, I will further explore the material and symbolic implications of EA as a knowledge infrastructure. EA, and the classifications and knowledge it creates, has a great deal of material force in the realm of extraction. EA as a knowledge infrastructure produces information that enables the continued invasion of physical infrastructures on Indigenous lands (Boyer, 2018; Mezzadra & Neilson, 2019; Spice, 2018; Truscello, 2020). Put simply, if impacts are not defined as significant, a project will be approved; this approval is completely based on if and how knowledge is understood and defined through assessment. Apart from this, assessment processes support an entire side industry of assessment practitioners, including advisors, managers, experts, specialists, and analysts (Baker & Westman, 2018). These consultants often do not have sufficient education and training in social science practice or enough cross-cultural work experience to produce accurate or sufficient data for impact evaluations (Baker & Westman, 2018). Still, these industry professionals bring a secondary level of ethical professionalism and validation to the assessment process through their presence and the information they supply (Barry, 2013). The financial support and validation of this industry is an important material outcome of EA as an infrastructure.

Apart from this material force, EA also does considerable work in terms of symbolically granting and enforcing legitimacy and credibility. A large part of the external optic of

environmental assessment is substantive engagement with communities and the integration of community feedback into the assessment itself. But, the analysis of the EA reports shows that current assessment strategies are problematic, narrowly scoped, and rooted in assumptions that can harm communities. Beyond this, the process is characterized by mistranslation, inaccessibility, and a lack of transparency, all of which seem to be programmed into the fundamental design of the infrastructure. For communities who participate in EA, these factors can make the process frustrating and stressful. Still, companies can gain credibility simply from engaging in the assessment process, aided by the work and knowledge of experts. In recent years, there have been efforts to 'ethicize' the mining industry and regain public trust in the assessment process in the face of public criticism (Barry, 2013). Increasing involvement of Indigenous communities in assessment has been seen as a way to increase corporate accountability, even if people feel pressure to get involved simply to mitigate potential damage on their communities.

Regardless, engaging with the EA infrastructure in very narrow ways, and with the most tokenized forms of community inclusion, can produce enormous benefits for companies. Not only does Indigenous participation provide more legitimacy to the process (at least on paper or to the general public), but company's brands are able to get a reputation boost by spreading word of their "substantive engagement" with communities. Barry (2013) explains that:

> The problem confronting contemporary businesses is not to exclude criticism, but rather to manage, channel and translate what we might call the 'immaterial labour' of criticism— both by recognizing its value, and by turning it productively into a source of value, as reputation. (p. 80)

Selectively opening space for public participation also allows companies to shift discussions about responsibility and accountability to frame environmental protection as a "s*hared* concern" rather than the duty of companies and the state (Li, 2015, p. 199).

Finally, EA has substantial power in helping inform the general public's understanding of mining. Although the assessment process seems far removed from the national eye, assessments do take place in the public sphere and most, if not all, of their documentation is available online. The knowledge produced in EA becomes part of the 'infrastructural imaginary' for mining projects, creating an image for the public of what the physical site is and how it operates (Parks, 2015; Spice, 2018).

6.2.3. Revising knowledge of the past

Discovering things in the present sheds new light on how we know about the past. Drawing off the sections above, I will now discuss the history of assessment policy reframed through an infrastructural lens and what this means for future policy development. Colonial expansion and racial violence have accompanied and justified Canada's territorial spread since early settlers arrived on the continent (Bernauer, 2019; Coulthard, 2014; Cowen, 2020; Greer, 2018; Innis, 1999). Extraction has been an intrinsic part of this development, and extractive industries have both supported and benefitted from the settler colonial project (Yellowhead Institute, 2019). Environmental assessment policy was conceived and developed within this colonial social infrastructure, which explains why the policy has worked so poorly for Indigenous communities, as shown in Chapter 5— the policy is not designed to overturn, or even challenge, the colonial relations or racial logics that are embedded within it or within the infrastructures that surround extractive industries more generally.

As a result, both extraction and impact evaluation processes can have inordinate impacts on Indigenous communities. As we have seen, extractive projects can have disproportionate impacts on Indigenous communities' health both because they affect a multitude of determinants of health simultaneously and because they have cumulative effects that are compounded by other forms of historical trauma. However, environmental assessment as an infrastructure in and of itself also disproportionately affects Indigenous communities because it fits within a longer history of Crown-Indigenous relations that are largely unequal, performative, and harmful. EA has the potential to reactivate stress and trauma to a much higher degree for Indigenous communities, which can be seen as a form of environmental racism— systematic discrimination based on race and furthered by policy (Bullard, 2000). Pulido (2017) coins the term the "environmental racism gap" to describe the perpetual inequalities between white and racialized communities resulting from unevenly distributed policies and regulation. In this case, I would assert that the environmental racism gap constitutes both the differential impacts that mining sites have on Indigenous communities, as well as the heightened stress and marginalization that Indigenous Peoples face in the assessment process itself compared with non-Indigenous participants. The idea of the 'gap' highlights the fact that universal policies and regulations, including EA, do not serve racialized communities because they fail to account for the historic systems that drive contemporary oppression. Although the scientific measurements used in EA

can give off an illusion of equality, these methods are not equitable. Without changing the colonial and racist power structures underlying and supporting EA, this infrastructure will only continue to disproportionately affect Indigenous communities.

There are many other impact evaluation practices that are used in conjunction with existing EA protocols. These range from more established practices to ones that are still emergent in the Canadian context, including: social impact assessment, health impact assessment, environmental and social impact assessment, sustainability assessment, social life cycle assessment, strategic environmental assessment, and many others. Dendena and Corsi (2015) explain that "the practice of impact assessment has, in fact, resulted in the flourishing of several methods, aimed to better capture the complexity of reality by introducing different perspectives of analysis" (p. 969). As such, there is a wide range of terms used to describe these alternative assessment practices, as each is technically meant to assess different things. In general, the state of the art for many of these alterative practices emphasize the need for flexibility, accommodation, and community involvement compared with existing EA (Esteves et al., 2012; Harris-Roxas et al., 2012). Still, these practices warrant interrogation. In their article analyzing consultation processes on the Athabasca oil sands, Baker and Westman (2018) highlight that under-trained assessment consultants often "claim to have invented new research methodologies such as integrated assessment, traditional land use assessment, cultural assessment, etc." to justify their work, putting the validity of these practices in question (p. 151).

These alternative assessment practices largely share environmental assessment's core problems regarding accessibility and transparency. Public participation is still very flawed; like EA, participation in assessments is used mostly to legitimize projects rather than to truly interrogate or substantively change proposals (Dendena & Corsi, 2015; Esteves et al., 2012). Also, alternative assessments often do not take a regional approach, the data included for analysis can be inaccurate or inappropriate, and there can be serious blind spots when identifying impacts due to practitioners' bias (Baker & Westman, 2018; Dendena & Corsi, 2015; Esteves et al., 2012; Jones & Bradshaw, 2015). Though the language and vocabulary may be different, the foundational logics of these alternative practices are largely similar to existing environmental assessment processes; they are not developed by communities themselves and often do not properly honour or center Indigenous ways of knowing and ontologies (Baker & Westman, 2018; Esteves et al., 2012; Jones & Bradshaw, 2015). Health impact assessment, in particular, is

generally considered to be more interdisciplinary and holistic than other assessment types, and to have better and more integrated stakeholder engagement practices (Jones et al., 2014). Still, HIA practitioners often fail to properly integrate community knowledge and ontologies and instead rely on a narrow set of assessment methods, which limits HIA's functionality for Indigenous communities (Harris-Roxas & Harris, 2011). Even when communities lead their own health assessments, HIA's scoping and processual guidelines often cannot contain the breadth and scale of mutual relations between Indigenous Peoples and the environment, which have lasted since time immemorial and require reciprocal duties and responsibilities (Jones & Bradshaw, 2015; Mackie, 2012).

Additionally, this rise in alternative assessments has created a confusing and overlapping impact evaluation landscape where multiple assessments can be conducted for the same project, often simultaneously (Dendena & Corsi, 2015; Esteves et al., 2012). This can be detrimental to communities, who often end up wading through more documentation and participating in more consultation processes (Dendena & Corsi, 2015; Esteves et al., 2012). This evaluation landscape is another manifestation of the environmental racism gap. Alternative assessment strategies, also developed within the same colonial infrastructures as EA, do not provide sufficient flexibility or space to fully integrate and build on Indigenous ways of knowing, meaning that these protocols will continue to be limited and inaccurate (Harris-Roxas et al., 2012; Mackie, 2012). Plus, the completion of these additional processes, along with mandated impact evaluation processes like environmental assessment, can exacerbate the existing accessibility issues that already disproportionately affect Indigenous communities and create further stress.

6.2.4. Uncovering practical politics

By acknowledging that EA operates as a knowledge infrastructure, we can recognize other goals that are accomplished when the policy fails communities. In this last section, I will discuss the politics of EA, specifically the successes and failures of the assessment infrastructure and the practical consequences of EA's infrastructural design. The primary success of EA as an infrastructure is how quickly it can move and the high level of processual efficiency it maintains. The failure, on the other hand, is that the information that is included and managed by EA is often irrelevant and harmful to communities. I argue, however, that this 'failure' has positive outcomes for corporate actors and for the state, who are able to benefit from the political

implications of performing EA. Here, I borrow Winner's (1980) definition of politics, meaning "arrangements of power and authority in human associations as well as the activities that take place within those arrangements" (p. 123).

EA as a knowledge infrastructure works to capture and transform criticism and other worldviews in order to expediate the development of material resource infrastructures. For this goal, the design of the infrastructure is extremely successful. Without EA's efficient and successful work managing and containing the conditions around the site, projects would take a much longer time to reach the construction phase. Mezzadra and Neilson (2019) explain that "there is a complex interplay among technological advances, knowledge production, and financial manipulation that allows capital to prepare the ground for further extraction" (p. 140). The infrastructure of EA is one means to "prepare the ground." The tight legislated timelines for EA completion and public comments serve a vital purpose in keeping the supply chain of extraction moving— here, I do not mean the supply chain that delivers raw materials to consumers, but rather the supply chain of information and legislation that maintains the flow of new resource projects, delivering benefits to corporations and to the state.

This infrastructural function necessarily limits the amount of flexibility that can be implemented in the design; mandating substantive engagement would pose a threat to the expediency that this process tries so hard to achieve and maintain. Any moment of pause, hesitation, or uncertainty is a danger to companies and governments, as it puts at risk the money that will be generated from the site. This has incidental benefits for companies, who are not really required to implement genuine change in their assessments and can often get away with perfunctory community consultation and engagement. EA's design seems to be purposefully made to inhibit the potential ability of any person to disrupt or slow it down. This can be seen in the limited comment periods, the mistranslations and misunderstandings of community concerns, and the ignoring of community questions and comments. This design represents another form of infrastructural securitization, different from the physical securitization described in section 2.5.1. Rather than secure projects through physical force (i.e., RCMP action), EA secures projects and their futures by maintaining a high level of speed and control over what is assessed and how, limiting communities' ability to intervene (Mezzadra & Neilson, 2019; Pasternak & Dafnos, 2018; Spice, 2018).

Communities being unable, or less able, to fully participate in EA or to change the conditions and outcomes of the assessment certainly constitutes an infrastructural failure. Or rather, it constitutes a failure if we assume that the goal and function of EA is to protect community interests and not simply to 'prepare the ground,' as I have suggested. However, there are significant political benefits for the state and for corporate actors produced by EA, and these practical politics are also important consequences of this infrastructure. One political repercussion of EA is the offloading of responsibility to companies from the state. EAs create parameters for measuring companies' success; as Li (2015) explains, the EA "produces the conditions necessary for corporations to check themselves— in terms that they themselves create" (p. 199). This is beneficial for companies, who can create lenient benchmarks for themselves, but also for state agencies, who pass off the task of establishing regulatory limits and evaluation guidelines to project proponents themselves (Li, 2015). This kind of offloading can be seen as a product of neoliberal governance, and this trend continues to complicate the ongoing landscape of obligations, relationships, and agreements between communities, companies, and the state (Cameron & Levitan, 2014).

