8. ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

8.1 INFRASTRUCTURE, PUBLIC FACILITIES, AND SERVICES

8.1.1 Rationale

This section includes a description of the scoping process used to identify Infrastructure, Public Facilities, and Services for inclusion in the assessment. Scoping is fundamental to focusing the Application for an Environmental Assessment Certificate/Environmental Impact Statement for a Comprehensive Study (Application/EIS) on those issues where there is the greatest potential to cause significant adverse effects. Valued components (VCs) are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (Canadian Environmental Assessment Agency [CEA Agency] 2006; BC Environmental Assessment Office [BC EAO] 2013). To be included in the environmental assessment (EA), there must be a perceived likelihood that the VC will be affected by the Project. Valued components are scoped into the EA based on issues raised during consultation with Aboriginal communities, government agencies, the public, and stakeholders. Consideration of certain VCs may also be a legislated requirement, or known to be a concern because of previous project experience.

Assessing effects on infrastructure and services is standard practice in Environmental Assessments (EAs) across Canada, and has been scoped into the Application/EIS by the BC EAO and the CEA Agency. In the context of the Project, Infrastructure, Public Facilities, and Services has been included in the assessment because of the Project's potential interaction with the VC. Table 8.1-1 presents the rationale for assessing potential Project Infrastructure, Public Facilities, and Services. In terms of interactions, the Project is expected to create both temporary and permanent population increases (during the Construction and Operations phases), both of which can create additional pressures on local facilities, services, and infrastructure. In addition, the Project will use certain local infrastructure directly, such as roads, wastewater facilities, and solid waste facilities.

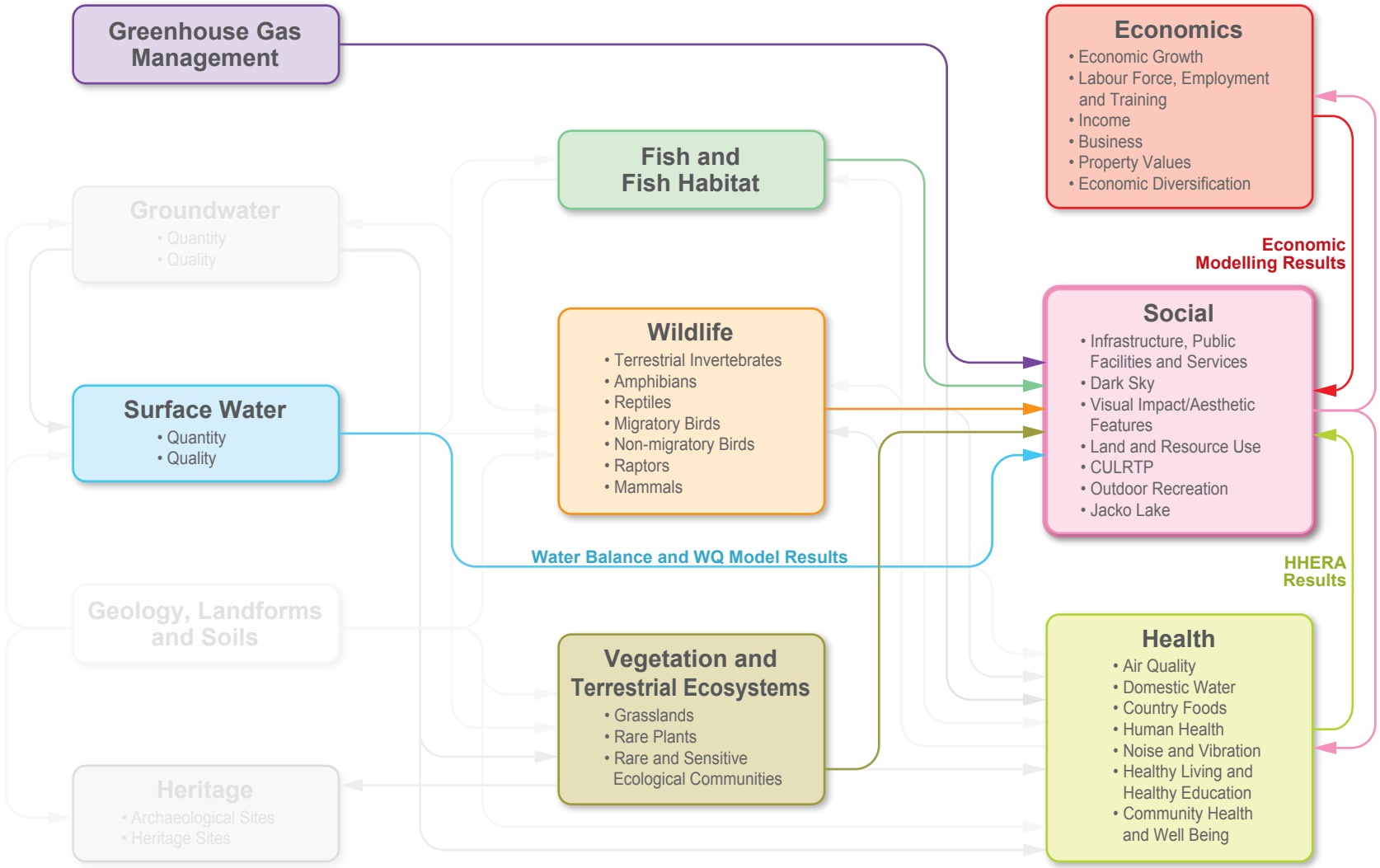
The assessment of potential effects to Infrastructure, Public Facilities, and Services is largely related to the Project's use of local and regional infrastructure and Project-driven temporary and permanent population growth.

Table 8.1-1. Rationale for Including Infrastructure, Public Facilities, and Services as a Valued Component

Valued Component	Identified by*				Rationale for Inclusion
	AG	G	P/S	SK	
Infrastructure, Public Facilities, and Services	X	X	X	X	The Project is located close to several communities (including the City of Kamloops, and the primary reserve parcels for the Tk'emlúps te Secwépemc and Skeetchestn Indian Band). The Project may place stress on infrastructure and services because of Project use (e.g., landfill) and Project-related in-migration (temporary during the Construction Phase and permanent/long-term during the Operation Phase).

**AG = Aboriginal Group; G = Guideline Requirement; P/S = Public/Stakeholder; SK = Scientific/Professional Knowledge.*

Figure 8.1-1
Inputs to Social Valued Components



8.1.2 Background

8.1.2.1 Regional Overview

The Project is located within the Thompson-Nicola Regional District (TNRD), an area in the British Columbia (BC) interior that includes both urban and rural landscapes. In the TNRD, the City of Kamloops (Kamloops) is not only the community closest to the Project, but also the major population centre in the region. Table 8.1-2 presents the total population for Kamloops, the TNRD, and BC from 2001 to 2011. The data demonstrates that the populations in Kamloops and the TNRD have been increasing consistently, although between 2006 and 2011 the population of both grew at a slower rate than the provincial population (Table 8.1-2).

Table 8.1-2. Total Population for the TNRD, 1996, 2001, 2006, 2011

	1996	2001	2006	2011	Percent Change from 2006 to 2011 (%)
Kamloops	76,394	77,281	80,376	85,678	6.6
TNRD	118,801	119,222	122,286	128,473	5.1
BC	3,724,500	3,907,738	4,113,487	4,400,057	7.0

Source: Statistics Canada 1997, 2002, 2007a, 2013a.

Future population growth for the TNRD is expected to occur at a lower rate than in previous years as a larger proportion of the population ages out of the family formation stage and the region becomes more dependent on migration for population increases (Urban Futures 2012).

8.1.2.2 Historical Activities

The region surrounding the Project has a long history of human activity that contributes to the current baseline condition, which is defined more specifically in the following section of this assessment.

Kamloops derives its name from the Secwépemc word "Tk'emlúps," which refers to the meeting of the North and South Thompson rivers. The general area was first inhabited by approximately 3,000 members of the Shuswap tribe, part of the Interior Salish Nation.

British Columbia officially became part of Canada in 1871, and construction of the transcontinental railroad was completed in 1885, encouraging the growth of a small village on the shore of the Thompson River. The village grew rapidly and by 1893 the population had risen to approximately 500 and became incorporated as a city with public works. In the following years, there were a number of infrastructure developments, including bridges that connected villages on either side of the rivers. The Canadian Northern Railway was completed in 1915, and the Kamloops airport was operational in 1939. The Trans-Canada Highway (Hwy) to the west of the Project area was completed in 1962, and the Yellowhead Hwy in 1970. The Kamloops area grew after the First World War until development slowed during the Depression and the Second World War. After this period, the City began to grow again, and much of the land that had been used formerly for farming in the valley was used for residential development.

Historical activities, to the extent that they inform and are relevant to the assessment of Project effects on Infrastructure, Public Facilities, and Services, are further described in the Characterization of Infrastructure, Public Facilities, and Services Baseline Condition section, below.

8.1.2.3 Baseline Studies

Information to describe baseline conditions in the Local Study Area (LSA) and the Regional Study Area (RSA) was collected from 2011 through to 2015 using the same study areas as the effects assessment for Infrastructure, Public Facilities, and Services. The LSA includes Kamloops; the Kamloops 1 IR, which is the primary reserve parcel for the Tk'emlúps te Secwépemc [TteS]; the Skeetchestn IR, which is the primary reserve parcel for the Skeetchestn Indian Band (SIB); and the TNRD-J. The TteS and SIB have formed the Stk'emlupsemc te Secwépemc Nation [SSN]. The RSA is the Thompson-Nicola Regional District (TNRD) and includes the Lower Nicola Indian Band (LNIB), Ashcroft Indian Band (AIB), Whispering Pines/Clinton Indian Band (WP/CIB). See Figure 8.1-3 and Figure 8.1-4 for the LSA and RSA, respectively.