Another important political consequence of EA is the heightened role of companies acting as instigators and mediators in ongoing negotiations between the state and Indigenous communities. In this case, I mean the role of project assessment in creating a forum for unequal exchange between the state and Indigenous Peoples. EA represents an important public space for continued dialogue and negotiation between communities, government bodies, and companies, but it is also a space where colonial relations are practiced and extended. Glen Coultard (2014) asserts that:

> In situations where colonial rule does not depend solely on the exercise of state violence, its reproduction instead rests on the ability to entice Indigenous peoples to *identify*, either implicitly or explicitly, with the profoundly *asymmetrical* and *nonreciprocal* forms of recognition either imposed on or granted to them by the settler state and society. (p. 25)

Here, I refer back to the earlier discussion of slow violence— although EA does not have the same physical or material qualities as other types of violence, it still necessitates interaction between the state and communities, and requires negotiations about ontology, knowledge, and jurisdiction. As Coulthard explains, the continued reproduction of colonialism relies on enticing Indigenous Peoples to participate in processes that grant recognition, even if they are

asymmetrical. In the case of EA, many communities can feel pressured to engage to try and ensure that their interests are represented, even if the knowledge, values, and comments that they share throughout the process are recognized in very limited forms or disregarded entirely. These exchanges can be very harmful for communities, which is why I assert that EA can be considered a form of slow violence. Not only is the dialogue very arduous and stressful, but it also provides a public platform for the colonial state to discursively erase and dismiss Indigenous knowledge and ontologies (Ladner, 2014; Yellowhead Institute, 2019). Nonetheless, the state and project proponents garner credibility and reputation from communities' participation.

7. CONCLUSION

> "Neoliberalism has given us an interesting conjuncture: its rapacity for natural resources… Has required the current structure of domination to bring indigeneity into representation, because so much of the natural resources that still exist in the world are to be found on lands traditionally occupied, owned, belonging with, or stewarded by Indigenous peoples… This, in turn, has given Indigenous worldings a rapturous potential." (Melamed, 2015, p. 83)

In this thesis, I have paired empirical analysis with critical theory to dissect the infrastructural elements of the environmental assessment process and understand its implications for Indigenous Peoples. Not only are there fundamental issues with assessment that make it irrelevant and inappropriate for evaluating effects on communities, but the furthering of colonial logics in the public sphere is harmful and contributes to asymmetrical power dynamics between the Crown and Indigenous Peoples. For this reason, I have framed EA as a knowledge infrastructure that reflects and reifies a larger colonial and racist social infrastructure in Canada, and as a form of slow violence that supports the continued and ongoing marginalization of Indigenous Peoples.

Drawing on the results of this research, it is clear that we need to move past the question of how to make EA more objective and less political. Rather, we need to ask: given that EA is necessarily political, how do we compensate for the imbalances of power and interest that are invested and encoded in these categories and processes? A new EA law, the Impact Assessment Act (Bill C-69) was passed in 2019, replacing CEAA 2012. While this new legislation has been lauded as more progressive and inclusive, it relies heavily on the precedent of CEAA 2012 for its basic structure and therefore carries over many problems from the previous law (Doelle & Sinclair, 2019; West Coast Environmental Law Association et al., 2019). Non-governmental organizations and scholars who contributed ideas during the law's development process now suggest that this legislation has failed to measure up to the improvements initially promised (Doelle & Sinclair, 2019; West Coast Environmental Law Association et al., 2019). This highlights that national policy reform is not necessarily a reliable option for liberation, since policies themselves are developed, operated, and implemented by a settler state.

There need to be broader conversations about the wide-reaching health implications of extractive projects. This work is especially important in the COVID-19 era, when new projects

are being hailed as essential in order to recover from the economic fallout of the pandemic (Earthworks et al., 2020). Some development companies are capitalizing on this narrative of inevitability and pushing through new policies that limit regulation and oversight on new projects (Earthworks et al., 2020). Currently, the relationships and dynamics between extractive industries and Indigenous Peoples in Canada are in rapid flux, especially considering that communities are facing new and serious threats to their health (Bernauer & Slowey, 2020). As companies and governments continue to insist on the necessity of large-scale developments, it is vital that we heighten our capacity to critically engage with these industries and projects.

This necessarily entails thinking about new and different kinds of resource governance that are more sustainable and just. In order to minimize adverse health impacts, facilitate local jurisdiction, and reduce settler resource overuse, the colonial power structures supporting Canada's current resource governance regime will need to be disrupted. Not only does this entail changing policy infrastructures to make them more competent and nuanced, but it also requires upending the judicial practices that facilitate legal land dispossession, including criminalization of land defenders and court injunctions against communities (Yellowhead Institute, 2019). In the same vein, Indigenous conceptions of consent and forms of law need to be taken seriously and respected in order to unsettle contemporary forms of resource use and settler hegemony (Coulthard, 2014; Yellowhead Institute, 2019). The quote from Jodi Melamed at the start of this conclusion highlights the interesting predicament that EA has created for itself— it has opened the door for future disruption and sovereignty. There are increasing opportunities for Indigenous communities to strategically engage with companies and assessment processes to leverage benefits and protect their own interests (Baker & Westman, 2018). Some examples of these efforts can be found in the Yellowhead Institute's (2019) Red Paper titled Land Back, which presents several case studies highlighting the importance of Indigenous justice frameworks and free, prior, and informed consent in community-company interactions. Honouring and centring these principles is vital to strengthening community capacity. And as researchers and citizens witnessing this process, it is crucial that we heighten our support of Indigenous communities, that we question the causal logics of these projects and industries, and that we contest these regulatory processes and policies when they reify structural oppression.

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9. APPENDIX

Table A.1. Search strings.

Concept	**Search terms**
Resource extraction	"Coal mine" OR "Coal mining" OR "Coal-bed methane" OR "Development of natural gas" OR "Development of shale gas" OR "Development of unconventional oil and gas" OR "Directional drilling" OR "Drilling" OR "Extraction" OR "Extraction and processing industry" OR "Fracking" OR "Gas drilling" OR "Gas rig" OR "Hydraulic fracturing" OR "Mining" OR "open pit mining" OR "opencast mining" OR "closed pit mining" OR "underground mining" OR "natural gas development" or "natural gas exploration" OR "Natural gas extraction" OR "Offshore drilling" OR "Oil and gas" OR "oil & gas" OR "Oil and gas drilling" OR "Oil and gas extraction industry" OR "Oil and gas industry" OR "Oil and gas wells" OR "Oil drilling" OR "Oil extraction" OR "Oil industry" OR "Oil rig" OR "Oilfield" OR "Onshore drilling" OR "Opencast mining" OR "Petroleum industry" OR "Pipeline" OR "Shale" OR "Shale gas exploitation" OR "Shale gas extraction" OR "Shale gas development" OR "Slick water stimulation" OR "Unconventional gas extraction" OR "Unconventional natural gas development"
Indigenous Peoples	"Indigenous" OR "Indian*" OR "First Nation*" OR "Native*" OR "aborigin*" OR "Inuit*" OR "Eskimo*" OR "Metis" OR "Métis" OR "Dene*" OR "Cree*" OR "Algonquin*"
Canada	"Canada" OR "Canadi*" OR "Quebec" OR "Québec" OR "Nunavut" OR "New Brunswick" OR "Newfoundland and Labrador" OR "Manitoba" OR "Yukon" OR "Saskatchewan" OR "Alberta" OR "Ontario" OR "Northwest Territories" OR "Prince Edward Island" OR "Nova Scotia"

Table A.2. Inclusion and exclusion criteria.

Criterion	**Include**	**Exclude**
Setting	Mining, oil, and gas projects	Logging or hydroelectric power projects
Population	Indigenous populations solely or studies comparing Indigenous and non-Indigenous samples	Studies that focus on non-Indigenous populations
Discussion of social-ecological context	Studies that include a discussion of the social-ecological context, and how a wide range of determinants of health are affected	Studies without a discussion of the social-ecological context
Study design	Empirical articles, peer-reviewed articles with a clear research design	Reviews, book chapters, organizational reports, grey literature, & conceptual articles
Accessibility	Available to McGill students	Not available to McGill students

Table A.3. Summary of codes identified in each article.

PP*	AU^	RESOURCE CODES	RESPONSE CODES	
CONSULTATION	Booth & Skelton 2011	Environmental degradation Species loss and animal contamination Increased traffic	Decline in consumption of traditional foods Diminished access to land Diminished land-spirit connection	Decreased sense of safety in community and concern for future generations Poor physical health
		Increased access to drugs	Poor physical health	
		Influx of strangers in the community	Increase in rents More people moving back to the community (reserve)	
		Constant participation in consultation Inappropriate assessment processes Interaction with mining officials Poorly conducted traditional use studies Multiple levels of government overseeing operations	Community division Psychological stress Feelings of powerlessness Distrust of government agencies Doubt of assessment effectiveness	Frustration at lack of consideration of cumulative effects Diminished access to land Perceived violation of Treaty and Aboriginal rights
		Rotational shift scheduling Increased income	Increased familial tension and breakdown Changing family dynamics	
	Place & Hanlon 2011	Environmental degradation Species loss	Concern about environmental contamination Diminished access to country foods	Concern about poor health of plants, animals, and people
		Diminished access to land	Diminished engagement in traditional activities	Increase in substance abuse
		New job and training opportunities	Disappointment in inaccessibility of work and in racism	
		Participating in environmental assessment and consultation processes	Feelings of mistrust, hopelessness, and doubt cause pervasive stress Frustration at lack of consideration of cumulative effects Feeling that Indigenous values/knowledge are not respected	Frustration that Indigenous Peoples are not leading or substantively involved in research for assessment Concern that government will not monitor the site and that reclamation to a satisfactory level will not occur
ACTIVE	Blangy & Deffner 2014	New jobs Increased income	Increased ability to finance hunting equipment	Increased food security
		Increased revenue for the community	New infrastructures	More community events
		Environmental degradation Diminished access to land	Leaner meat Loss of territory for hunting and fishing	Irreversible land change Contamination of animals
		New roads and traffic Air traffic	Dust from helicopters affects animals & plants Women becoming alienated from berry picking Caribou are increasingly remote	Increased access to the land in summer Changing migration patterns for caribou
		Changing social relations due to mine presence	Alcoholism, drug use, abuse, and risky behaviours Family problems and breakdown	Violence against women Increased social inequalities

ACTIVE		Difficult working conditions Language barriers in the workplace Rotational shift scheduling	High turnover rate at work Racism and discrimination at work Lack of comprehension of Inuit culture	Rumours and stress in the community Difficulty finding childcare
		New training and education opportunities	Encouraging youth to leave school early	
	Davison & Hawe 2012	Increased revenue for the community	Increased community resources	
		Rotational shift scheduling Increase in income Increased transience in the community	Decreased presence of adults in the home Disruption to family unit Difficulties for female workers with dependent children	Changing family dynamics as more grandparents taking over childcare—possibility of more language being spoken at home
		Increase in employment possibilities Inequities in accessibility	Tension between work and education Diminished opportunities for women compared with men	Pressures on school to prepare students for mining labour market
	Dana et al. 2008	Broader economy (ex: more employment)	Potential decrease in alcoholism as people become busier	
		Social inequalities	Increase in crime and violence	Increase in family breakdown
		Influx of industrial development	Increased alienation Increase in displaced people as housing prices rise	Wear and tear on infrastructure Damage to environment and livelihoods
	Dana et al. 2009	Increased revenue for the community	Increase in drug/alcohol presence and use	Increase in family breakdown
		Influx of strangers in the community	Overcrowding and lack of affordable housing Increase in displaced people Increase in crime and violence	Increase in family breakdown Increase in substance abuse Increase in suicide
		Environmental degradation Potential spills/disasters	Degradation of cultural sites Destruction of traplines Contamination of animals	Destruction of animals' habitats Changing land-spirit connection
	Hodgkins 2017	Participation in training programs	Increased substance abuse Difficulties overcoming educational and skills deficits	Difficulty balancing familial responsibilities, particularly for women with dependents Increased financial pressures
	Kunkel 2017	Environmental degradation Species loss and animal contamination	Reduction in fishing Potential break in intergenerational transfer of knowledge	Loss of traditional knowledge Threat to food and medicine security
	Laneuville 2014	Presence of new road Regulations around use of mining road Traffic (and air traffic)	Faster and more comfortable travel Limited ability to hunt and harvest Limited community control over the land	Dust pollutes wildlife and waters and limits activities on the land Interference in migration routes
		Rotational shift scheduling Extended time out at camp	Greater flexibility in schedule for hunting activities	Ability to keep an eye on animal migration while at work and plan next hunting trip

	Mine camp built on sacred site (ancestral graves)	Ancestors' spirits are disturbed Workers can connect with ancestors in graves near camp	Fear and anxiety caused by these spirit encounters
	Increased income	Increased ability to purchase hunting equipment (ATVs, snowmobiles) and gasoline	
Nightingale et al. 2017	New jobs and training opportunities Increased income	Increased material wellbeing Increased financial independence and autonomy for women, as well as confidence and skills	Increase in substance abuse (increased legal permits and bootlegging) creates heightened violence against women Reduced economic stress
	Difficulties in the workplace due to sexism, racism, and language conflict	Increased risk of sexual harassment/assault for women Lack of benefits pushing women out of industry	Changing gendered dynamics in the family as women take on role of primary breadwinners can create tensions
	Rotational shift scheduling	Increased familial tension and breakdown fuelled by time apart, rumours, and stress Diminished access to country foods due to limited time on the land	Diminished engagement in traditional activities Increased substance abuse Difficulties for children unable to be placed in childcare
	Poor support for workers and community members	Feeling that services are inadequate	
Rodon et al. 2013	Rotational shift scheduling Discrimination at work Substance-free mine camps	Respite from work done at home Housing on site gives workers their own space Time away is difficult for younger couples with children Some workers leaving their jobs to be with family Increased absenteeism from school when workers are at home	Stricter standards for Inuit workers compared with French-speaking employees Exacerbated tensions between workers of differing racial identities Diminished interest in mine work Increased alcohol consumption on off days
	New jobs with better income Increased revenue for the community Royalty payments	Diminished interest in work when royalty payments come to the community Improved family living conditions when royalties are given to community members themselves—increased ability to pay for equipment to go out on the land and facilitated participation in traditional activities	Increased consumption of alcohol and drugs, which drives spousal violence and sexual abuse New infrastructures (gymnasium and hotel) when royalties are managed and administered by community, and indirect jobs
	Environmental degradation	Diminished health of people and food Fear of spills and contamination because of previous mining encounters	Diminished consumption of fish and caribou due to fears of contamination Dust and contaminants affecting traditional habitats

	Shandro et al. 2017	Environmental degradation Environmental dispossession Reduction in fishing and cultural activities	Continued emotional stress due to uncertainty and lack of trust Altered dietary patterns Reduced physical activity	
POST-CLOSURE	**LeClerc & Keeling 2015**	Persistence in mixed economy	Decrease in trapping/change in trapping patterns	
		Restricted access to land Environmental degradation Contamination of groundwater	Degradation of traplines Hunters needing to repurpose post-mining landscapes into new traplines Changing access patterns to land	
		Poor remediation work	Continued contamination Community discontent and concern for safety	Minimal vegetation regrowth Distrust of new development projects
	Rixen & Blangy 2016	Job losses	Possibly closer family relations and more time on the land learning traditional skills Possible intensification of social problems such as alcohol abuse, familial tension, and suicide due to personal stress Some children may stay in school longer because choosing to work at the mine is no longer viable, and some may leave due to personal stress/loss of vision	Unemployment may hurt mine-employed families more Possible increased dependence on social assistance May be difficult to find work with limited alternative industries Likely lower stress for workers with dependents as they leave rotational shift scheduling Overcrowding may intensify
		Decreased land degradation Disappearance of noise, contamination, and traffic	Caribou populations may resurge in the area Access to the land may become difficult with road closures and lack of wage labour income to maintain hunting equipment	Possible that mining residue will keep country foods unsafe Food independence will likely still be difficult, but possible improvements in local nutrition/general health

PP* = project phase (consultation, active, post-closure) being investigated in each study; AU^ = authors and year of publication.
Note: the table should be read horizontally. For each article, the resource mechanisms (M1) that were discussed are grouped with the corresponding response mechanisms (M2) in the same row.

Table A.4. Project characteristics.

Project proponent **Mine type**	**Assessment type** **Report year**	**Proposed mine life and production capacity**	**Indigenous Peoples mentioned in report**	**Result**
Ajax Mine Project, *British Columbia*				

KGHM Ajax Mining Inc. Copper and gold mine	Comprehensive study under CEAA 1992 August 2017	"The Project would process up to 65,000 tonnes of ore per day over an operating mine life of up to 23 years"	Stk'emlupsemc te Secwépemc Nation (Tk'emlúps te Secwépemc [Tk'emlúps Indian Band] and the Skeetchestn Indian Band), Whispering Pines/Clinton Indian Band (Whispering Pines/Clinton), Ashcroft Indian Band (Ashcroft), Lower Nicola Indian Band (Lower Nicola), Métis Nation British Columbia	Denied
Akasaba West Copper-Gold Mine Project, *Québec*				
Agnico Eagle Mines Ltd. Copper and gold mine	EIA under CEAA 2012 May 2018	"The plan is for the Project to extract 5.1 million tonnes of ore over a four-year period" (transported over 6 year period)	Lac Simon First Nation, Kitcisakik First Nation	Approved ^
Arnaud Mining Project, *Québec*				
Mine Arnaud Inc. Apatite concentrate mine	Comprehensive study under CEAA 1992 July 2015	"Annual extraction rate of approximately 11 million tonnes of ore and a production of apatite concentrate of approximately 1.2 million tonnes a year… the operating life of the mine is estimated at 31 years"	Innu First Nations of Uashat mak Mani-Utenam and Matimekush-Lac John	Approved
Black Point Quarry Project, *Nova Scotia*				
Black Point Aggregates Inc. Granite quarry	EIA under CEAA 2012 April 2016	"The average annual production rate would exceed 1 million tonnes over a span of approximately 50 years"	Nova Scotia Mi'kmaq First Nations (12/13 nations represented by Kwilmu'kw Maw-klusuaqn Negotiation Office, while the Sipekne'katik First Nation represented itself)	Approved
BlackRock Mining Project, *Québec*				
BlackRock Metals Inc. Iron, titanium and vanadium mine	Comprehensive study under CEAA 1992 June 2014	"(The proponent) is proposing to develop an iron-titanium-vanadium mine with an annual production capacity of 12.4 million tonnes of ore and 3 million tonnes of iron and vanadium concentrate"	Oujé-Bougoumou and Mistissini Cree Nations	Approved
Blackwater Gold Project, *British Columbia*				
New Gold Inc. Gold and silver mine	EIA under CEAA 2012 April 2019	"The Project would have a production capacity of 60,000 tonnes per day of gold and silver ore over a mine life of 17 years"	Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Saik'uz First Nation, Stellat'en First Nation, Nazko First Nation, Skin Tyee Nation, Tŝilhqot'in Nation, Métis Nation British Columbia, Nee-Tahi-Buhn Band	Approved
Brucejack Gold Mine Project, *British Columbia*				
Pretium Resources Inc. Gold and silver mine	EIA under CEAA 2012 July 2015	"The proposed Project would produce approximately 16 million tonnes of mineralized material at a rate of up to	Nisga'a Nation, Tsetsaut/Skii km Lax Ha, Tahltan Nation, Métis Nation B.C.	Approved

		2,700 tonnes per day over a minimum 22-year mine life"		
BURNCO Aggregate Mine Project, *British Columbia*				
BURNCO Rock Products Ltd. Sand and gravel mine	Comprehensive study under CEAA 1992 November 2017	"The BURNCO Aggregate Mine Project would produce up to 1.6 million tonnes of gravel per year over a 16-year operating life"	Squamish Nation, Tsleil-Waututh Nation, Musqueam Indian Band, Hul'qumi'num Treaty Group (Stz'uminus First Nation, Cowichan Tribes, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe) and Métis Nation British Columbia	Approved
Côté Gold Mine Project, *Ontario*				
IAMGOLD Corporation Gold mine and metal mill	EIA under CEAA 2012 April 2016	"The mine and metal mill would have an ore production capacity and an ore input capacity, respectively, of 60,000 tonnes per day, with a life of approximately 15 years"	Mattagami First Nation (represented by Wabun Tribal Council), Flying Post First Nation (represented by Wabun Tribal Council), Brunswick House First Nation, Métis Nation of Ontario Region 3 Consultation Committee (the Métis Nation of Ontario), Algonquin Anishinabeg Nation Tribal Council, Matachewan First Nation	Approved
Donkin Export Coking Coal Project, *Nova Scotia*				
Xstrata Coal Donkin Management Limited (XCDM) Coal mine	Comprehensive study under CEAA 1992 April 2013	"The Project consists of a multi-continuous miner underground operations producing approximately 3.6 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal that is subsequently washed to provide approximately 2.75 Mtpa of product coal that is primarily suitable for coking coal markets, but may also supply thermal coal markets"	Mi'kmaq of Nova Scotia	Approved
Dumont Nickel Mine Project, *Québec*				
Royal Nickel Corporation Nickel mine	Comprehensive study under CEAA 1992 May 2015	"It plans to extract ore over a period of 19 years, to process the higher grade ore and to temporarily stockpile the low-grade ore for that period. At the end of the mining phase, the stockpiled low-grade ore will be used to feed the concentrator for another 12 years, at which time the mine complex will be closed after 33 years of operation. The ore processing facility will have an initial capacity of 52,000 tonnes/day, but	Abitibiwinni First Nation, Cree Nation	Approved

		will reach 105,000 tonnes/day by the fifth year of mining operations"		
Goliath Gold Project, *Ontario*				
Treasury Metals Inc. Gold mine	EIA under CEAA 2012 August 2019	"(The Project) will have an ore production capacity of 5,424 tonnes per day and an ore input capacity of 3,240 tonnes per day with an anticipated mine and mill life of 12 years. Over the 12 years of operations, the average ore production and ore input capacity of the mine and mill would be 2,700 tonnes per day"	Aboriginal People of Wabigoon, Eagle Lake First Nation, Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation), Lac des Mille Lacs First Nation, Métis Nation of Ontario, Naotkamegwanning First Nation (Whitefish Bay First Nation), Wabauskang First Nation, Wabigoon Lake Ojibway Nation	Approved
Hammond Reef Gold Project, *Ontario*				
Agnico Eagle Mines Ltd. Gold mine and mineral mill	Comprehensive study under CEAA 1992 July 2018	"Mining would occur for 11 years, with an ore production capacity of 60,000 tonnes per day. The on-site metal mill would have an ore input capacity of 60,000 tonnes per day"	Couchiching First Nation, Lac des Mille Lacs First Nation, Lac La Croix First Nation, Métis, represented by the Métis Nation of Ontario Region 1 Consultation Committee, Mitaanjigamiing First Nation, Naicatchewenin First Nation, Nigigoonsiminikaaning First Nation, Rainy River First Nations, Seine River First Nation, Wabigoon Lake Ojibway Nation	Approved
Hardrock Gold Mine Project, *Ontario*				
Greenstone Gold Mines Gold mine and metal mill	EIA under CEAA 2012 November 2018	"As proposed, the gold mine would have an ore production capacity of 30,000 tonnes per day, and the metal mill would have an ore input capacity of 30,000 tonnes per day"	Animbiigoo Zaagi'igan Anishinaabek, Aroland First Nation, Biigtigong Nishnaabeg, Constance Lake First Nation, Eabametoong First Nation, Ginoogaming First Nation, Long Lake #58 First Nation, Marten Falls First Nation, Métis Nation of Ontario, Pays Plat First Nation, Red Sky Métis Independent Nation, Biinjitiwaabik Zaaging Anishinaabek, Bingwi Neyaashi Anishinaabek, Pic Mobert First Nation	Approved
Howse Property Iron Mine Project, *Newfoundland and Labrador*				
Howse Minerals Limited Iron ore mine	EIA under CEAA 2012 April 2018	"(The Project would) produce 46 million tonnes of iron ore over a period of 15 years, with a maximum production rate of 25,000 tonnes of iron ore per day"	Innu Nation, Innu Takuaikan Uashat mak Mani-Utenam, Nation Innu Matimekush-Lac John, Naskapi Nation of Kawawachikamach, NunatuKavut Community Council	Approved