The baseline studies sought to understand the nature and capacity of infrastructure, public facilities, and services most likely to be affected by the Project, which is approximately 2 km south of the municipal boundary and linked to the city via the public road network. Given the location of the Project, studies related to infrastructure and services focused on Kamloops. The intent of these studies was to provide a baseline from which potential changes from the Project could be measured. More detailed baseline findings are contained in the Ajax Project Socio-economic Baseline (Appendix 7.1-A).

Data Sources

The baseline studies for Infrastructure, Public Facilities, and Services were based on primary and secondary sources. Primary sources included key person interviews (KPIs) and workshops with potentially affected parties. Interviews were conducted with representatives of the City of Kamloops and service providers, including social service organizations, the RCMP, and Interior Health Authority. The interviews were conducted between 2011 and 2015, while workshops with representatives of the city and regional district occurred in 2012 and 2014. Secondary data sources include a variety of publicly available sources from government statistics (Statistics Canada), academic literature on resource development, and municipal documents (e.g., community plans).

Consultation activities undertaken with the Aboriginal Groups during the Pre-Application period included capacity building and funding, Traditional Knowledge/Traditional Land Use (TK/TLU) studies, community meetings, site tours, and meetings with Aboriginal Group representatives; information collected from these sources has been used to inform the assessment (see Section 4.3). Multiple attempts have been made to engage each Aboriginal Group to seek the baseline data required for the Application/EIS, including the circulation of baseline documentation for review and comment. The information gathered through this engagement, although limited, has been incorporated in the Application and considered in the assessments. In some cases, the requested information was not available from Aboriginal Groups at the time of writing or from secondary sources. Where appropriate, additional information made available by Aboriginal Groups will be considered in Project development plans.

Methods

The existing conditions in communities around the Project were determined through KPIs, personal communications, literature review, and workshops with municipal representatives. Research focused on the current conditions of infrastructure, public facilities, and services and their capacity. Where information is available, future trends related to capacity are also considered.

Characterization of Infrastructure, Public Facilities, and Services Baseline Conditions

Since Kamloops is the closest community to the Project and the largest community in the TNRD, it is expected that the infrastructure and services in and provided by Kamloops are more likely to experience direct and indirect Project effects than other communities in the LSA and RSA. Therefore, the characterization of baseline conditions will focus primarily on Kamloops, with some discussion of the TteS and SIB. Potential interactions between the Project and Infrastructure, Public Facilities, and Services were determined through discussions with stakeholders, past experience, and professional judgement. These potential interactions are described in Section 8.1.4.

Population

Table 8.1-3 presents the population for communities in the LSA and RSA in 2001, 2006, and 2011. As Census Canada reports population information by Indian Reserve (IR), the population counts below are for on-reserve populations only. Overall, the population of this area has been growing. The exceptions to this are: the on-reserve population for the SIB reserve, which experienced a decline of 1.9% in population between 2006 and 2011; and electoral district of Thompson-Nicola J (Copper Desert Country) (TNRD-J), which experienced a 3.0% decline in population between 2006 and 2011.

The on-reserve population for the Kamloops IR 1 has been broken out by those who self-identify as Aboriginal (i.e., First Nations, Métis, or Inuit) and those who do not. The distinction is included in the population tables because a large number of non-Aboriginal persons reside in the Sun Rivers development, which is located on the Kamloops 1 IR (Aird, *pers. comm*. 2015) and according to the 2011 Census of Canada (Statistics Canada 2013a), over 70% of the on-reserve population does not self-identify as Aboriginal.

Population projections for all communities are not publicly available. In the Kamloops Official Community Plan (KAMPLAN), the City uses a growth rate of 1.25%, with the community expecting to reach 100,000 and 120,000 in population in 2021 and 2036, respectively (City of Kamloops 2004). In 2012, Urban Futures completed a series of projections for the broader TNRD (i.e., the RSA). According to the final report (Urban Futures 2012), the TNRD has an aging population and a projected fertility rate that is expected to remain below replacement levels, which are expected to slow growth in the TNRD. It is projected that the population of the TNRD will reach 151,064 by 2026 and 161,071 by 2036, which reflects an average expected growth rate of 0.8%.

Table 8.1-3. Population for Communities in the LSA and RSA, 2001, 2006, 2011

Census Division[1]	2001	2006	2011	% Change 2006-2011[2]
City of Kamloops	77,281	80,376	85,678	6.6
TNRD-J	1,509	1,609	1,560	-3.0
Kamloops IR 1 (TteS) – non-Aboriginal identity[2]	695	990	1,795	44.8
Kamloops IR 1 (TteS) – Aboriginal identity[3]	720	795	745	-6.7
Skeetchestn IR (SIB)	241	258	253	-1.9
Total LSA [4]	**80,446**	**84,028**	**90,031**	**6.2**
Ashcroft 4 (AIB)	77	50	76	52.0
105 Mile Post 2 (AIB)	10	5	21	320.0
Whispering Pines IR 4 (WP/CIB)	60	64	60	-6.3
Nicola Mameet IR 1 (LNIB)	442	---	603	---
Zoht IR 4 (LNIB)	35	37	25	-32.4
Joeyaska IR 2 (LNIB)	37	37	44	18.9
Hamilton Creek 7 (LNIB)[5]	0	0	5	--
Total RSA[6]	**119,222**	**122,286**	**128,473**	**5.1**
British Columbia	**3,907,738**	**4,113,487**	**4,400,057[7]**	**7.0**

Source: Statistics Canada 2002, 2007, 2013a.
Notes:
[1] The figures shown in the table have been subjected to a confidentiality procedure known as random rounding; values are rounded either up or down to a multiple of '5', and in some cases '10'.
[2] Calculated by InterGroup Consultants.
[3] "Total Aboriginal identity population" is composed of those persons who reported identifying with at least one Aboriginal group, that is, North American Indian, Métis or Inuit, and/or those who reported being a Treaty Indian or a Registered Indian, as defined by the Indian Act of Canada, and/or those who reported they were members of an Indian band or First Nation.
[4] The LSA is the City of Kamloops, the Kamloops IR 1, the Skeetchestn IR, and the TNRD-J.
[5] Hamilton Creek 7 is a dissolved census subdivision.
[6] The RSA is the TNRD.
[7] Excludes census data for one or more incompletely enumerated Indian reserves or Indian settlements.

Housing

Table 8.1-4 presents census data on household and dwelling characteristics for communities in the LSA and the TNRD (RSA) to present the current situation for housing stock in the LSA and RSA. The majority of houses in Kamloops and on the Kamloops IR 1 and Skeetchestn IR required only regular maintenance or minor repairs in 2011, which also held true for the RSA as a whole. Minor repairs, as defined by Statistics Canada (2013b), include missing or loose floor tiles, bricks, shingles, or defective steps, railing or siding. Major repairs refer to the repair of defective plumbing or electrical wiring, structural repairs to walls, floors or ceilings, Major repairs were required in 6% of occupied private dwellings in Kamloops, 8% in the TNRD-J, and 6.3% in the LSA as a whole. In the RSA, 7.9% of private occupied dwelling required major repairs.

Table 8.1-4. Household and Dwelling Characteristics, 2011

	City of Kamloops	TNRD-J	Kamloops IR 1 (Non-Aboriginal Identity)	Kamloops IR 1 (Aboriginal Identity)	Skeetchestn IR	LSA (Total)	RSA (TNRD)
Total number of occupied private dwellings by condition of dwelling	35,025	650	780	345	105	36,905	53,375
Only regular maintenance or minor repairs needed	32,850	595	760	260	75	34,540	49,180
Major repairs needed	2,170	55	20	85	30	2,360	4,195

Source: Statistics Canada 2013a.

While Statistics Canada does not report the overall condition of housing stock (i.e., availability), data from the BC Real Estate Association (2015) suggest that the residential housing stock is currently sufficient in Kamloops. The residential housing market for Kamloops is currently in balance and has been since midway through 2013 through to the end of Quarter 1 2015. A housing market is determined to be in balance by months of inventory, which is the amount of time selling all currently listed properties would take, provided no new properties are listed. In addition to having a balanced market, as of June 2015, there were 2,117 active residential listings with 520 new listings and 310 residential properties sold. Residential property included single family homes, condos, and multiplexes (Kamloops and District Real Estate Association [KDREA] 2015a). Residential building permits in Kamloops have increased during the first five months of 2015 as compared with the previous year (161 compared to 138, respectively) (City of Kamloops 2015a).

Rental Accommodations

In terms of rental accommodation, through the KPI Program and workshops with the City of Kamloops conducted for the Project, there was concern expressed regarding rental housing and affordable housing. Interviewees and municipal representatives worried about the construction workforce occupying rental properties. Table 8.1-5 presents the number of privately owned apartments in terms of structures and units in Kamloops.[1] The city has 3,341 privately owned rental units split between 130 structures of various sizes.

[1] CMHC uses the Kamloops Census Agglomeration (CA) for its housing statistics. The Kamloops CA, which includes Chase, Kamloops, Kamloops IR 1, Logan Lake, Sahhaltkum IR 4, Sun Peaks Mountain, the TNRD-J, the TNRD-P, and Whispering Pines IR 4.

Table 8.1-5. Number of Privately Owned Apartments by Size of Structure in Kamloops, April 2015

Category of structure by number of dwelling units	3-5	6-19	20-49	50-199	200+	Total
Number of structures	16	42	54	10	0	130
Number of dwelling units in structure	65	463	1,692	1,121	0	3,341

Source: CMHC 2015a.

Table 8.1-6 presents the availability and vacancy rates for City of Kamloops and a comparison community (Kelowna), and BC. Compared to BC as a whole and Kelowna, which is a comparable population centre in interior British Columbia, Kamloops had a higher availability and vacancy rate for rental housing. The vacancy rate in Kamloops for rental apartment structures with three or more units as of April 2015 was 5.1%, which is the same rate as the previous year (CMHC 2015a). The availability rate, which measures occupied and unoccupied apartments that are available for rent was higher than the vacancy rate at 7.2% (CHMC 2015a).

Table 8.1-6. Availability and Vacancy Rates for Kamloops, Kelowna, and British Columbia, April 2015

	Availability Rate[1]	Vacancy Rate[2]
Kamloops	7.2	5.1
Kelowna	2.8	1.9
British Columbia	2.5	1.8

Source: CMHC 2015a.

[1] *"Availability" is defined as a vacant property ready for rental, a property where the tenant gave notice of departure, or was given notice to leave by the landlord, and where a new tenant has not yet signed a lease for the property.*

[2] *"Vacancy" rate includes those units that are vacant at the time of the survey and ready for rental.*

Affordable Housing

Affordable housing is housing that costs no more than 30% of before-tax income. This includes utilities and taxes (Kamloops Homelessness Action Plan Partners and Kamloops Housing Board 2013). There is a wide spectrum of housing that can be considered affordable, which includes housing provided by private, public, and not-for-profit sectors and different forms of housing tenure, such as rental and ownership. Affordable housing can be temporary and permanent (CMHC 2015). In Kamloops specifically, as of 2012, it was estimated that Kamloops required an additional 2,222 affordable housing units, which includes temporary supported housing, subsidized housing, private market rental, and entry-level ownership (Kamloops Homelessness Action Plan partners and Kamloops Housing Board 2013). Discussions with stakeholders suggest that housing affordability is an ongoing concern in Kamloops (Ajax KPI Program 2014-2015; Mazzotta, *pers. comm*. 2015). Recently, Kamloops and BC announced an agreement to create up to 98 new affordable rental housing units. The units will be at three city-owned properties. The Province will arrange construction financing, while the City will contribute the land (BC Housing 2015).

According to the 2014 homeless count (ASK Wellness Society 2015), there were 96 homeless people in Kamloops on the day the count occurred. Homeless people included individuals who were

unsheltered or emergency sheltered. This number is likely low because of the difficulties in counting homeless persons, including finding homeless persons and the disappearance of known homeless camps shortly before enumeration. In addition to persons who are unsheltered or emergency sheltered, there are people in Kamloops who belong to the hidden homeless population. These persons are staying temporarily with friends or family, at hotels/motels, and in time-limited residential programs. According to the most recent count of the hidden homeless, which was in 2010, there were an estimated 1,167 hidden homeless people in Kamloops (Social Planning and Research Council of BC qtd. in ASK Wellness Society 2015).

Temporary and Short-term Accommodations

Through the KPI Program and workshops with the City of Kamloops, representatives have raised concerns regarding temporary and short-term accommodations as the engineering, procurement, and construction management (EPCM) contractor and/or construction workforce may rent accommodations during Project construction. Most of the hotels, motels, and other temporary accommodations such as hostels and bed and breakfasts in the RSA are concentrated in Kamloops, which has over 3,000 hotel and motel rooms (City of Kamloops 2015b). Most of the surrounding towns and villages such as Chase, Ashcroft, Merritt, Barriere, and Clearwater also have a small number of temporary accommodations. According to Tourism Kamloops (2015), there are at least 300 sites in campgrounds and RV parks of various categories within 20 km of the city centre (e.g., full hook-up, water, and electricity), excluding provincial parks in the area and sites in other communities in the TNRD.

In 2014, hotels in Kamloops had an occupancy rate of at least 50% for two-thirds of the year (Table 8.1-7). Occupancy rates are higher during the summer months, when tourism is most active, although the rates were lower than they had been in 2013. August had the highest occupancy rate for hotel/motel rooms at 81%. Hotel occupancy rates for 2015 were available for January to May at the time of writing. For every month excluding February, occupancy rates have been lower ranging from 0.2 percentage points lower in May to 14.2 percentage points lower in March (Destination BC 2015b).

Kamloops, which is involved in sports tourism, will reserve blocks of rooms in connection with events when necessary. This is typically done about a year in advance. The first priority for accommodations in connection with sporting events is to secure rooms for participants. The residences at TRU are often used for this purpose. Accommodations for spectators are primarily a concern for large, multi-sport events and are usually not a component of bids for events (McCorkell, pers. comm. 2015).

Water, Sewer, Landfill

Over 95% of the City's water supply, including potable water is supplied by the South Thompson River. Water is treated at the Kamloops Centre for Water Quality, which was commissioned in 2005. It uses membrane filtration technology to provide drinking water. The Centre also contains laboratories and classrooms (City of Kamloops n.d.b.). There are four systems in the City of Kamloops – the Main and Campbell Creek systems, which are owned and operated by the City and the Rayleigh and Heffley systems, which are private utilities (City of Kamloops 2010b). The Sustainable Kamloops Plan notes that as of 2008, water use by residents of Kamloops was high compared to other communities in the southern interior (City of Kamloops 2010a).

Table 8.1-7. Hotel Occupancy Rate by Month for Kamloops, 2014[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Occupancy rate	34.8%	38.0%	57.8%	56.0%	61.3%	64.1%	67.0%	81.0%	65.7%	53.1%	39.4%	34.4%	55.0%
Year-over-year point change	-2.0	-2.7	4.5	-5.2	-5.9	-7.1	-8.0	-4.2	-5.5	-4.2	-1.3	1.2	-2.7

Source: Destination BC Corp. 2015a.

[1] *Hotel occupancy rate is the percentage of hotel rooms occupied during a specific time period and omits unavailable rooms (e.g., due to renovations).*

The majority (over 95%) of the population of Kamloops, as well as part of the Kamloops 1 IR, are served by the Kamloops wastewater disposal system. This system includes collection pipes, pump stations, and a wastewater treatment facility. After treatment, approximately 80% of the treated effluent is discharged into the Thompson River and the remaining 20% spray irrigated onto a local farm and other lands (City of Kamloops n.d.). An upgrade of the sewage treatment plant was completed in September 2014. The expansion allows for incoming wastewater flows of up to 54,000 m^3/day, which is expected to accommodate population growth in Kamloops to 2031 (Venture Kamloops n.d.). Sewage treatment and disposal for approximately 5% of the population is through unsewered on-site systems such as septic tanks and disposal fields (City of Kamloops n.d.).

The City of Kamloops operates two landfills and two recycling depots. It also offers garbage and recycling collection services. Kamloops has developed a system for disposing of compostable yard waste. The Barnhartvale Landfill accepts resident waste and is expected to operate until at least 2020. The Mission Flats Landfill accepts residential and commercial waste and is expected to operate until at least 2053. Kamloops is currently reworking the design and operation plans for the landfills, which may extend their life. Neither landfill accepts industrial waste (Farrow, *pers. comm*. 2015). There is a privately operated landfill within city limits.

Emergency Services

Kamloops is serviced by Kamloops Fire Rescue (KFR) for fire and coordinated emergency services and BC Ambulance Service for ambulance services. Kamloops Fire Rescue runs a dispatch centre jointly with 28 other communities in the TNRD. Kamloops Fire Rescue has seven fire stations located throughout the City, including a recent addition in the Aberdeen neighbourhood. Although call volumes have increased, the KFR is able to provide quality service and could expand its capacity if required, although response times could become an issue depending on the areas where growth occurs (McLean, *pers. comm*. 2014). The Kamloops 1 IR has an agreement in place with Kamloops for fire protection services (TteS 2015a).

There are nine RCMP detachments in the TNRD, including Ashcroft, Barriere, Chase, Clearwater, Clinton, Kamloops (City, Traffic Service, and T'kemlups Rural branches), Logan Lake, Lytton, and Merritt. The boundaries of the TNRD and the boundaries of the RCMP detachment jurisdictions do not overlap in all cases. The largest detachment is in Kamloops, with 118 regular members and a support staff of 60 civilians (RCMP 2014). The Kamloops detachment of the RCMP provides law enforcement services for the municipality, along with the services it is provincially and federally mandated to provide (Learned, *pers comm.* 2015). The Kamloops RCMP detachment faces the same issues regarding recruiting resources as other law enforcement agencies at the municipal and provincial levels across the country, i.e., the pool of interested and qualified candidates for openings is smaller than the number of officers who will be retiring in the near term. As a result, vacant positions due to retirement will need to be filled, while additional positions created to address new mandates must also be filled. The current shortage in human resources is not expected to improve over the next three years (Learned, *pers. comm.* 2015).

Crime rates, which are the number of *Criminal Code* offences (excluding drugs and traffic) reported per 1,000 persons, for the Kamloops City Detachment have been decreasing overall since 2004 (Table 8-1.8). The increase that occurred between 2012 and 2013 was in part attributed to organized

crime attempting to establish a base in the city. According to the detachment, there is a correlation between drug activity and property crime (Klassen 2014). The detachment has been working hard to prevent organized crime from taking root in Kamloops (Learned, pers. comm. 2015). The crime rates in Kamloops are higher than the crime rate for BC (Table 8.1-8).