Kami Iron Ore Project, *Québec/Newfoundland and Labrador*				
Alderon Iron Ore Corp. Iron ore mine	Comprehensive study under CEAA 1992 October 2013	"Peak production of approximately 16 Mtpa of iron ore concentrate" (p. 1)	Innu Nation, NunatuKavut Community Council, Innu-takuaikan Uashat mak Mani-utenam, Nation Innue Matimekush-Lac John, Naskapi Nation of Kawawachikamach	Approved
Kitsault Mine Project, *British Columbia*				
Avanti Kitsault Mine Ltd. Molybdenum mine	Comprehensive study under CEAA 1992 August 2013	"Production capacity of approximately 40,000 to 50,000 tonnes per day"	Nisga'a Nation, GHCO (on behalf of Gitanyow Huwilp Wiitaxhayetwx-Sidok, Huwilp Gwass Hlaam, Huwilp Gwinuu, and Huwilp Gamlaxyeltxw), Gitanyow Huwilp Luuxhon, Gitxsan Nation, Kitselas First Nation, Kitsumkalum First Nation and the Métis Nation of B.C.	Approved
KSM (Kerr-Sulphurets-Mitchell) Project, *British Columbia*				
Seabridge Gold Inc. Gold, copper, silver, and molybdenum mine	Comprehensive study under CEAA 1992 July 2014	"The Project is expected to have an average ore extraction rate of approximately 130,000 tonnes per day over an anticipated 52-year mine life"	Nisga'a Nation	Approved
Magino Gold Project, *Ontario*				
Prodigy Gold Incorporated Gold mine and metal mill	EIA under CEAA 2012 January 2019	"The mine and metal mill would have an ore production capacity of 45,200 tonnes per day and an ore input capacity of 35,000 tonnes per day, respectively, and would operate for approximately 12 to 15 years"	Batchewana First Nation, Garden River First Nation, Michipicoten First Nation, Missanabie Cree First Nation, Pic Mobert First Nation, Red Sky Métis Independent Nation, The Métis Nation of Ontario	Approved
Mining and Milling the Midwest Project, *Saskatchewan*				
AREVA Resources Canada Incorporated Uranium mine	Comprehensive study under CEAA 1992 April 2012	"The Midwest Project is proposed to extract and process approximately 985,000 tonnes of ore averaging 1.7% uranium (U) for a total resource of approximately 16,500 tonnes U metal... The development of the Midwest pit, including mining, is expected to take approximately five years, with ore initially accessed after two years. The Midwest ore is expected to be milled in the following five to seven years. Decommissioning of the Midwest site is expected to last two years, followed by five years of post-decommissioning monitoring"	Hatchet Lake Denesuline First Nation, Black Lake Denesuline First Nation, Fond du Lac Denesuline First Nation, Northern Settlement of Camsell Portage, Northern Settlement of Wollaston Lake, Northern Settlement of Uranium City, Northern Hamlet of Stony Rapids	Approved

Murray River Coal Project, *British Columbia*				
HD Mining International Ltd. Coal mine	EIA under CEAA 2012 October 2016	"The Project would have a production rate of six million tonnes of metallurgical coal per year over a 25-year mine life"	Saulteau First Nations, West Moberly First Nations, McLeod Lake Indian Band, Métis Nation British Columbia	Approved *
North American Lithium Spodumene Mine Project, *Québec*				
North American Lithium Inc. Spodumene (lithium mineral) mine	Comprehensive study under CEAA 1992 February 2018	"3,800 tonnes per day… until 2030"	Cree Nation, Lac Simon, Abitibiwinni Algonquin First Nations	Approved
Rainy River Project, *Ontario*				
New Gold Inc. Gold mine and metal mill	EIA under CEAA 2012 January 2015	"Mining would occur for 15 to 20 years, with an ore production capacity of 27,000 tonnes per day (tpd). The onsite metal mill is proposed to have an ore input capacity of 21,000 tpd"	Rainy River First Nation, Naicatchewenin First Nation, Anishinaabeg of Naongashiing First Nation (Big Island), Big Grassy River First Nation, Ojibways of Onigaming First Nation, Naotkamegwanning First Nation (Whitefish Bay), Métis represented by the Métis Nation of Ontario Region 1 Consultation Committee, Mitaanjigamiing (Stanjikoming) First Nation, Couchiching First Nation, Buffalo Point First Nation, Northwest Angle #33, Northwest Angle #37, Anishinabe of Wauzhushk Onigum (Rat Portage), Lac La Croix First Nation, Seine River First Nation, Nigigoonsiminikaaning First Nation	Approved
Red Mountain Underground Gold Project, *British Columbia*				
IDM Mining Ltd. Gold-silver mine	EIA under CEAA 2012 December 2018	"The Project would have a year-round production rate of 1,000 tonnes per day or 365,000 tonnes per year over a mine life of six years"	Nisga'a Nation, Tsetsaut/Skii km Lax Ha, Métis Nation B.C.	Approved
Renard Diamond Mine Project, *Québec*				
Stornoway Diamond Corporation Diamond mine	Comprehensive study under CEAA 1992 May 2013	"The estimated mine life is approximately 20 years, at an ore production rate of approximately 7,000 tonnes per day"	Cree Nation of Mistissini	Approved
Sisson Project (Tungsten and Molybdenum Mine), *New Brunswick*				
Sisson Mines Ltd. Tungsten and molybdenum mine	Comprehensive study under CEAA 1992 April 2016	"The Project would operate for an estimated 27 years at a mining rate of 30,000 dry metric tonnes per day"	Maliseet First Nations (St. Mary's, Kingsclear and Woodstock First Nations), Mi'gmag First Nations in New Brunswick	Approved ‡
Star-Orion South Diamond Mine Project, *Saskatchewan*				

Shore Gold Inc. and Fort à la Corne Joint Venture Diamond mine	Comprehensive study under CEAA 1992 June 2014	"The Project would excavate approximately 45,000 of kimberlite rock per day over a project 20-year period"	Cumberland House Cree Nation, James Smith Cree Nation, Métis Nation – Saskatchewan Eastern Region II and Western Region II, Muskoday First Nation, Red Earth Cree Nation, Peter Ballantyne Cree Nation, Wahpeton Dakota Nation	Approved
Whabouchi Mining Project, *Québec*				
Nemaska Lithium Inc. Spodumene (lithium mineral) mine	EIA under CEAA 2012 August 2015	"The mine would have an average ore production rate of 3,000 tons per day over a life of 26 years"	Cree Nation of Nemaska	Approved

^ "The Agency concludes that the Akasaba West copper and gold mine Project is likely to have significant adverse cumulative environmental effects on the current use of lands and resources for traditional purposes, and to cause adverse effects on the exercise of potential rights to hunt by the two Algonquin First Nations of Lac Simon and Kitcisakik on the territory claimed by the Algonquin Nations despite the implementation of accommodation and mitigation measures, and would make recommendations to that effect to the Minister of Environment and Climate Change" (p. iv).
* "The Agency concludes that, taking into account the implementation of these key mitigation measures, the Murray River Coal Project is likely to cause significant cumulative adverse environmental effects to the use of caribou by Aboriginal peoples. This is because the Project, in combination with other physical activities that have been or will be carried out, will undermine the survival and recovery of the Quintette herd of southern mountain caribou" (p. iii).
‡ "The Project is predicted to result in the loss of land (approximately 1,253 hectares), and residual impacts on resources used by Maliseet and Mi'gmag First Nations for traditional purposes. Measures have been identified that would mitigate some of these impacts (e.g. limiting the size of the Project footprint, applying mitigation to address impacts on biophysical resources used by Maliseet and Mi'gmag First Nations). However, with respect to Maliseet First Nations, the Agency considers that the measures proposed fail to address the permanent loss of access to an area of high value and the associated use of that area. The Agency concludes that the Project is likely to result in significant adverse environmental effects on the current use of lands and resources for traditional purposes by Maliseet First Nations. Furthermore, the Agency is of the view that a limited number of large contiguous Crown land blocks, particularly along the Saint John River valley, remain available to practice current uses for traditional purposes proximal to the Maliseet communities of Tobique, Kingsclear, Woodstock, and St. Mary's First Nations. Within the remaining Crown land blocks, use by these First Nations is limited by other existing land uses. Given this context, the Agency concludes that the environmental effects of the Project, in combination with the cumulative environmental effects of other projects and activities, on the current use of lands and resources by Maliseet First Nations are also likely to be significant" (p. iv).

Table A.5. Assessed VCs and potential effects on Indigenous Peoples.

VCs assessed by the agency	**VC category** **Potential or expected residual effects for Indigenous Peoples**
Ajax Mine Project (2/23 assessed indicators found significant)	
• Greenhouse Gases • Vegetation • Surface Water Quality and Quantity • Groundwater Quality and Quantity • Fish and Fish Habitat • Wildlife • Current Use of Land and Resources for	Human Health • Increase in human health risk and potential health effects associated with inhalation exposures to PM2.5 and PM10 • Increase in human health risk and potential health effects associated with inhalation exposures to NO2, SO2, CO, particulate-bound metals and PAHs • Increase in human health risk and potential health effects associated with total direct contact for metals • Increase in sleep disturbance due to increased noise levels Community Well-being

Traditional Purposes • Air Quality • Human Health • Noise and Vibration • Heritage	• Changes to visual quality for residents • Decrease in dark sky quality
	Current Use of Lands and Resources for Traditional Purposes
	• Effects on fishing • Effect on hunting and plant gathering • Effect on cultural and ceremonial uses
	Heritage
	• Effects to archaeological sites • Effects to early settlement heritage sites • Effects to Indigenous heritage
Akasaba West Copper-Gold Mine Project (0/6 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Change that may be caused to the environment, outside Canada • Indigenous peoples— health conditions • Indigenous peoples— current use of lands or resources for traditional purposes • Indigenous peoples— physical or cultural heritage and structure, site or thing that is of historical, archaeological, paleontological or architectural significance • Species at risk	Current use of lands and resources for traditional purposes
	• Effect on access to the mine site (100 hectares during operation, 40 hectares after closure). • Change in wildlife resources. • Perceived loss of quality of resources.
	Health conditions
	• With little exposure to contaminants emitted from the project, low current land use by Algonquin First Nations for current uses for traditional purposes means that the Algonquins would have low exposure to contaminants; • Low probability of increased concentrations of dust, metals, metalloids and other contaminants in air, animal flesh, plants, fruits or water to exceed health protection standards and criteria.
	Physical or cultural heritage, and effect on historical, archaeological, paleontological or architectural sites or structures
	• Archaeological studies have shown that the study area has very low archaeological potential; • No elements concerning physical or cultural heritage or historical, paleontological or architectural sites have been identified.
Arnaud Mining Project (0/17 assessed indicators found significant)	
• Water resources • Human health (impact of changes to the environment [air quality, noise environment and drinkable water] on quality of life and human health) • Fish and fish habitat • Birds and their habitat • Terrestrial wildlife and its habitat • Current use of land and resources for traditional purposes and site or thing of archaeological, heritage or historical significance	Human health
	• Health effects from atmospheric emissions • Greenhouse gas emissions • Health effects from noise (stress, nuisance, sleep disturbance) • Contamination of drinking water
	Current use of lands and resources for traditional purposes
	• Loss of areas that are currently used • Changes in the noise environment may disturb land users • Risk of contamination of traditional food • Destruction or damage to an Aboriginal archeological site
Black Point Quarry Project (0/28 assessed indicators found significant)	
	Current use of lands and resources for traditional purposes by the Mi'kmaq – Aboriginal Land and Resource Use

• Freshwater fish and fish habitat • Marine species and habitat • Migratory birds • Current use of lands and resources for traditional purposes by the Mi'kmaq • Physical and cultural heritage • Commercial Fisheries • Tourism and Recreation • Species at risk	• Permanent loss of wildlife and plant resources which have been reportedly traditionally harvested within the immediate Project footprint; loss of future opportunities to harvest these resources • Harm to, or dispersion of local wildlife due to noise disturbance • Potential degradation of the local marine and shoreline habitats surrounding the shipping terminal related to dust contamination, the potential for accidental aggregate spillage during loading, and possible contamination resulting from petroleum products associated with cargo vessels
	Socio-economic conditions of the Mi'kmaq (commercial fisheries)
	• Marine terminal construction: noise and suspended sediments causing fish avoidance / Temporary avoidance • Loss of access to fishing grounds during construction; displacement / Temporary pending offsetting plan • Vessel traffic to support construction; loss of access to fishing grounds; displacement / Temporary displacement • Presence of the operational marine terminal; access to fishing grounds; displacement / None anticipated following offsetting plan • Ongoing terrestrial and marine operations; exclusion of current trapping and all-terrain vehicle passage / Limitations to public access
BlackRock Mining Project (0/23 assessed indicators found significant)	
• Birds and their habitat • Terrestrial wildlife and their habitat • Current use of land and resources for traditional purposes and site or thing of archaeological, heritage or historical significance.	Current use of lands and resources for traditional purposes
	• Loss of use of land (hunting, fishing, gathering) • Loss of a hunting camp • Risk to user safety • Disturbance of land users • Risk of contamination of traditional food
Blackwater Gold Project (0/36 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Health and socio-economic conditions of Indigenous peoples • Current use of lands and resources for traditional purposes • Physical or cultural heritage, and historical, archaeological, paleontological, or architectural sites or structures • Transboundary environmental effects – greenhouse gas emissions • Aquatic environment • Wetlands • Wildlife and species at risk • Socio-economic conditions for the public • Species at risk	Noise
	Increased noise from blasting and mining equipment and the pump station during construction and operations, and from aircraft during construction, could lead to speech comprehension issues and annoyance for Indigenous people.
	Changes to quality of air, water, soil, and country foods
	The Project may affect the quality of water, soil, and country foods through dust deposition and changes to surface water and groundwater quality. Indigenous peoples who spend time in the project area and who have direct contact with soil and surface water, inhale dust and air emissions, and ingest soil, surface water, vegetation, wild game, and fish, may be exposed to contaminants of potential concern and may experience an increased health risk due to the Project.
	Reduced access to quantity of country foods
	Effects of the Project on moose harvesting for traditional purposes could have potential effects on Indigenous peoples' food security. The proponent did not identify any interaction between changes from the Project and Indigenous groups' economic development opportunities.
	Loss or alteration of access
	The Project would interfere with some land users' ability to reach specific areas due to the location of the mine site and freshwater supply pipeline on currently used access routes.
	Reduced quality of experience:

	The Project would cause a change in the abundance or distribution of resources and interfere with the use and enjoyment of lands and resources as a result of sensory disturbance.
	Destruction or disturbance of sites
	The Project has the potential to destroy or disturb known and undiscovered archaeological sites, cultural heritage resources and historic heritage sites, and paleontological sites.
	Changes to quality of experience and access
	The Project has the potential to create noise and visual disturbances which would affect the quality of experience of using culturally important sites. The construction and operation of project components could reduce access to important cultural and spiritual sites identified by Indigenous groups.
	Fishing
	The mine site, airstrip, freshwater supply system and linear components will all contribute to visual and auditory disturbances to the quality of experience for fishing for Lhoosk'uz Dené Nation and Ulkatcho First Nation.
	Hunting and trapping
	Reduction in harvesting for hunting and trapping success due to a decrease in the quantity of resources in area of mine site for Lhoosk'uz Dené Nation, Ulkatcho First Nation and Skin Tyee Nation. Access to up to 14 traditional land use sites for hunting and trapping by Ulkatcho First Nation and three by Skin Tyee Nation will not be available for the life of the mine. The mine site, airstrip, freshwater supply system and linear components will all contribute to visual and auditory disturbances to the quality of experience for hunting and trapping for Lhoosk'uz Dené Nation, Ulkatcho First Nation, and Skin Tyee Nation.
	Gathering
	Reduction in success of plant gathering for Ulkatcho First Nation due to decrease in quantity and quality of resources. Reduction in access to up to ten of Ulkatcho First Nation's plant gathering sites near the mine site and fresh water supply system will be disrupted. The mine site, airstrip, freshwater supply system and linear components will all contribute to visual and auditory disturbances to the quality of experience for gathering for Lhoosk'uz Dené Nation, Ulkatcho First Nation, Skin Tyee Nation, Saik'uz First Nation, Stellat'en First Nation, and Nadleh Whut'en First Nation would also temporary auditory disturbances during construction and permanent visual disturbances from the transmission line.
	Other cultural and traditional uses of the land
	Ulkatcho First Nation will also be restricted from accessing a trail, campsite, culturally modified trees, a named place, and other current cultural and traditional use sites within the mine site. Skin Tyee Nation will be restricted from accessing trails and a named place within the mine site and campsites and gathering areas around Tatelkuz Lake. The mine site, airstrip, freshwater supply system and linear components will all contribute to visual and auditory disturbances to the quality of experience for other cultural and traditional uses of the land.
Brucejack Gold Mine Project (0/15 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Outside Canada • Aboriginal peoples — health and socio-economic conditions	Current use of lands and resources for traditional purposes
	Residual effects are not predicted in relation to fishing practices of Aboriginal people. There is the potential for residual effects to occur on hunting and trapping practices as a result of a change in the location, timing and availability of wildlife, and a displacement of hunting within the Project area.
	Health and socio-economic conditions

• Aboriginal peoples — current use of lands and resources for traditional purposes • Aboriginal peoples — physical or cultural heritage, and effects on historical, paleontological or architectural sites or structures • Species at risk • Nisga'a employment and outcome • Nisga'a business, revenue, capacity and investment activity • Natural resource activity and related earnings or values • Nisga'a government revenues and expenditures • Nisga'a housing • Nisga'a community services • Nisga'a community wellbeing • Nisga'a worker health • Nisga'a culturally important resources/sites • Nisga'a participation in cultural activities and practices	• Residual noise effects will occur including exceedance of noise guidelines for sleep disturbance and speech interference. • Residual effects to air quality will occur due to Project-related emissions and fugitive dust. • Residual effects to water quality will occur due to the localized introduction of contaminants or suspended solids, or from Project-related spills/leaks. • Residual labour market effects will occur to Aboriginal peoples by causing changes related to employment and labour participation, increasing competition for labour and wage inflation, and decreasing employment at closure. • During the Operations phase of the Project education and skills development for Aboriginal groups are expected to increase due to on-the-job training, work experience and skill development for Project workers • In-migration of workers for the Project is expected to have an adverse effect due to an increased demand on a limited housing and infrastructure supply during the construction phase. Housing supply is expected to increase during the operations phase. • In-migration of workers for the Project is expected to increase the demand for health and social services during the construction phase. However, these services are expected to adapt to the increased demand during the Operations and Closure phases of the Project.
	Physical or cultural heritage, and effects on historical, paleontological or archaeological sites or structures
	Residual effects are expected to be negligible.
BURNCO Aggregate Mine Project (0/30 assessed indicators found significant)	
• Freshwater environment • Marine environment • Terrestrial environment • Greenhouse gas emissions • Human health • Current use of land and resources for traditional purposes by Aboriginal persons	Effects on human health from changes to noise levels (Human Health)
	Increased noise levels during construction and operation of the Project could increase annoyance, sleep disturbance and impact the general well-being of those who are exposed.
	Effects on human health from air emissions (Human Health)
	Air emissions from the Project could affect human health through the inhalation of air contaminants. Air contaminants have the potential to cause respiratory or inflammatory effects on human receptors. This is especially true for sensitive receptors, such as children and the elderly.
	Effects on human health from changes in contaminants in country foods (human Health)
	Project activities could change the concentration of contaminants in the soil and water in and around the Project area which could increase concentrations of contaminants in the tissues of harvested foods such as plants, fish, and game meat. This in turn could marginally increase the human health risk for people who consume these foods.
	Effects on human health from changes to surface water quality (Human Health)
	Through Project activities, the concentrations of contaminants of potential concern could increase in water bodies in the Local Study Area. People may be exposed to these chemicals through recreational activities such as swimming and fishing in McNab Creek and along the foreshore.
	Effect on Squamish Nation's Current Use- Hunting Elk (Current Use of Lands and Resources for Traditional Purposes)

	The Project would have residual effects on the current use of hunting elk from loss of habitat and displacement of the animals from sensory disturbance. Members of Squamish Nation may also lose the ability to access the area for hunting. There may also be an indirect loss to the practice of hunting due to decrease quality of experience for the members. These effects may ultimately result in diminished success in the Squamish Nation's ability to hunt elk.
	Effect on Squamish Nation's Current Use- Hunting other Wildlife (Current Use of Lands and Resources for Traditional Purposes)
	The Project would have residual effects on the current use of hunting a variety of wildlife including deer, grouse, and migratory birds from loss of habitat and displacement of the animals from sensory disturbance. Squamish Nation's practice of hunting marine mammals would also be affected due to marine mammals avoiding the region because of acoustic disturbances. Members of the Squamish Nation may also lose the ability to access the area for hunting. There may also be an indirect loss to the practice of hunting due to decrease quality of experience for the members. These effects may ultimately result in diminished success in the Squamish Nation's ability to hunt other wildlife.
	Terrestrial and Marine Vegetation (Current Use of Lands and Resources for Traditional Purposes)
	Vegetation that is used for traditional purposes may need to be removed within the Project area. Plants within the Project area may not be accessible by Indigenous groups. Additionally, there could be a perceived decrease in the quality of resource due to air emissions from the gravel that could settle on vegetation and affect country foods.
	Effects on Squamish Nation's Current Use — Effects to Squamish Nation Cultural Activities (Current Use of Lands and Resources for Traditional Purposes)
	The Project would cause changes to the valley bottom and the alluvial fan of McNab Creek which could have direct effects on Kw'ech'tenm, an important cultural site for Squamish Nation. Approximately 59 hectares of land used for traditional purposes would be impacted, with 28 hectares being permanent lost through the creation of the pit lake. Additionally, there may be effects on access to cultural sites located along the barge route that are important to Squamish Nation.
	Effect on Indigenous Current Use — Freshwater Fishing (Current Use of Lands and Resources for Traditional Purposes)
	The Project would have residual effects on the current use of fishing in freshwater environment because it may result in a loss of fish species that are harvested by Indigenous people and the habitat used by those species. Indigenous groups report fishing in McNab Creek, upstream of the project area and, while McNab Creek is not expected to be impacted, many of the species that live in the creek may lose rearing and spawning habitat from other small creeks impacted by the Project. There may also be an indirect loss to the practice of fishing due to decrease quality of experience for Indigenous people. These effects may ultimately result in diminished success in the Squamish Nation's ability to fish in the freshwater environment.
	Effect on Indigenous Current Use — Marine Fishing (Current Use of Lands and Resources for Traditional Purposes)
	The Project would have residual effects on the current use of fishing in the marine environment because it may result in a loss of fish species that are harvested and the habitat used by those species. Barge loading and marine shipping activities may decrease fish use in the marine environment through noise effects, decreased water quality, loss of habitat, and thereby impact the success of the Indigenous harvesting fish in the marine environment. There may also be an indirect loss to the practice of fishing due to decrease quality of experience for Indigenous people. These effects may ultimately result in diminished success in the Squamish Nation's ability to fish in the marine environment.
Côté Gold Mine Project (0/24 assessed indicators found significant)	

• Fish and fish habitat • Migratory birds • Current use of lands and resources for traditional purposes by Aboriginal peoples • Health and socio-economic conditions of Aboriginal peoples • Physical and cultural heritage, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance for Aboriginal peoples • Other ecological components of the environment and socio-economic conditions	Effects on traditional plant harvesting (Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples)
	• Loss of traditional harvesting areas at the mine site due to the project footprint overlapping with these areas. • Loss of habitat and changes to the abundance of plant resources along the transmission line alignment. • Loss of access to traditional areas due to human health related land use restrictions.
	Effects on traditional hunting and trapping (Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples)
	• Loss of traditional hunting areas due to overlap with the mine site (e.g. waterfowl hunting site and route). • Increased hunting pressure on wildlife species as a result of newly created access (e.g. new access roads and the transmission line alignment). • Hunting and trapping may become more difficult in areas close to the Project due to changes in abundance and distribution of wildlife species due to habitat loss and fragmentation, sensory disturbances such as noise, light and traffic and mortality due to vehicle collisions. • Loss of access to traditional hunting and trapping areas due to human health related land use restrictions.
	Effects on traditional fishing (Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples)
	• Changes in abundance and distribution of fish in water bodies used for fishing due to effluent discharges, noise and vibration caused by blasting activities, watercourse realignments and loss of fish habitat. • Loss of some water bodies that could support fishing activities. • Overlap of areas important for traditional fishing by the transmission line alignment.
	Effects on the traditional and 4M Circle Canoe routes (Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples)
	• Implementation of access controls during the construction and operation phases due to project infrastructure and activities. • Modification to routes due to overlap with the project footprint, watercourse realignments, creation of retention dams and removal of dams. • Modifications to access due to human health related land use restrictions.
	Exposure to contaminants in water (Health and Socio-economic Conditions of Aboriginal Peoples)
	• Ingestion and dermal contact with contaminants in water from sources including: o Changes in water quality from effluent discharges to the lower basin of Neville Lake. o Seepage and surface drainage from the tailings management facility, open pit, mine rock and overburden stockpiles, and mine water pond. o Contact water from open pit, mine rock and overburden stockpiles, low grade ore stockpile, project infrastructure, and watercourse realignments.
	Exposure to contaminants in fish (Health and Socio-economic Conditions of Aboriginal Peoples)
	• Consumption of fish from Bagsverd Lake South, should flooding of organic material lead to increased production of methylmercury.
	Exposure to air contaminants (Health and Socio-economic Conditions of Aboriginal Peoples)
	• Breathing in air contaminants from sources including blasting, drilling, crushing, road dust, emissions from equipment and vehicles.
	Exposure to contaminants in traditional plants (Health and Socio-economic Conditions of Aboriginal Peoples)