Table 8-1.8. Crime Rates for Total *Criminal Code* Offences, 2004-2013

Jurisdiction	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Kamloops Municipal Force	165.9	168.3	159.1	153.5	118.3	112.0	112.5	105.7	98.8	106.8
British Columbia	112.0	117.2	111.8	105.1	96.6	90.9	85.7	80.3	78.0	74.5

Source: Ministry of Justice, Police Services Division 2014a.

In 2013, each officer managed an annual workload of 76 cases. Compared with other municipal RCMP forces in communities with a population of 15,000 or over, 4 out of 31 communities had officers managing a higher case load: the Courtenay Municipal RCMP, the Fort St. John Municipal RCMP, the Prince George Municipal RCMP, and the Vernon Municipal RCMP (Ministry of Justice, Police Services Division 2014b).

In addition to the difficulties related to increased capacity in terms of human resources, the Kamloops City Detachment would have difficulties expanding, given the physical restrictions of the current building. The current building occupied by the detachment is at capacity, although Kamloops, which contracts with the RCMP detachment to provide municipal policing services, has acquired an additional property on the North Shore. This property is about a block away from a community police office. The new property will meet the needs of the current community police office and be able to house some non-essential units, such as the traffic unit. The new building is expected to be operational in about a year (Learned, *pers. comm.* 2015).

Based in Kamloops IR 1, the Tk'emlúps Rural Branch of the RCMP provides police services for Kamloops 1 IR and Skeetchestn IR. Current staffing is sufficient, although with continued population growth, the detachment will need more human resources in the future (Aird, *pers. comm.* 2015).

Health and Social Services

The Interior Health Authority (IHA) is responsible for administering health care services in the TNRD communities. Facilities range from Community Health Centres, which offer a variety of services from basic laboratory and radiology to long-term residential care, to hospitals in Ashcroft, Clearwater, and Kamloops. Royal Inland Hospital (RIH), which is located in Kamloops, is the primary medical facility in the TNRD. Kamloops is located in the Kamloops Local Health Area (LHA), which is part of the IHA. The LSA also includes the North Thompson LHA. Both LHAs are in the Thompson Cariboo Shuswap Health Service Delivery Area (HSDA) (see Figure 10.6-2) for a map of the relevant health authority boundaries). Healthcare services in Kamloops are currently facing challenges in two areas: a chronic shortage of family doctors and capacity at the RIH.

In 2009-10, which is the last year for which statistics at the LHA level were publicly available through the IHA for the LHAs, in the Kamloops LHA and North Thompson LHA, there were 1.1 and 1.2 general practitioners per 1,000 population, respectively (IHA 2010a, 2010b). Rates were comparable for the Thompson-Cariboo-Shuswap HSDA, which had 1.1 general practitioners per 1,000 population and the IHA, which had 1.3 general practitioners per 1,000 population (IHA 2010a). These rates are slightly lower than ratios reported by Statistics Canada (2012) for British Columbia, which had a rate of 1.34 per 1,000. More recent statistics from the Canadian Institute for Health Information are available for the Thompson/Cariboo Health Region, which includes the LSA and the RSA. According to the Canadian Institute for Health Information (2014), there were 1.2 physicians per 1,000 population in 2013. The shortage of family doctors in the LHA is not unique to the area, as provincial and national rates were 1.2 family medicine physicians per 1,000 population and 1.1 per 1,000 population, respectively. To counter the current shortage, there has been a concerted recruitment effort involving the Thompson Region Division of Family Practice and Venture Kamloops, along with a recently established program through RIH to recruit family physician residents. The recruitment efforts will bring six new family physicians to Kamloops and the RIH residency program has brought in six residents (Venture Kamloops 2014b).

The RIH in Kamloops, operates above its capacity (IHA 2013) as occupancy for inpatient beds has increased every year (Ajax KPI Program 2011-2012, 2014-2015; IHA 2013). There have been a small number of inpatient beds added at the RIH and strategies are in place to lower the number of alternate level care days, which would free up beds. Additionally, a new clinical services building for out-patient diagnostics is currently under construction and is expected to open in May 2016. The new facility will free up space in the RIH but how the space will be used is currently being discussed (Ajax KPI Program 2011-2012, 2014-2015).

The emergency department at the RIH is also an area of concern in connection with capacity. Unscheduled visits to the emergency department have increased by close to 5,000 visits from 49,748 visits in 2009-10 to 56,695 visits in 2012-13 (IHA 2012f, 2013). The reasons for the increase in visits include a lack of family physicians in general and the lack of care alternatives available on weekends (Ajax KPI Program 2011-2012). To help alleviate some of the pressure on the emergency department, the RIH is working on a number of initiatives to improve access and flow, including stronger relations with community partners to smoothly transition patients out of hospital care, and planning to use out-patient clinics more effectively to increase access to hospital beds (Ajax KPI Program 2011-2012, 2014-2015).

The Q'wemtsin Health Society (QHS) provides health care services on-reserve to TteS and SIB members. The TteS health centre is currently without a doctor and the nurse practitioner, who is in the community two days a week, cannot always meet demand. Similar to the situation in Kamloops, there is a long list of TteS members in need of a family doctor. The clinic on the Skeetchestn IR is attended by a variety of staff throughout each week and month (Q'wemtsin Health Society, *pers. comm.* 2015).

Social Services

There is a broad base of social services available in Kamloops, similar to the variety that could be found in a major metropolitan centre. Social service providers in Kamloops include Interior Community Services, ASK Wellness Society, the Phoenix Centre, and the Interior Indian Friendship

Society. In addition, most provincial social service agencies have local offices in Kamloops. Most non-profits in the community are operating at capacity, but the organizations in Kamloops have demonstrated that they have the ability to adapt to new social issues and work well together to avoid duplicating services (Mazzotta, *pers. comm.* 2015).

On the Kamloops 1 IR, TteS members have access to a drug and alcohol counsellor; programs for Elders, such as a program to alert Elders of potential programs they may be eligible for upon turning 60 and an Elders Retreat; a Home Visitor service that provides transportation to members to medical appointments, the food bank, and other essential services; and Home Support, which helps connect families with resources and helps them as they work with Secwépemc Child and Family Services (TteS 2015).

Recreation Services

There are a wide range of recreation services and facilities available throughout Kamloops and the LSA. Section 8.6, Outdoor Recreation, contains a more detailed description of outdoor recreation facilities and opportunities in Kamloops and the TNRD, including provincial parks.

There are numerous sporting facilities, including ice rinks, pools, soccer pitches, and baseball diamonds. In addition to these facilities, there are a variety of municipal parks that support a range of activities including mountain biking (Bike Ranch), hiking in undeveloped terrain (Peterson Creek Park and Kenna Cartwright Park), and watersports (Riverside Park). During the interview program, it was noted that usage of municipal parks has been increasing, which is expected as the population increases. Recent consultation conducted by Kamloops suggests that residents want more green space for outdoor recreation (Andersen, et. al. *pers. comm.* 2014).

Education

The majority of the RSA is in the jurisdiction of BC Public School District no. 73. The southern-most part of the RSA is in School District no. 58, and the western-most part is in School District no. 74; however, these represent a small fraction of the total number of schools in the RSA and are not located near the Project. The highest concentration of educational facilities is in and around Kamloops. In Kamloops, School District no. 73 contains 23 elementary schools and eight secondary schools, including an open online learning program (Board of Education of Schools District No. 73 [Kamloops/Thompson] 2012; Ajax KPI Program 2011-2012, 2014-2015). Enrolment has been declining and it is expected that enrolment will average out to approximately 1,000 students per grade in the next few years for a total of about 12,000 students. Average class sizes are below the maximum numbers and most schools are operating below capacity (Ajax KPI Program 2011-2012, 2014-2015).

The TteS runs the Sk'elep School of Excellence on the Kamloops IR 1, which offers grades Kindergarten through 7 (Kamloops Indian Band Department of Education 2015). Members also attend schools in School District no. 73 (School District no. 73 2012). On the SIB reserve, the Skeetchestn Community School offers grades Kindergarten through 12 (SIB n.d.). Members also attend schools in School District no. 73 (School District no. 73 2012).

Transportation Infrastructure

Kamloops is a major hub for shipping and is located on the Trans-Canada Highway. It is one of only two cities in Canada that is serviced by both the Canadian National Railway and the Canadian

Pacific Railway (Venture Kamloops 2014). The major transportation routes through Kamloops include the Trans-Canada Hwy (No. 1) running east-west, the provincial Yellowhead Hwy/Coquihalla Hwy (No. 5) running north-south, and the Princeton-Kamloops Hwy (No. 5a) running south of Kamloops to Princeton. Provincial Hwy 5 is known as the Coquihalla south of Kamloops and connects with Hwy 97C in Merritt. The Coquihalla is the primary highway route connecting Kamloops with the Lower Mainland of BC. It is part of the National Highway System and part of the principal trans-provincial route, carrying approximately 10,000 vehicles per day (vpd) in the rural sections and up to 46,000 vpd within Kamloops. The on-ramp at the Inks Lake Interchange does not meet current Transportation Association of Canada (TAC) geometric design requirements for ramps (Opus International 2015).