	• Consumption of contaminants in traditional plants via air deposition of toxins to soils and subsequent uptake by plants.
	Effects on Aboriginal socio-economic conditions (Health and Socio-economic Conditions of Aboriginal Peoples)
	• Impacts to recreational and commercial fishing (including baitfish harvesting). • Impacts to cottages and outfitters. • Impacts to plant harvesting for economic purposes and campgrounds.
	Removal and retention of physical and cultural heritage sites and features, and structures of historical or archaeological importance (Structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and physical and cultural heritage)
	• Damage of physical and cultural heritage sites and features and structure of historical or archaeological importance due to soil erosion and human disturbances related to mining activities on sites in close proximity to the project footprint. • Exposure of new archaeological sites including as a result of changes to water levels. • Disruption to the cultural and spiritual heritage of the area due to removal of a bald eagle nest and resulting disruption to the bald eagle (bald eagles being of cultural, spiritual, and of heritage importance).
Donkin Export Coking Coal Project (0/49 assessed indicators found significant)	
• Atmospheric resources • Water resources • Birds and wildlife • Wetlands • Rare plants • Freshwater fish and fish habitat • Marine environment • Commercial and recreational fisheries • Land use • Current use of land and resources by the Mi'kmaq for traditional purposes • Archaeological and heritage resources	"Although many technical issues were evaluated and addressed within the environmental assessment, the key potential residual effects resulting from the project relate to the partial loss of access to fisheries resources for commercial and food-social-ceremonial purposes by the Mi'kmaq. Other key issues include fish habitat compensation planning, wetland compensation, archaeology, marine accidents, cumulative effects, and the development of environmental management plans." p15
Dumont Nickel Mine Project (0/13 assessed indicators found significant)	
• Air quality • Water resources • Fish and fish habitat • Birds and their habitat • Current use of lands and resources for traditional purposes, and sites and things of archaeological, heritage or historical significance	Current use of lands and resources • Loss of land use (hunting, fishing, gathering). • The western part of the mine complex will be partially located on the Mapachee family's land, which is used for observation and transmission of traditional knowledge.
Goliath Gold Project (0/14 assessed indicators found significant)	
	Current Use of Lands and Resources for Traditional Purposes

• Fish and fish habitats • Migratory birds and wetlands • Health and socio-economic conditions of Aboriginal peoples • Indigenous uses (current use of lands and resources for traditional purposes by Aboriginal peoples) • Transboundary effects (greenhouse gas emissions) • Species at risk	• Reduction of quality and availability of resources • Loss or alteration of access for Indigenous use • Alteration to travel routes or archaeological resources • Reduction of overall quality of experience during Indigenous use
	Health and Socio-Economic Conditions
	• Exposure to air and water contaminants by inhalation, ingestion or dermal contact • Reduced ability to harvest subsistence and economic resources
Hammond Reef Gold Project (0/17 assessed indicators found significant)	
• Atmospheric environment • Water resources • Fish and fish habitat • Terrestrial habitats and wildlife • Human health • Socio-economic conditions • Current use of lands and resources for traditional purposes by Aboriginal persons • Physical and cultural heritage resources	Human Health
	• Respiratory human health risks due to decreased air quality • Human health risk due to elevated noise levels
	Socio-economic Conditions
	• Changes in levels of activity for outdoor recreation and tourism due to sensory disturbance, wildlife displacement, and altered viewscape • Changes in forestry activity due to lost forest cover within the project site • Changes in hydropower generation capacity of downstream power producers due to water taking from Upper Marmion Reservoir by the Project
	Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons
	• Changes to trapping from reduced land area • Changes to fishing and trapping experiences from sensory disturbance due to decreased air quality, elevated noise levels, and the altered viewscape
	Physical and Cultural Heritage Resources
	• Degraded local heritage value of resources disturbed or removed from the former Hammond Reef Mine and Sawbill Mine sites
Hardrock Gold Mine Project (0/13 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Health and socio-economic conditions of Aboriginal peoples • Current use of lands and resources for traditional purposes by Aboriginal peoples • Physical or cultural heritage, and historical, archaeological, paleontological, or architectural significance for Aboriginal peoples • Transboundary environment	Current Use of Lands and Resources for Traditional Purposes
	• Reduction of quality and availability of resources • Loss or alteration of access for Indigenous use • Reduction of overall quality of experience during Indigenous use
	Health and Socio-Economic Conditions
	• Exposure to air and water contaminants by inhalation, ingestion or dermal contact • Reduced ability to harvest subsistence resources
	Physical or Cultural Heritage
	• Loss or alteration of nesting habitat for bald eagles

• Wetlands • Species at risk	
Howse Property Iron Mine Project (0/11 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Health and socio-economic conditions of Indigenous peoples • Current use of lands and resources for traditional purposes • Physical or cultural heritage, and historical or archaeological sites or structures • Transboundary environment • Species at risk	Physical or Cultural Heritage and Historical or Archaeological Sites or Structures • Residual effect on historic or archaeological sites or structures • Residual effect on Kauteitnat Current Use of Lands and Resources for Traditional Purposes • Residual effect on access • Residual effect on subsistence and traditional caribou hunting • Residual effect on other subsistence and traditional activities Health and Socio-economic Conditions of Indigenous Peoples • Residual effect on health status of Indigenous peoples • Residual effect on socio-economic conditions of Indigenous peoples
Kami Iron Ore Project (0/93 assessed indicators found significant)	
• Atmospheric environment • Landforms, soils, snow and ice • Water resources • Wetlands • Freshwater fish, fish habitat, and fisheries • Birds, other wildlife and their habitats, and protected areas • Species at risk and species of conservation concern • Historical and cultural resources • Current use of land and resources for traditional purposes by Aboriginal persons • Other current use of lands and resources • Health and community health	Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons • Change in Activity Distribution (Location and/or Timing) • Change in Overall Activity Levels • Resulting Change in Overall Quality and Cultural Value of the Activity Other Current Use of Lands and Resources • Change in Access • Change in Level of Activity / Use • Change in Cabin Use • Change in Viewscape • Change in Designated Land Use • Changes to Industrial Development • Changes to Residential and Recreational Property Health and Community Health • Changes in Air Quality (Which Could Affect Human Health) • Changes in Water Quality (Which Could Affect Human Health) • Changes in Soil Quality (Which Could Affect Human Health) • Changes in Vegetation Quality (Which Could Affect Human Health) • Changes in Perceptions of Quality of Life and Well-Being
Kitsault Mine Project (0/31 assessed indicators found significant)	
• Groundwater • Hydrology • Surface water & sediment quality • Fish and fish habitat • Marine aquatic resources	Land and Resource Use • Project footprint reduces or removes access to areas for traditional uses • Project footprint reduces or removes access to trapping and guide outfitting opportunities • Potential human health risk from exposure to metals in country foods

• Vegetation & plant communities • Wildlife and wildlife habitat • Land and resource use	
KSM (Kerr-Sulphurets-Mitchell) Project (0/65 assessed indicators found significant)	
• Groundwater quantity • Groundwater quality • Surface water quantity • Surface water quality • Fish and fish habitat • Wetlands • Wildlife, wildlife habitat • Current use of lands and resources for traditional purposes by Aboriginal peoples • Human health	Current Use of Lands and Resources
	• Harvesting of mountain goat: restricted access, noise disturbance and functional habitat loss in Mine Site Area • Subsistence: restricted access to subsistence areas in the Processing and Tailings Management Area • Trapping: restricted access to trap lines 617T015 and 617T011 in the Processing and Tailings Management Area • Fishing practices: fish resources diminished downstream of Processing and Tailings Management Area from reduction in water quality • Harvesting of moose: increased traffic along Highway 37/37A
	Health effects from surface water
	• Human health effects due to ingestion of metals from untreated water from downstream of Tailings Management Facility and the Mine Site during Operation to Closure • Human health effects due to ingestion of metals from untreated water from down steam of Tailings Management Facility and the Mine Site during Post- Closure
	Health effects from air quality (Human Health)
	• Health effects from emission of NO2, SO2, CO, TSP, PM2.5, and PM10 • Increase in hazard quotient for metal inhalation • Increase in incremental lifetime cancer risk due to an increase in concentration of metals and PM2.5 and risk of excess mortality due to an increase in concentrations of PM2.5
	Health effects from country foods
	• Human health effects due to consumption of country foods • Overall predicted degree of effect after mitigation to human health
	Navigable Waters
	• Effects on navigational safety and access
Magino Gold Project (0/11 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Indigenous uses (current use of lands and resources for traditional purposes) • Indigenous peoples (health) • Transboundary effects (greenhouse gas emissions) • Wetlands • Snapping Turtle • Species at risk	Current use of lands and resources for traditional purposes
	• Changes in the availability of resources and access to lands and resources • Changes in the quality of experience due to sensory disturbances
	Health
	• Exposure to Air and Water Contaminants by Inhalation or Ingestion
Mining and Milling the Midwest Project (0/37 assessed indicators found significant)	
	Human environment

• Atmospheric environment • Geological/hydrogeological environment • Aquatic environment - physical • Aquatic environment – biological • Terrestrial environment • Human environment (human health - chemical and radiological, physical hazards) • Socio-economic environment (land and resource use, heritage resources, navigation)	• Visual impact of Project facilities • Reduction in number of undisturbed sites of cultural importance increase in employment and business opportunities • Increase in education and training • Increase in labour income • Increase in economic activity in nearby communities/region • Nuisance to human populations due to increase in noise or dust emissions • Reduced road safety • Deterioration of road surface • Effects of changes to air, water, soil, vegetation quality and aquatic and terrestrial VEC exposure on human health • Changes in air quality, with possible effects on human health and/or visual aesthetics
Murray River Coal Project (0/11 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Changes to environment on Aboriginal peoples - Health and socio-economic conditions • Changes to environment on Aboriginal peoples - Current use of lands and resources for traditional purposes • Changes to environment on Aboriginal peoples - Physical or cultural heritage, and effects on historical, paleontological or architectural sites or structures • Transboundary environmental effects - Greenhouse gas emissions • Species at risk	Current Use of Lands and Resources for Traditional Purposes • Residual effect to changes in access to habitations, gathering and cultural or spiritual sites. • Residual effect due to the reduction in quality of experience for fishing, hunting, trapping, gathering and use of habitations, trails and cultural/spiritual sites. • Residual effect due to the alteration of harvesting behaviours due to perceived reduction in quality of aquatic and terrestrial resources. • Residual effect due to changes in success of hunting/trapping efforts. • Residual effect due to changes in success of gathering practices.
North American Lithium Spodumene Mine Project (0/10 assessed indicators found significant)	
• Atmospheric environment • Water quality • Fish and fish habitat • Birds and bird habitat • Current use of lands and resources for traditional purposes, structures and things that are of archaeological, heritage and historical significance	Current use of lands and resources • Loss of area for the practice of traditional activities • Disturbance of traditional activities in the mine site periphery cause by noise, loss of access to the territory or by avoidance of resources because of fear of contamination. • Disturbance or destruction of vestiges of interest or historical traces
Rainy River Project (0/9 assessed indicators found significant)	
	Current use of lands and resources for traditional purposes by Aboriginal peoples

• Fish and fish habitat • Aquatic species • Migratory birds • Health and socio-economic conditions of Aboriginal peoples • Current use of lands and resources for traditional purposes by Aboriginal peoples • Physical or cultural heritage and effects on historical, archaeological, paleontological or architectural sites or structures of Aboriginal peoples • Recreation and commercial use • Amphibians and reptiles • Furbearers • Federal species at risk	• Loss or fragmentation of terrestrial wildlife habitat for hunting and impacts to species hunted (e.g. White-tailed Deer, Moose, furbearers). • Loss of 27 ha of existing fish habitat in the Minor Creek Systems for bait fishing. • Loss of plants harvested for food and medicines. • Loss of cultural features. • No predicted effects on historical travel routes used to cross what is now the Canada-US border between Ontario and Minnesota.
	Health and socio-economic conditions of Aboriginal peoples
	• Potential concerns with indirect health effects from possible contamination in the atmosphere, surface water, and groundwater from the mine development (particularly heavy metals that bioaccumulate in the food chain). • Loss of 27 ha of existing fish habitat in the Minor Creek Systems* for commercial baitfish license holders.
	Physical or cultural heritage, and effects on historical, archaeological, paleontological or architectural sites or structures of Aboriginal peoples
	• Construction and operation (i.e., stockpiles and tailings management area) will impact current cultural use. • Effects to archaeological sites are not expected. No known archaeological sites within project site. • Cultural sites and historical travel routes of importance to Aboriginal groups were identified on the project site and within the regional study areas.
Red Mountain Underground Gold Project (0/14 assessed indicators found significant)	
• Fish and fish habitat • Migratory birds • Current use of lands and resources for traditional purposes • Physical and cultural heritage, and historical, archaeological, paleontological or architectural sites or structures • Health and socio-economic conditions of Indigenous peoples • Transboundary environment - greenhouse gas emissions • Species at risk	Changes to access to Bitter Creek valley (Current Use of Lands and Resources for Traditional Purposes)
	The Project would restrict access of Indigenous peoples to the Bitter Creek valley for fishing, hunting, trapping, and gathering plants. The Project both facilitates access to the Bitter Creek valley given that there is no current road into the valley, and limits Indigenous peoples' access because the proponent would install a locked, manned gate along the access road near the Clements Lake turnoff.
	Changes to fishing (Current Use of Lands and Resources for Traditional Purposes)
	Changes to fishing by Indigenous peoples may occur as a result of effects on fish and fish habitat and increased recreational fishing by the public.
	Changes to hunting and trapping (Current Use of Lands and Resources for Traditional Purposes)
	Changes to hunting and trapping by Indigenous peoples in the Bitter Creek valley may occur as a result of effects to wildlife, and increased recreational hunting by the public.
	Changes to plant gathering (Current Use of Lands and Resources for Traditional Purposes)
	Changes to plant gathering by Indigenous peoples in the Bitter Creek valley from surface disturbance, dust and invasive species, and changes to the experience of plant gathering, health and safety.
	Health effect from decreased air quality (Health and Socio-Economic Conditions)
	Exhaust and air emissions from mine equipment and the process plant may cause adverse effects to health of Indigenous people using the Project area. The Project would increase nitrogen dioxide, sulphur dioxide, carbon monoxide, particulate matter and dust deposition in the local study area.
	Health effect from reduced quality of traditional foods (Health and Socio-Economic Conditions)
	The Project is expected to reduce the quality of traditional foods as a result of increases in contaminants of potential concern in air, water, and soil. The proponent conducted a human health risk assessment that indicated that several

	estimates of non-cancer contaminants of potential concern had hazard quotients that exceeded the Health Canada acceptable hazard quotient threshold of 0.2 in the baseline condition and predicted future conditions.
	Health effect from diminished surface water quality (Health and Socio-Economic Conditions)
	Changes in contaminants of surface water that could be consumed by Indigenous people, increasing the contaminants of potential concern ingested, particularly increasing arsenic in Bitter Creek.
	Health effect from increased noise (Health and Socio-Economic Conditions)
	Project activities may affect Indigenous people spending time in the area through a reduction of the quality of experience of practicing traditional activities. Noise levels are predicted to reach the background noise level of approximately 35 decibels near the outer edge of the local study area.
Renard Diamond Mine Project (0/9 assessed indicators found significant)	
• Air quality • Water quality • Fish and fish habitat • Terrestrial wildlife and its habitat • Birds and bird habitat • Current use of lands and resources of archaeological, heritage and historical significance for traditional purposes	Residual effects assessment not included in the report, making it difficult to determine potential impacts on communities.
Sisson Project (Tungsten and Molybdenum Mine) (0/29 assessed indicators found significant)	
• Atmospheric environment • Acoustic environment • Water resources • Aquatic environment • Terrestrial environment • Vegetated environment • Wetland environment • Public health • Land and resource use • Current use of land and resources for traditional purposes by Aboriginal persons • Heritage resources	Predicted impacts not included in the residual effects assessment in the report.
Star-Orion South Diamond Mine Project (0/9 assessed indicators found significant)	
• Atmospheric environment • Surface water resources • Groundwater resources • Vegetation and plant communities • Terrestrial wildlife habitat and species • Fish and fish habitat	Traditional Land Use (All Uses) (Current use of resources for traditional purposes) • Traditional lands that have high intrinsic cultural value would be lost from the mine footprint and enclosure. • Alternate traditional use areas within the FalC forest would support biophysical resources relied on for traditional land use. • Alternate areas in the FalC forest would be accessible for traditional land use and would minimally affect travel cost to these alternate areas.

• Current use of land and resources for traditional purposes by Aboriginal persons • Human health	• Direct and indirect loss of traditional lands and transformation of the habitat would span over multiple generations, and within a socio-cultural context, the changes to the cultural value of the area and preferred opportunities for traditional practice would be long-term at a community level and possibly permanent for certain individuals. • Alternate traditional use areas within the FalC forest may not have as high cultural importance or quality.
	Traditional Trapping and Fishing (Current use of resources for traditional purposes)
	• Residual effects from direct loss of and changes in access to current and future fishing opportunities are unlikely. • Residual effects from changes in resource availability for traditional fishing are unlikely. • Residual effects from direct loss of and changes in access to traplines will be financially compensated
	Cultural Heritage (Current use of resources for traditional purposes)
	• Access to camping and cultural sites would be restricted within the mine enclosure. • Camping and cultural sites near the access road right-of-way would be disturbed by noise, dust and/or aesthetics. • Bingo Hill site would be removed
	Noise (Human Health)
	Predicted noise levels would be at or below the threshold of 45 A-weighted decibels at the project fence line.
	Air Quality (Human Health)
	Predicted air quality parameters would be below recommended guidelines at the project fence line
	Country Foods (Human Health)
	Residual effect on health due to country foods consumption from dust deposition on soil and plants is negligible
	Drinking Water (Human Health)
	Negligible effects on drinking water availability for potable wells after taking into account mitigation. Project effect on groundwater quality is unlikely after taking into account mitigation. No likely effects on Saskatchewan River flows that would affect drinking water availability. Drinking water taken from the Saskatchewan River is treated before consumption.
Whabouchi Mining Project (0/5 assessed indicators found significant)	
• Fish habitat • Migratory birds and their habitat • Current use of lands and resources for traditional Aboriginal purposes • Health and socio-economic conditions of Aboriginal peoples • Physical and cultural heritage of Aboriginal peoples	Current use of lands and resources for traditional purposes
	• Potential loss of slightly more than 9 km2 of land, and changes to access to the land. • Loss and displacement of wildlife resources following the loss of or changes to aquatic and terrestrial habitat. • Disturbance and mortality of wildlife resources associated with operations. • Potential loss of a wildlife resource caused by increased hunting pressures associated with the presence of workers. • Avoidance of traditional foods due to the perception that local resources are contaminated by mine waste.
	Health and socio-economic conditions
	• Exposure of Cree to contaminants from consuming water, animal flesh and fruit and from breathing of dust.
	Physical and cultural heritage
	• Loss of archaeological heritage during excavation and mine development work. • Loss of enjoyment of the Bible Camp due to degradation of air quality, noise and visual nuisances.

Table A.6. Significance grades.

VC as specified in assessment	Definition of moderate magnitude	Definition of high magnitude	Factors that distinguish high from moderate magnitude
Ajax Mine Project			
Current use of lands and resources for traditional purposes	Varies from baseline and may result in noticeable changes to current use. At least some behaviours are altered at least some of the time while carrying out current use.	Varies from baseline to a high degree; the current use can no longer be carried out in preferred locations and ways.	Degree of deviation from baseline
Heritage	Changes to small but intact portions of heritage or archaeological sites of moderate or high significance, or substantial and intact portions of sites of low significance.	Changes to substantial and intact heritage or archaeology sites of moderate or high significance.	Size and significance of site
Akasaba West Copper-Gold Mine Project			
Current use of lands and resources for traditional purposes	Varies from baseline and may result in noticeable changes to current Indigenous use. The project has repercussions that modify the quantity and quality of available resources and/or access to the territory so that current use is affected. Some behaviours are changed, but current use is not compromised.	Varies from baseline to a high degree. The project has repercussions that modify the quantity and quality of available resources and/or access to the territory. Current Indigenous use is no longer possible in preferred locations and ways.	Degree of deviation from baseline
Health and socioeconomic conditions	Health risks, with exposures below, but close to, health guidelines. Residual effects would persist despite mitigation and management options. The risks are average since the area is used by First Nations, but the applicable standards would be respected for air and water quality and noise.	Health risks, with exposures higher than the health guidelines. The risks are high since the area is used by First Nations. Exceedances of applicable standards are to be expected for air and water quality and noise.	Requirements of existing legal guidelines
Physical or cultural heritage and structure, site or thing that is of historical, archaeological, paleontological or architectural significance	Displacement or compaction of small portions of archaeological sites, changes that indirectly affect the integrity of archaeological sites, loss of access.	Displacement or compaction of substantial and intact portions of at least one significant site. Changes that directly affect the integrity of archaeological sites, loss of significant access to significant sites.	Size and significance of site
Arnaud Mining Project			
Human health	The effect can be detected in a population, but falls within the normal range of variability or complies with standards and regulatory objectives.	The effect causes clear and sustained exceedances of the regulatory standards and objectives.	Requirements of existing legal guidelines

Current use of lands and resources for traditional purposes	Affects some users of land and resources with regard to one or more activities, and/or one or more sites valued by the community; does not compromise the community's ability to continue its traditional way of life.	Affects the majority of users of land and resources with respect to many activities, and/or affects a number of sites valued by the community and/or compromises the community's ability to continue its traditional way of life.	Number of users affected
Black Point Quarry Project			
General	An environmental effect affecting part of a population, or one or two generations, or where there are rapid and unpredictable changes in an effect or parameter so that it is temporarily outside the range of natural variability determined from local knowledge over many seasons.	An environmental effect affecting a whole ecological population or group of people, or where the effect or parameter is outside the range of natural variability determined from local knowledge over many seasons.	Number of users affected
BlackRock Mining Project			
General	The effect leads to a reduction in the quality or use of the component but does not compromise its environmental integrity.	The effect endangers the environmental integrity of the component or substantially and irreversibly changes the component or its use.	Maintenance of environmental integrity
Blackwater Gold Project			
Health and socioeconomic conditions	Effects are clearly distinguishable, may be nearing guidelines or thresholds, will persist with mitigation and management, and may result in elevated concern amongst stakeholders.	Effects are highly distinguishable and result in exceedances of guidelines or thresholds, will persist with mitigation and management, and may result in substantial concern amongst stakeholders.	Requirements of existing legal guidelines
Physical or cultural heritage and structure, site or thing that is of historical, archaeological, paleontological or architectural significance	Effects result in a change from baseline conditions, and the feature of physical and/or cultural heritage importance would be noticeably changed; and activity and use associated with the feature and its value would be affected, but could continue.	The feature of physical and/or cultural heritage importance would be removed, destroyed, and/or use associated with the feature would no longer continue.	Modification versus discontinuation or limitation of access, activities, or sites
Current use of lands and resources for traditional purposes	Current use by Indigenous peoples partially diminished from historical levels; moderate interference with underlying conditions; and or current use by Indigenous peoples moderately resilient to change.	Current use by Indigenous peoples highly diminished from historical levels; high interference with underlying conditions and / or current use by Indigenous peoples has low resilience to change.	Degree of deviation from baseline
Brucejack Gold Mine Project			

Health and socioeconomic conditions	There is a moderate level of disturbance to existing socio-economic conditions and/or a complete exposure pathway to affect health risk with exposures below, but nearing health-based guidelines. Residual effect will still persist with mitigation and management.	There is a high level of disturbance to existing socio-economic conditions and/or a complete exposure pathway to affect health risk with exposures above health-based guidelines.	Requirements of existing legal guidelines
BURNCO Aggregate Mine Project			
Human health	Exposures are below, but nearing health-based guidelines and measurable effects will still persist with mitigation and management.	Exposures and measurable effects are above health-based guidelines.	Requirements of existing legal guidelines
Côté Gold Mine Project			
Traditional Plant Harvesting, Trapping, Hunting, and Fishing	May affect areas used, or modify the ability to use areas, for traditional plant harvesting, trapping, hunting, and fishing, but does not limit the ability to carry out these activities.	May affect areas used, or modify the ability to use areas, for traditional plant harvesting, trapping, hunting, and fishing, and limits the ability to carry out these activities.	Modification versus discontinuation or limitation of access, activities, or sites
Cultural, Spiritual, and Ceremonial Sites	May affect or change the integrity of, or access to, cultural, spiritual, or ceremonial sites or values, but will not limit cultural value or the ability to use sites.	May affect the integrity of, or access to, cultural, spiritual, or ceremonial sites and values, and limits cultural value and the ability to use sites.	Modification versus discontinuation or limitation of access, activities, or sites
Navigational Routes	May affect or modify the use of canoe routes, but will not limit navigation along these routes. May affect canoe routes but will not limit use of navigable waters.	May affect or modify the use of canoe routes, and limits navigation along these waters. May affect canoe routes and limits use of navigable waters.	Modification versus discontinuation or limitation of access, activities, or sites
Recreational and Commercial Fishing (Including Baitfish Harvesting)	May affect a small number of water bodies used for fishing but does not limit the ability to fish.	May affect several water bodies used for fishing and limits the ability to fish.	Modification versus discontinuation or limitation of access, activities, or sites
Hunting	May affect portions of hunting areas but does not limit the ability to carry out hunting activities.	May affect several hunting areas and may affect how these hunting areas are accessed but does not substantially limit the ability to carry out hunting activities.	Modification versus discontinuation or limitation of access, activities, or sites
Trapping	May affect small portions of trapline areas and affects a few individual trappers but will not limit the ability to carry out trapping activities.	May affect large portions of trapline areas which may limit the ability to carry out trapping activities.	Modification versus discontinuation or limitation of access, activities, or sites
Cottages and Outfitters	May affect cottage areas or areas used by outfitters and may require the removal of a few cottages but will not limit use of these areas.	May affect cottage areas or areas used by outfitters and may change access to or require the removal of multiple cottages which may limit use of these areas.	Modification versus discontinuation or limitation of access, activities, or sites