There are several secondary and rural roads to the south of Kamloops that are in the vicinity of the proposed Project. These include Lac Le Jeune Road, a paved two-lane arterial public road that is approximately 23 km long. Lac Le Jeune Road becomes Frontage Road to the north and intersects Copperhead Drive in Kamloops, where there is an interchange with Hwy 5. To the south, Lac Le Jeune Road becomes Meadow Creek Road at the location where the road connects to Hwy 5 at the Walloper Lake interchange, Exit 336 from Hwy 5. Lac Le Jeune Road provides access to a small industrial park near Kamloops, Iron Mask Trailer Park, private agricultural land, recreational land, and three provincial parks (Figure 8.1-2). At the time of writing, Lac Le Jeune Road is below both MoTI's and City of Kamloops' desired Levels of Service (Opus International 2015).

Road performance is often evaluated via a Level of Service (LoS) rating; a qualitative measure to rate the quality of traffic service. LoS is used to analyze highways by categorizing traffic flow and assigning quality levels based on performance measure like speed, density. LoS ratings range from A to F where a rating of A indicates a high quality of service from a free flow condition when traffic demand is much less than roadway capacity. A rating of F is considered a failure when traffic demand greatly exceeds roadway capacity. A pavement condition survey was completed for the Project in April 2015 to assess potential impacts of increased traffic on Lac Le Jeune Road between Inks Lake Road and Copperhead Drive (9 km). The results of the condition survey indicate that the majority of the road surface is rated as poor to very poor condition. The City of Kamloops has deferred maintenance on Lac Le Jeune Road until 2018/19. Additional details regarding the pavement review and assessment of Project traffic on the road condition can be found in the TIA, which is included as Appendix 8.1-A.

Data were collected from multiple sources including MoTI and collected by KAM and its consultants from MoTI. The resulting traffic count data were analysed. Predicted traffic volume for various intersections and interchanges were estimated using baseline traffic volumes and growth rates accepted by Kamloops and MoTI, and background developments planned for the study area for future horizon years (2016, 2018, 2024, and 2039). Background developments are defined as the reasonably foreseeable future developments independent of the Project. The Gateway Casino development has also been incorporated into traffic assumptions, as it is expected to be completed by 2016. Further, as requested by the City of Kamloops and MoTI, planned road network improvements were also included in baseline traffic volume assumptions (Table 8.1-9).

Table 8.1-9. Base Traffic Volumes

Road	Segment	Direction	# Lanes	Base Volume (AADT)			
				2016	2018	2024	2039
HWY 5	Ironmask Interchange to Copperhead Interchange	EB	3	7,658	7,843	8,425	10,076
		WB	3	7,658	7,843	8,425	10,076
	Inks Lake Interchange to Ironmask Interchange	NB	2	4,946	5,065	5,441	6,507
		SB	2	4,946	5,065	5,441	6,507
	Walloper Interchange to Inks Lake Interchange	NB	2	4,946	5,065	5,441	6,507
		SB	2	4,946	5,065	5,441	6,507
Lac le Jeune Rd	Sugarloaf Rd to Ajax Mine Access Rd.	NB	1	535	771	828	991
		SB	1	270	390	419	501
	Ajax Mine Access Rd to Goose Lake Rd	NB	1	535	771	10	13
		SB	1	270	390	10	13
Ajax Mine Access Rd (new road)	Lac le Jeune Rd to Project Site	EB	1	0	9	10	13
		WB	1	0	9	10	13
	Highway 5 to Lac le Jeune Rd	EB	1	0	9	10	13
		WB	1	0	9	10	13

Baseline information related to safety, specifically to collision rates for Highway 5, Lac le Jeune Road, and the Ajax Mine Access Road, is contained in Section 10.7.2.3, Baseline Studies, in Community Health and Well-being.

8.1.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for Infrastructure, Public Facilities, and Services and encompasses possible direct, indirect, and induced effects on the VC.

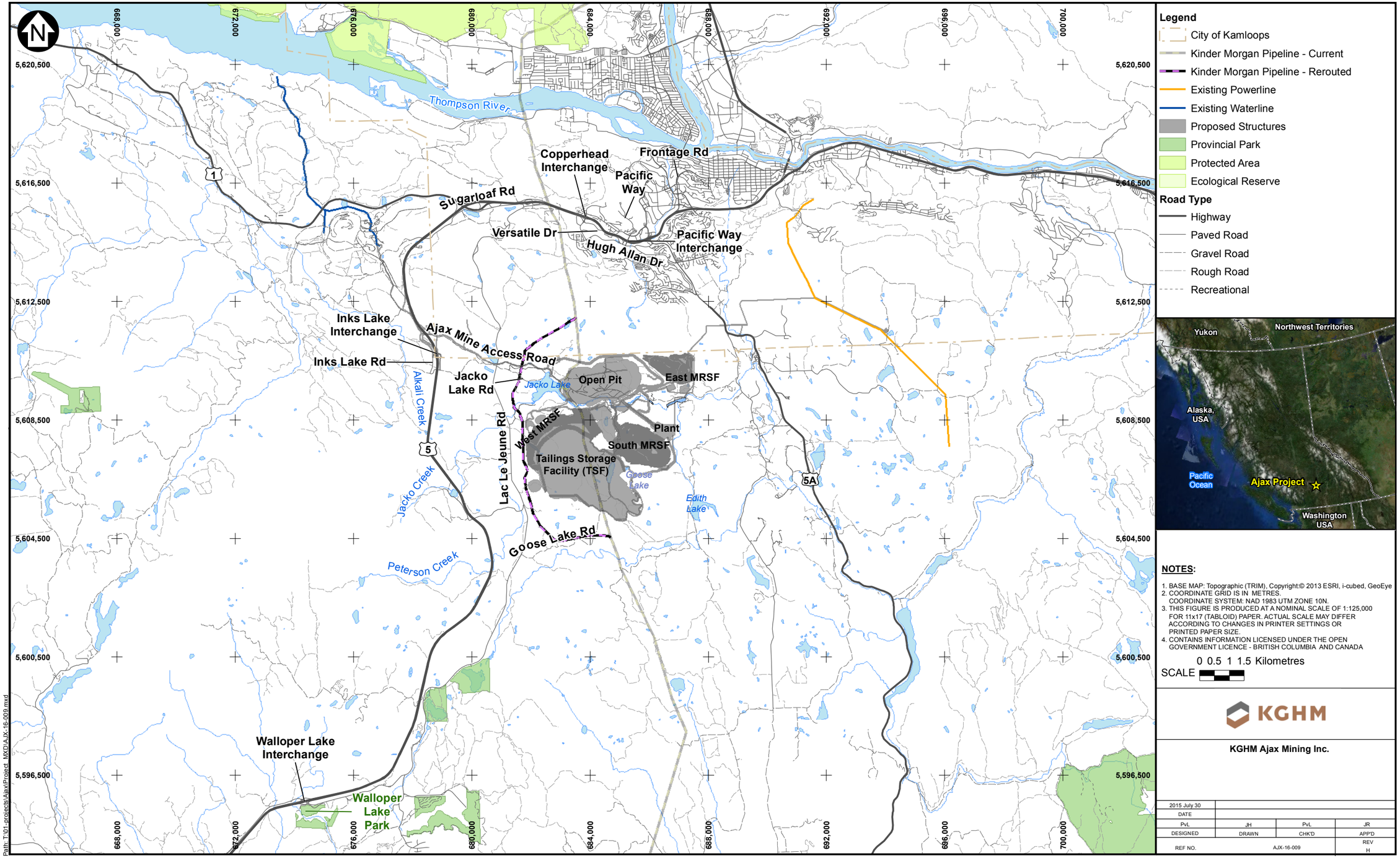
8.1.3.1 Spatial Boundaries

Local Study Area

The LSA for the Infrastructure, Public Facilities, and Services assessment comprises the City of Kamloops, the TNRD-J electoral area, and two Aboriginal Groups – TteS and SIB. The primary reserve parcels for these Aboriginal Groups are Kamloops 1 IR (TteS) and Skeetchestn IR (SIB). These communities are located closest to the Project and are therefore more likely to experience direct and indirect Project effects. It should be noted that the traffic impact assessment (TIA; described further in Section 8.1.4.2) uses a different LSA, which is limited to the City of Kamloops.

Figure 8.1-2
Road Network in the Vicinity of the Project

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Legend

- City of Kamloops
- Kinder Morgan Pipeline - Current
- Kinder Morgan Pipeline - Rerouted
- Existing Powerline
- Existing Waterline
- Proposed Structures
- Provincial Park
- Protected Area
- Ecological Reserve

Road Type

- Highway
- Paved Road
- Gravel Road
- Rough Road
- Recreational

NOTES:

1. BASE MAP: Topographic (TRIM), Copyright© 2013 ESRI, i-cubed, GeoEye
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:125,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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0 0.5 1 1.5 Kilometres
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KGHM Ajax Mining Inc.

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Within the LSA, Kamloops is the closest and most populous community to the Project, with the most established services and infrastructure. Because of its size and proximity, Kamloops will likely experience more direct Project effects—particularly effects related to workforce, services, and—compared to and services other communities in the LSA and is therefore the focus of this assessment. See Figure 8.1-3 for a map of the LSA.

Regional Study Area

The RSA is the TNRD and includes the LNIB, AIB and WP/CIB communities. The TNRD was chosen as the RSA because the Project is within its administrative jurisdiction. The Project will use the regional road network for transporting construction material and concentrate. Its workers may also make demands on infrastructure and services throughout the region. See Figure 8.1-4 for a map of the RSA.