Archaeology	Displacement or compaction of small portions of archaeological site, changes that indirectly affect the integrity of archaeological sites, loss of access to sites or site has been assessed and cleared in accordance with the Ontario Heritage Act.	Loss or removal of entire or valuable portions of archaeological sites as a result of ground disturbance; major changes to context and accessibility of sites.	• Requirements of existing legal guidelines • Size and significance of site
Donkin Export Coking Coal Project			
Current use of lands and resources for traditional purposes	A nominal loss, or substantive loss that is compensated, in the availability of or access to land and/or resources currently used for traditional purposes by the Mi'kmaq.	A non-compensated substantive and permanent loss in the availability of or access to land and/or resources currently used for traditional purposes by the Mi'kmaq.	• Compensation or mitigation strategies available • Size and significance of site
Archaeological and Heritage Resources	Mitigated disturbance to, or removal of, an archaeological or heritage resource.	Unmitigated disturbance to, or destruction of an archaeological or heritage resource considered to be of major importance.	• Compensation or mitigation strategies available • Size and significance of site
Dumont Nickel Mine Project			
General	The effect leads to a reduction in the quality or use of the component but does not compromise its environmental integrity.	The effect endangers the environmental integrity of the component or substantially and irreversibly changes the component or its use.	Maintenance of environmental integrity
Goliath Gold Project			
Health of Aboriginal peoples	The effect results in a change to exposures below but nearing health-based standards.	The effect results in a change to exposures above health-based standards.	Requirements of existing legal guidelines
Socioeconomic conditions	Measurable change in a current activity that would require some alteration in behaviour to carry out the activity.	Measurable change in a current activity that would mean the activity no longer can be carried out.	Modification versus discontinuation or limitation of access, activities, or sites
Current use of lands and resources for traditional purposes	The effect results in a change to the preferred locations or means to practice an activity or use by an Indigenous community such that it may be modified or limited.	The effect results in a change such that an activity or use can no longer be carried out by an Indigenous community in its preferred locations or manner.	Modification versus discontinuation or limitation of access, activities, or sites
Hammond Reef Gold Project			
Socioeconomic conditions	Measurable change in a current activity that would require some alteration in behaviour to carry out the activity.	Measurable change in a current activity that would mean the activity no longer can be carried out.	Modification versus discontinuation or limitation of access, activities, or sites
Current use of lands and resources for traditional purposes	Changes to locations or resources, experience, or use of locations or resources for traditional purposes but would not prevent carrying out these activities.	Changes to locations or resources, experience, or use of locations or resources for traditional purposes that would prevent carrying out these activities.	Modification versus discontinuation or limitation of access, activities, or sites
Human health	Measurable change from baseline conditions that would present exposures below, but nearing, health-based standards.	Measurable change from baseline conditions that would present exposures above health-based standards.	• Degree of deviation from baseline

Physical and cultural heritage resources	Partial degradation of the heritage resource value may occur.	Severe degradation or loss of the heritage resource value.	• Amount of degradation
Hardrock Gold Mine Project			
Current use of lands and resources for traditional purposes	The effect results in a change in preferred locations or means to practice the activity, and use by an Indigenous group may be modified or limited.	The effect results in a change such that the activity can no longer be carried out by an Indigenous group in its preferred manner and locations.	Modification versus discontinuation or limitation of access, activities, or sites
Health of Aboriginal peoples	The effect results in a change to exposures below but nearing health-based standards.	The effect results in a change to exposures above health-based standards.	Requirements of existing legal guidelines
Socioeconomic conditions	Measurable change in a current activity that would require some alteration in behaviour to carry out the activity.	Measurable change in a current activity that would mean the activity no longer can be carried out.	Modification versus discontinuation or limitation of access, activities, or sites
Physical and cultural heritage and historical and archeological sites and structures	The effect results in a change in conditions, and the feature of physical and/or cultural heritage importance would be noticeably changed. Activity and use associated with the feature and its value would be affected, but use could continue.	The feature of physical and/or cultural heritage importance would be removed, destroyed, and/or use associated with the feature would no longer continue.	Modification versus discontinuation or limitation of access, activities, or sites
Howse Property Iron Mine Project			
Physical and cultural heritage resources	The effect results in a change from baseline conditions, and the feature of physical and/or cultural heritage importance would be noticeably changed. Activity and use associated with the feature and its value would be affected, but use could continue.	The feature of physical and/or cultural heritage importance would be removed, destroyed, and/or use associated with the feature would no longer continue.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
Current use of lands and resources for traditional purposes	The effect results in a change from baseline use conditions, and preferred locations or means to practice the activity and use may be modified or limited.	The effect results in a change from baseline use conditions, and the activity can no longer be carried out in the preferred manner and locations.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
Health and socioeconomic conditions	The effect results in a change from the baseline health status or socio-economic conditions, and the change would be of notable concern and consequence.	The effect results in a change from the baseline health status or socio-economic conditions, and the change would be of serious concern and consequence.	Degree of deviation from baseline
Kami Iron Ore Project			
Current use of lands and resources for traditional purposes	Affects less than half of users across multiple activities.	Affects the majority of land and resource users across multiple activities.	Number of users affected
Health and community health	Effect is detectable within a population, but is within normal range of variability or within regulatory standards and objectives.	Effect causes clear and sustained exceedances of regulatory standards or objectives.	Requirements of existing legal guidelines
Kitsault Mine Project			

General	The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.	The magnitude of effect is predicted to differ from baseline conditions, guideline or threshold value so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions).	Degree of deviation from baseline
KSM (Kerr-Sulphurets-Mitchell) Project			
Aboriginal Groups	The magnitude of the effect differs from the average value for baseline conditions and preferred options for practicing the activity may be lost or modified.	The magnitude of the effect differs from baseline conditions and the activity may be impacted over a broad area or no longer practiced.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
Human health	The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.	The magnitude of effect differs from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation.	Degree of deviation from baseline
Magino Gold Project			
Health of Aboriginal peoples	The effect results in a change in health status, with exposures below but nearing health-based standards.	The effect results in a change in health status, with exposures above health-based standards.	Requirements of existing legal guidelines
Current use of lands and resources for traditional purposes	The effect results in a change to locations or resources, experience, or use of locations or resources for traditional purposes, and preferred locations or means to practice the activity and use by an Indigenous group may be modified or limited.	The effect results in a change to locations or resources, experience, or use of locations or resources for traditional purposes, and the activity can no longer be carried out by an Indigenous group in its preferred manner and locations.	Modification versus discontinuation or limitation of access, activities, or sites
Mining and Milling the Midwest Project			
General	Effect is at or slightly above the limits of natural variation or existing environment values; is at or slightly above reference criteria, or guideline values; 10 to 20% of the particular habitat is lost within the local assessment boundary.	Effect exceeds the upper or lower limit of natural variation or existing environment values; exceeds reference criteria, or guideline values; greater than 20% of the particular habitat is lost within the local assessment boundary.	• Degree of deviation from baseline • Maintenance of environmental integrity
Murray River Coal Project			
Current use of lands and resources for traditional purposes	The magnitude of the effect differs from the baseline use conditions and preferred locations and means for practicing the activity may be lost or modified.	The magnitude of the effect differs from baseline use conditions and the activity can no longer be carried out in the preferred manner and locations.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
North American Lithium Spodumene Mine Project			

Current use of lands and resources for traditional purposes	Varies from baseline and may result in noticeable changes to current use by First Nations. The Project leads to impacts that alter the quantity and quality of the available resources or territory access such that current use is impacted. A few behaviours are altered, but current use is not jeopardized. Relocation or compaction of small parts of archeological sites, modifications resulting in an indirect effect of the integrity of archeological sites, loss of access.	Varies from baseline to a high degree. The Project leads to impacts that alter the quantity and quality of the available resources or territory access. Current use by First Nations can no longer be carried out in preferred locations and ways. Relocation or compaction of substantial area and untouched of at least one significant site. Modifications having a direct effect on the integrity of archeological sites, significant loss of access to important sites.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
Rainy River Project			
Socioeconomic conditions ("Also refers to recreation and commercial use and VCs related to Aboriginal peoples.")	Effect is clearly distinguishable but is unlikely to pose a serious risk to the VC or represent a management challenge. If effect can be measured quantitatively, then Level II effect represents change of 10 to 20 percent from baseline conditions within project study area. Effect extends to the regional study area or includes effects at a Provincial level.	Effect is likely to pose a serious risk to the VC and represents a management challenge. If effect can be measured quantitatively, then Level III effect represents change greater than 20 percent from baseline conditions within project study area. Effect is expected to extend beyond the regional study area and Provincial to the National or International level.	• Degree of deviation from baseline • Number of users affected
Red Mountain Underground Gold Project			
Current use of lands and resources for traditional purposes	The magnitude of the effect differs from the baseline use conditions and preferred locations and means for practicing the activity may be lost or modified.	The magnitude of the effect differs from baseline use conditions and the activity can no longer be carried out in the preferred manner and locations.	• Degree of deviation from baseline • Modification versus discontinuation or limitation of access, activities, or sites
Health and socioeconomic conditions	Exposures are below health-based guidelines.	Exposures are above health-based guidelines.	Requirements of existing legal guidelines
Renard Diamond Mine Project			
General	Magnitude of the effect: This refers to the relative significance of the project's effects on a component of the environment. Assessment of magnitude takes into account the natural and social environment of which the component is a part. The magnitude may be low, moderate or high.	Magnitude of the effect: This refers to the relative significance of the project's effects on a component of the environment. Assessment of magnitude takes into account the natural and social environment of which the component is a part. The magnitude may be low, moderate or high.	Maintenance of environmental integrity
Sisson Project (Tungsten and Molybdenum Mine)			
Public health and safety	Project-related environmental exposures are predicted to exceed the benchmarks established by a recognized health organization (i.e., 2.0< Hazard	Project-related environmental exposures are predicted to substantially exceed the benchmarks established by a recognized health organization	Requirements of existing legal guidelines

	Quotient ≤10.0; 2.0<Concentration Ratio≤10.0; 1E-04< Incremental Lifetime Cancer Risk ≤1E-03) and/or may result in a long-term, substantive change in the public health status.	(i.e., Hazard Quotient >10.0; Concentration Ratio>10.0; Incremental Lifetime Cancer Risk >1E- 03) and/or are likely to result in a long-term, substantive change in the public health status.	
Land and resource use	Adjacent land and resource use activities are affected by the Project but can continue, and/or land and resource use activities of specific groups are restricted or degraded but can continue if mitigation or compensation is applied.	Land and resource uses are incompatible with adjacent land use activities, and/or land and resource use of a broad range of groups is restricted or degraded such that they cannot continue and for which the environmental effects are not mitigated or compensated.	• Compensation or mitigation strategies available • Modification versus discontinuation or limitation of access, activities, or sites
Current use of lands and resources for traditional purposes	A nominal loss, or a substantive loss that is mitigated, in the availability or access to land and/or resources currently used for traditional purposes by Aboriginal persons.	An unmitigated, substantive and permanent loss in the availability or access to land and/or resources currently used for traditional purposes by Aboriginal persons.	Compensation or mitigation strategies available
Heritage resources	Loss of heritage resources not of major importance; pre-disturbed heritage site, artifacts present, however, no or little chance of intact features.	A permanent Project-related disturbance to, or destruction of, all or part of a heritage resource (i.e., archaeological, architectural or palaeontological resources) considered by the provincial heritage regulators to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, but that can be mitigated or compensated to the extent that the environmental effects are not significant.	• Size and significance of site • Expertise of government regulators
Star-Orion South Diamond Mine Project			
General	1–10% change in the valued component or predicted effect exceeds threshold or recommended guidelines. Effect is clearly distinguishable at the community or population level but is unlikely to pose a serious risk to the valued component or represent a management challenge.	>10% change in the valued component or predicted effect greatly exceeds threshold or recommended guidelines. Effect is likely to pose a serious risk to the valued component and represents a management challenge.	Requirements of existing legal guidelines
Whabouchi Mining Project			
General	The effect changes the level of quality of the component or its use without necessarily compromising its environmental integrity.	The effect compromises the integrity of the component or significantly changes its quality or use.	Maintenance of environmental integrity