8.1.3.2 Temporal Boundaries

The duration of each phase considered in the assessment is given below:

- **Construction**: 2 years;
- **Operation**: 23 years;
- **Decommissioning and Closure**: 5 years (includes project decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance)
- **Post Closure**: 5+ years

8.1.3.3 Administrative Boundaries

There are several sets of administrative boundaries affecting the assessment of potential Project effects on Infrastructure, Public Facilities, and Services, including municipal and reserve boundaries, regional district boundaries, census division and subdivision boundaries, and the various boundaries used by the Interior Health Authority (e.g., Local Health Areas [LHA]). Municipal, reserve, and regional district boundaries are depicted on Figure 8.1-3. Health services boundaries used by the IHA are depicted on Figure 10.6-2.

Overall, the LSA and RSA for the Infrastructure, Public Facilities, and Services VC rely on census divisions and subdivision boundaries for baseline population data as changes in population is one of the primary drivers of change for Infrastructure, Public Facilities, and Services. Census information includes the Census of Canada and the National Household Survey, both of which were most recently conducted in 2011. Table 8.1-10 lists the census subdivisions within the LSA, including those for the Aboriginal Groups in the LSA and the RSA, including those Aboriginal groups identified in Section 8.1.2.3 and included in the assessment at the request of either the BC EAO or the CEA Agency.

The assessment of potential Project effects on Infrastructure, Public Facilities, and Services is also informed by the geographic boundaries established by municipalities (e.g., city limits), which are related to the responsibility for and oversight of infrastructure (e.g. roads, water treatment, waste management) and some services.

8.1.3.4 Technical Boundaries

Technical boundaries did not influence the scoping of the assessment on Infrastructure, Public Facilities, and Services.

Table 8.1-10. Census Sub-divisions in the Thompson-Nicola Regional District Census Division and Sub-Divisions in the Local Study Area

	Community /Aboriginal Group	Census Subdivision1 (Name, Type)
Local Study Area		
City of Kamloops	Kamloops	City
Tk'emlúps te Secwépemc	Kamloops 1	Indian Reserve
Skeetchestn Indian Band	Skeetchestn	Indian Reserve
Thompson-Nicola J (TNRD-J)	Thompson-Nicola J (Copper Desert Country)	Regional District Electoral Area
Regional Study Area		
TNRD	Thompson Nicola	Regional District
Lower Nicola Indian Band	Joyeska 2, Nicola Mameet 1, Zoht 4, Hamilton Creek 7	Indian Reserves
Ashcroft Indian Band	Ashcroft 4 105 Mile Post 2	Indian Reserve
Whispering Pines/Clinton Indian Band	Whispering Pines 4	Indian Reserve

Source: Statistics Canada.

[1] Only those reserve parcels for which Statistics Canada has reported population data in the 2011 Census have been listed.

[2] Only those Aboriginal Groups who have been included in the assessment by the BC EAO or the CEA Agency have been listed here.

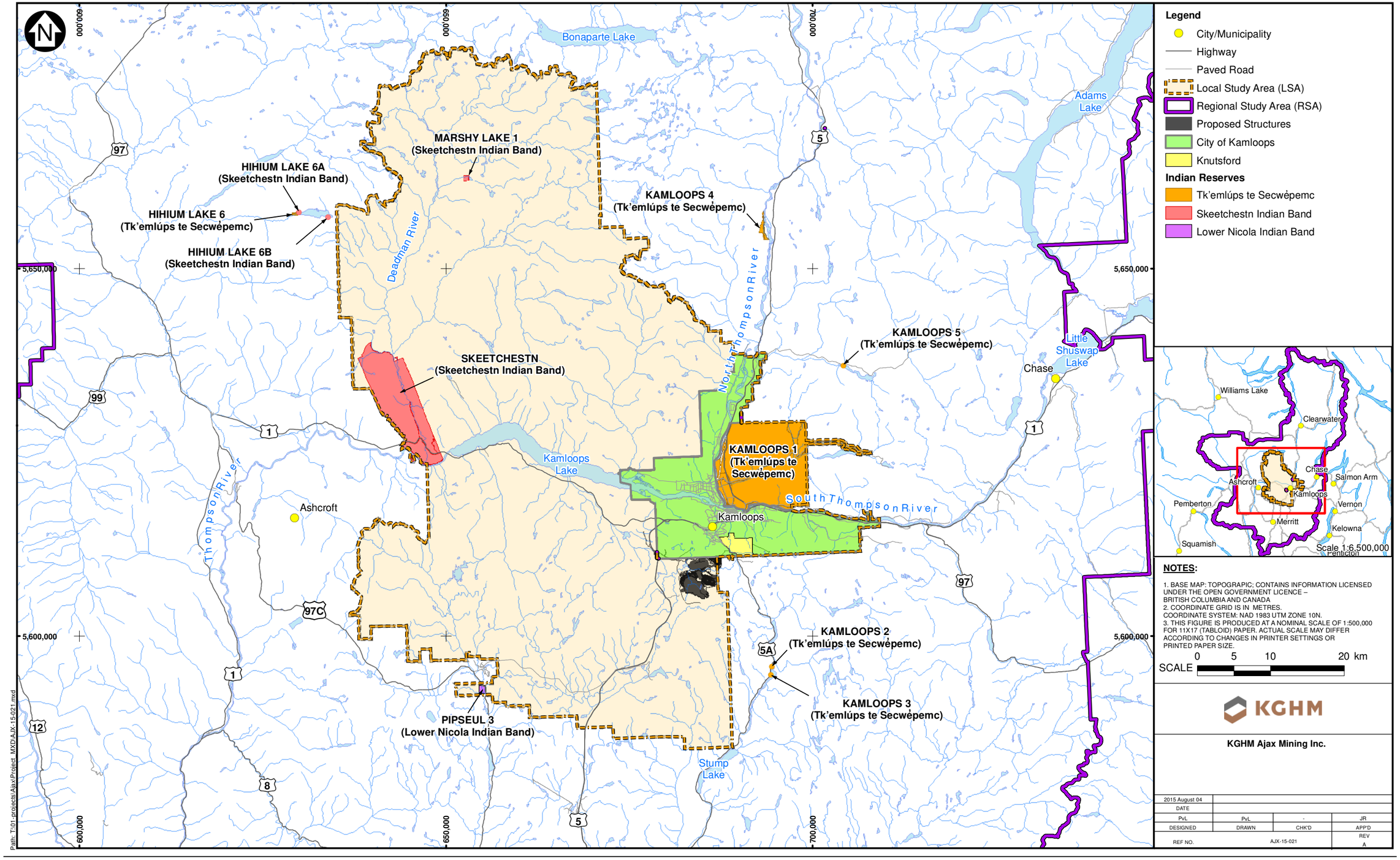
8.1.4 Potential Effects of the Project and Proposed Mitigation for Infrastructure, Public Facilities, and Services

Each Project phase will have different effects on infrastructure, public facilities, and services. Two pathways have been identified, including:

- New population arising from in-migrating workers (and families) during the Construction and Operation phases may result in additional demand for infrastructure and services; and
- Project-related use of public infrastructure. This includes public roads, during Construction and Operations phases, for the transport of equipment, materials, and workers to and from the Project site, as well as the transport of concentrate to the Port of Vancouver and waste sludge and solid waste facilities during all phases of the Project.

Figure 8.1-3
Local Study Area

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NOTES:

1. BASE MAP: TOPOGRAPIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:500,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

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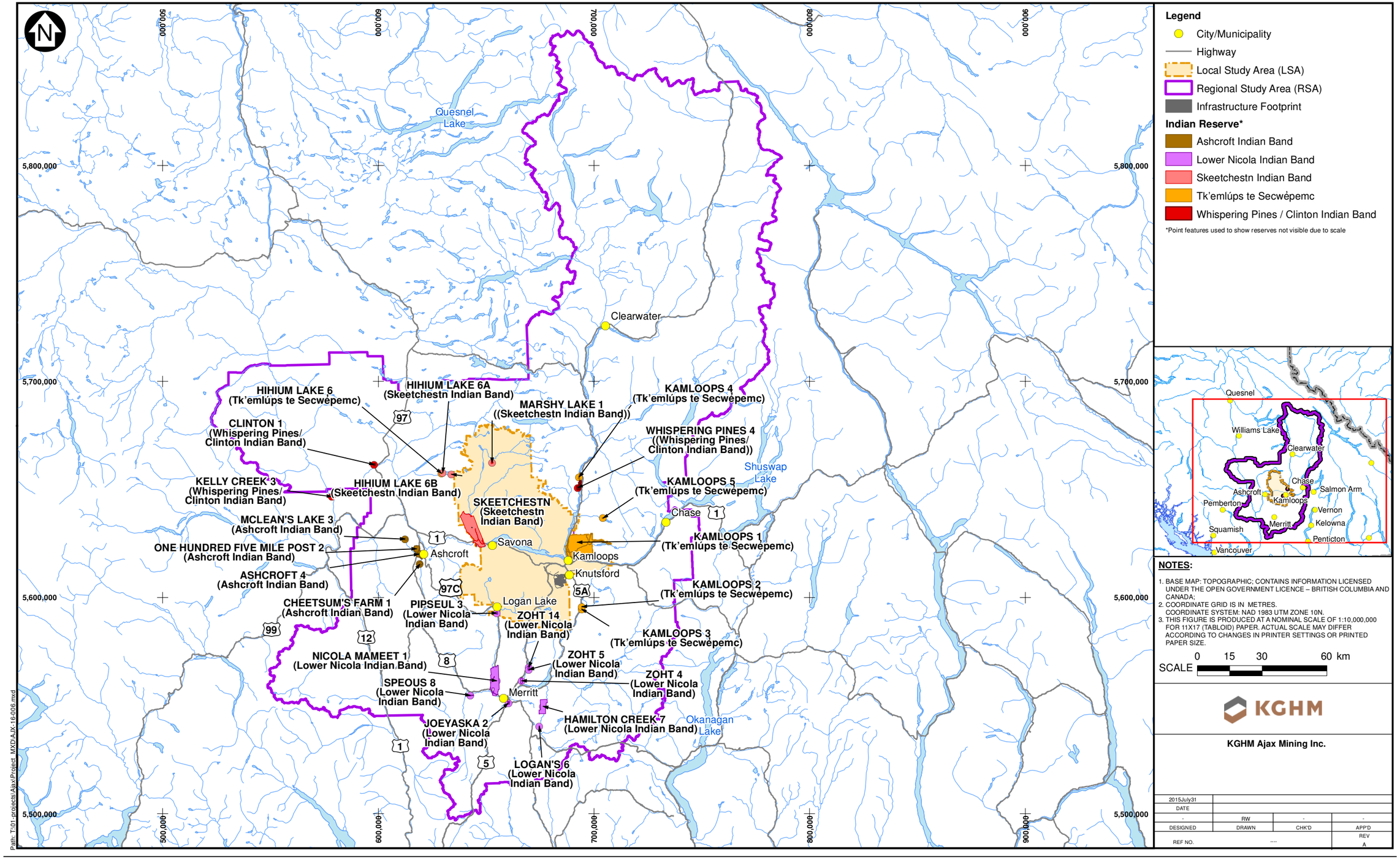
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Figure 8.1-4
Regional Study Area

InterGroup CONSULTANTS



NOTES:

1. BASE MAP: TOPOGRAPHIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA;
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:10,000,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

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While the Project will continue to make use of public infrastructure (e.g., landfills) and the public road network during the Decommissioning and Closure and Post-closure phases, demands are expected to be reduced from the Construction and Operations phases. In addition, an influx of population is not anticipated during Decommissioning and Closure and Post-closure; therefore, these two phases are not carried forward to the discussion of key effects.

8.1.4.1 Identifying Potential Effects on Infrastructure, Public Facilities, and Services

This section begins with the identification of potential interactions between the Project's activities and components, and the VC (i.e., Infrastructure, Public Facilities, and Services), as summarized in Table 8.1-11. This section also describes why other aspects of this VC, which were described as part of baseline conditions, will not be discussed further in this section. Only interactions that are characterized as "M," potentially moderate, or "H," key, will be carried forward to the effects assessment on this VC.

Increased Demand for Housing and Accommodations

During Construction and Operations, the Project workforce could place stress on housing and accommodations in and around Kamloops, primarily in Kamloops as it is the closest major population centre to the Project with the most amenities. Since neither the Construction phase nor the Operations phase workforces are anticipated to be sourced wholly from the LSA or the RSA, direct and contract employees will require housing and accommodations while they work on the Project. Demand for housing and accommodations is anticipated as a key effect during Construction and Operations. During Decommissioning and Closure and Post-closure, the Project workforce is not expected to make demands on housing and accommodations, as the employment requirements during these phases are smaller and the phases are shorter, which means that it is unlikely someone will move to the LSA or RSA for Project-related employment during these phases. Therefore, Project workforce effects on housing and accommodations during Construction and Operations will be carried forward into the effects assessment.

Increased Stress on Community Infrastructure and Services due to Project Workforce

During Construction and Operations, the Project workforce could place stress on some aspects of community infrastructure and services. In general, the aspects of infrastructure and services that are expected to experience stress related to the Project are currently experiencing stress related to capacity or are anticipated to experience capacity-related stress as the population grows. Services that could be affected include emergency services, in particular police services if the temporary workforce during the Construction Phase leads to an increase in issues that require police attention. Pressures on healthcare services are also a concern due to existing capacity constraints and a concern that it may be difficult to retain doctors and other healthcare providers. Potential effects on healthcare services are assessed in Section 10.7, Community Health and Well-being since the topic affects the health of community members.

There are some infrastructure and services in the LSA that are not anticipated to experience stress from the Project workforce. Through the KPI Program, no concern was expressed related to School District no. 73. Schools in Kamloops are not operating at capacity and an increase of students would

be welcomed and absorbed into the system (Ajax KPI Program 2014-2015). Recreational services in Kamloops are also expected to be able to absorb an influx of population (Andersen, et al. pers. comm. 2014). Outdoor recreation beyond the municipal boundary may be affected by the Project; these effects are discussed in Section 8.6, Outdoor Recreation.

Increased Stress on Community Infrastructure and Services due to Project Activities

The Project is currently planning on using municipal infrastructure for some of its putrescible solid waste and sewage sludge disposal. Therefore, construction wastes transport and sewage disposal are expected to interact with Infrastructure, Public Facilities, and Services during all phases. The Construction and Operations phases are anticipated to have a moderate interaction with the VC. As Project activities and staffing decrease during the end of the Operations Phase and into Decommissioning and Closure and Post-closure phases the amount of solid waste and sewage sludge produced is expected to decrease. Therefore, the interaction between general waste disposal and sewage disposal for these phases is characterized as negligible to minor and are not discussed further.

Increased Traffic Volumes and Effects on Public Road Infrastructure

Transporting waste (general and hazardous), sewage disposal, and mineral concentrate—as well as Project staff (direct employees and contract employees) accessing the mine site daily—will involve use of the public road network. This will include an increase in personal and heavy vehicles using the roads around the Project to access the site, including heavy goods vehicles. These activities are generally applicable to both the Construction and Operations phases. In addition, during the Construction Phase, public road realignment, use, and maintenance is expected to interact with public road infrastructure and traffic.

While road use will also occur during the Decommissioning and Closure and Post-closure phases, traffic volume is expected to decrease to the point where the interactions are negligible to minor.

Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works

During engagement with Kamloops and the TNRD, representatives from both expressed concern regarding labour competition impeding their ability to maintain and/or expand public works. As this effect could potentially affect Infrastructure, Public Facilities, and Services, it is discussed below. The labour needs and anticipated local hiring for the Project are described in Section 7.2, Labour Force, Employment, and Training. This effect is expected to be the most pronounced during the Construction and Operations phases, as that is when Project demand for labour is expected to be the greatest. The interaction is anticipated to be negligible to minor during Decommissioning and Closure and Post-closure as the workforce is expected to be smaller and activities less intense.

Table 8.1-11. Identifying Potential Project Interactions and Effects on Infrastructure, Public Facilities, and Services

	Project Activities	Potential Effects on Infrastructure, Public Facilities, and Services				
		Increased Demand for Housing and Accommodations	Increased Stress on Community Infrastructure and Services due to the Project Workforce	Increased Stress on Community Infrastructure and Services due to Project Activities	Increased Traffic Volumes and Effects on Public Road Infrastructure	Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works
Construction	Clearing and Grubbing	O	O	O	O	O
	Earthworks	O	O	O	O	O
	Overburden/Topsoil Stockpile	O	O	O	O	O
	Laydown Areas and Storage Yards	O	O	O	O	O
	Project Lighting	O	O	O	O	O
	Site Security and Fencing	O	O	O	O	O
	Fuel Storage and Filling Area	O	O	O	O	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	L	O
	Construction Wastes Transport, Storage, and Disposal	O	O	M	M	O
	Sewage Infrastructure and Disposal	O	O	M	M	O
	Public Road Realignment, Use, and Maintenance	O	O	O	M	O
	Site Road Construction, Use and Maintenance	O	O	O	O	O
	Haul Truck Road Construction, Use, and Maintenance	O	O	O	M	O
	Site Buildings and Process Plant	O	O	O	O	O
	Explosives Magazine and Storage Facilities	O	O	O	O	O
	Open Pit Development	O	O	O	O	O
	Drilling and Blasting	O	O	O	O	O
	Crushing Mine Rock	O	O	O	O	O
	Loading, Hauling, and Deposition of Mine Rock	O	O	O	O	O
	Temporary Ore Stockpile	O	O	O	O	O
	Tailing Storage Facility Development	O	O	O	O	O
	Power Transmission, Distribution	O	O	O	O	O
	Natural Gas Line	O	O	O	O	O
	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	O	O	O	O	O
	Water Intake from Kamloops Lake	O	O	O	O	O
	Fire Suppression Infrastructure	O	O	O	O	O
	Contact Water	O	O	O	O	O
	Non-contact Water	O	O	O	O	O
	Haul Truck Road	O	O	O	O	O
	Water Management Dams	O	O	O	O	O
	Mine Staffing (Direct Employment)	H	L	O	H	M
	Contracted Employment	H	L	O	H	L
	Taxation	O	O	O	O	O

(continued)

Table 8.1-11. Identifying Potential Project Interactions and Effects on Infrastructure, Public Facilities, and Services (continued)

	Project Activities	Potential Effects on Infrastructure, Public Facilities, and Services				
		Increased Demand for Housing and Accommodations	Increased Stress on Community Infrastructure and Services due to the Project Workforce	Increased Stress on Community Infrastructure and Services due to Project Activities	Increased Traffic Volumes and Effects on Public Road Infrastructure	Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works
Operation	Open Pit Development	O	O	O	O	O
	Drilling and Blasting	O	O	O	O	O
	Hauling Mine Rock and Ore from Pit	O	O	O	O	O
	Crushing and Conveying Ore	O	O	O	O	O
	Temporary Ore Stockpile	O	O	O	O	O
	Development of Mine Rock Management Facilities	O	O	O	O	O
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	O	O	O	O	O
	Revegetation through Progressive Reclamation	O	O	O	O	O
	Process Plant Operation	O	O	O	O	O
	Deposition to Tailing Storage Facility	O	O	O	O	O
	Site Road Use and Maintenance (Materials, Personnel, Supplies)	O	O	O	O	O
	Concentrate Transport and Storage	O	O	O	M	O
	Explosives Magazine and Storage Facilities	O	O	O	O	O
	Fire Suppression Infrastructure	O	O	O	O	O
	Fuel Storage and Filling Area	O	O	O	O	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	M	O
	General Wastes Transport, Storage, and Disposal	O	O	M	M	O
	Sewage Infrastructure and Disposal	O	O	M	M	O
	Laydown Areas and Storage Yards	O	O	O	O	O
	Power Transmission, Distribution	O	O	O	O	O
	Project Lighting	O	O	O	O	O
	Site Access, Security and Fencing	O	O	O	O	O
	Water Intake from Kamloops Lake	O	O	O	O	O
	Contact Water	O	O	O	O	O
	Non-contact Water	O	O	O	O	O
	Potable Water Treatment and Use	O	O	O	O	O
	Haul Truck Road	O	O	O	O	O
	Mine Staffing (Direct Employment)	H	L	O	M	M
	Contracted Employment	H	L	O	M	M
	Taxation	O	O	O	O	O

(continued)

Table 8.1-11. Identifying Potential Project Interactions and Effects on Infrastructure, Public Facilities, and Services (completed)

	Project Activities	Potential Effects on Infrastructure, Public Facilities, and Services				
		Increased Demand for Housing and Accommodations	Increased Stress on Community Infrastructure and Services due to the Project Workforce	Increased Stress on Community Infrastructure and Services due to Project Activities	Increased Traffic Volumes and Effects on Public Road Infrastructure	Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works
Decommissioning and Closure	Dismantling of Ancillary Buildings	O	O	O	O	O
	Pit Lake Planning	O	O	O	O	O
	Site Road/Bridge Decommissioning	O	O	O	O	O
	Tailing Storage Facility Decommissioning and Reclamation	O	O	O	O	O
	Mine Rock Management Facilities Reclamation	O	O	O	O	O
	Fuel Storage and Filling Area	O	O	O	O	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	L	O
	General Wastes Transport, Storage, and Disposal	O	O	L	L	O
	Sewage Infrastructure and Disposal	O	O	L	L	O
	Laydown Areas and Storage Yards	O	O	O	O	O
	Power Transmission, Distribution	O	O	O	O	O
	Project Lighting	O	O	O	O	O
	Site Access, Security and Fencing	O	O	O	O	O
	Contact Water	O	O	O	O	O
	Non-contact Water	O	O	O	O	O
	Potable Water Treatment and Use	O	O	O	O	O
	Haul Truck Road	O	O	O	O	O
	Road use to the Project (Materials, Personnel, Supplies)	O	O	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	L	L
	Contracted Employment	O	O	O	L	L
	Taxation	O	O	O	O	O
Post Closure	General Site Inspections and Maintenance	O	O	O	L	O
	Contact Water	O	O	O	O	O
	Non-contact Water	O	O	O	O	O
	Road use to the Project (Materials, Personnel, Supplies)	O	O	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	L	O
	Contracted Employment	O	O	O	L	O

Notes:

O	*No interaction anticipated.*
L	*Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
M	*Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*
H	*Key interaction; warrants further consideration.*

8.1.4.2 Key Effects on Infrastructure, Public Facilities, and Services

Since one of the primary pathway of effects between the Project and Infrastructure, Public Facilities, and Services is population growth, before examining specific effects of the Project, this section presents Project-related population projections for the Construction and Operations phases. Baseline population projections for Kamloops and the TNRD are presented in Characterization of Infrastructure, Public Facilities, and Services Baseline Conditions above.

After the Project-related population projections, the following potential effects of the Project are discussed:

- Increased demand for housing and accommodations;
- Increased stress on community infrastructure and services due to the Project workforce;
- Increased stress on community infrastructure and services due to Project activities;
- Increased traffic volumes and effects on public road infrastructure; and
- Competition for labour may reduce availability of skilled workers and affect municipal works.

Project-Related Population Projections

Construction Phase

Table 8.1-12 presents the estimated non-local workforce during the Construction Phase. The local-hire percentage changes during each year of construction based on the construction demands. The percentage of workers hired locally is expected to be higher in Year 1 than in Years 2 and 3 because Years 2 and 3 will require a larger number of workers in the designated trades, for which local recruitment will be limited.[2] A more detailed discussion of local-hire percentages during the Construction Phase can be found in Section 2.7, Project Benefits and a more detailed discussion of the characteristics of the labour force in the LSA can be found in Section 7.2, Labour Force, Employment, and Training.

For the purposes of the assessment, it is assumed that since Construction Phase employment is short-term, non-local workers are unlikely to move to the LSA or RSA. A range of potential local hires is given below because there are a variety of factors at play, including KAM employment policies, the extent to which an EPCM contractor is used by KAM, and the availability of local workers. Based on trends in the mine construction industry, workers are expected to be predominantly male.

[2] The Project Construction Phase is defined as a two-year period for the purposes of the environmental assessment; however, the total period between the start of construction activities and plant commissioning is approximately three years (see Section 2.2.4). The Construction and Operations phases overlap. Since the magnitude of construction activities in the third year is much smaller than in the previous two years, the overlap does not influence the conclusions of many of the effects assessments. Since the assessment of Construction-phase effects on Infrastructure, Public Facilities, and Services is dependent on workforce numbers, which are from the assessment on Labour Force, Employment, and Training, the workforce during Construction will be divided into three years.

Table 8.1-12. Estimated Non-local Workforce during Project Construction

	Year 1	Year 2	Year 3
Estimated number of non-local workers[1,2]	231 to 425	648 to 950	305 to 465

[1] Derived from workforce estimate data provided by KAM (2014)
[2] Includes direct and contract employees.

Operations Phase

During the Operation Phase, the workforce will be smaller and therefore the number of in-migrating workers will be lower; however, non-local workers will likely bring their families with them and settle permanently in the LSA. Table 8.1-13 presents estimated in-migration related to direct Project employment, on average over the Operation Phase. Detailed discussion on the local hire scenarios is provided in Section 2.7 of Project Benefits.

Table 8.1-13. Estimated Total In-migration for Average Project Operations for Direct Employment – Employees and Families

Occupational Classification	Estimated Average Employment Positions[1]	Estimated In-migration for High Local-hire Scenario[2]	Estimated In-migration for Low Local-hire Scenario[3]
Direct Employment Total	468	338	551

[1] Derived from workforce estimate data provided by KAM (2014).
[2] Based on a high local-hire scenario of 74% for designated trades and 83% for non-designated trades and multiplied by the average family size in BC during the 2011 Census of Canada, 2.8.
[3] Based on a low local-hire scenario of 58% for designated trades and 69% for non-designated trades and multiplied by the average family size in BC during the 2011 Census of Canada, 2.8.

In addition to in-migration related to direct employment, the Project may also result in in-migration related to indirect and induced employment (Table 8.1-14). Direct employment includes positions at KAM, while indirect jobs are those that support the Project as suppliers or contractors not directly employed by KAM. Induced employment accounts for the additional positions that are a result of the money spent by direct/indirect employees in the community. To calculate the extent of indirect and induced employment created for each new Project position, employment multipliers are used. The multiplier, also called an employment impact ratio, presents the number of indirect and induced employment created in response to each direct employment position. The multiplier differs depending on whether or not a direct position is filled locally or by an in-migrating worker. The latter is higher because it is assumed that an individual who moves to fill a position will have a greater impact on spending in the community (Horne 2009).

The employment multipliers for Kamloops for the mining industry have remained fairly consistent between 1996 and 2006 (Horne 1999 qtd. in Sunderman 2003; Horne 2004, 2009). For direct, indirect, and induced employment with no migration, the employment multiplier is 1.73. For direct, indirect, and induced employment with migration, the employment multiplier is 2.03 (Horne 2009). To determine the employment multiplier for only indirect and induced employment, which is used in the tables below, the one direct employment position is subtracted from the ratio, leaving only

indirect and induced positions. It is assumed that these multipliers are conservative (0.73 and 1.03, respectively). As a community grows, the economy diversifies accordingly.

Table 8.1-14. Indirect and Induced Employment Created as Result of Direct Project Employment during Project Operation

	High Local Employment Scenario		Low Local Employment Scenario	
	Local Employees	In-migrating Employees	Local Employees	In-migrating Employees
Direct Project Employment (Jobs)	346	122	271	197
Employment Multiplier (indirect and induced jobs)	0.73	1.03	0.73	1.03
Indirect and Induced Employment Created (Jobs)	253	125	198	202
Total Indirect and Induced Jobs Created	378		401	

The second step, shown in Table 8.1-15, involves applying a range of possible in-migration to fill the indirect and induced positions created in response to the Project. The ranges were determined using the four following assertions:

- Indirect and induced positions will occur largely in the following sectors: retail, personal care services, hospitality, and professional and government services (e.g., education, municipal services, and healthcare).
- There will likely be more positions created in the retail, personal care services, and hospitality sectors than in professional and government services.
- Of those categories, positions in the retail, personal care services, and hospitality sectors will be more readily filled by workers in the LSA than positions in professional and government services.
- There is no specific evidence available regarding in-migration related to indirect and induced employment.

With these assertions in mind, it is assumed that between 10% and 30% of the indirect and induced positions will be filled by in-migrants (i.e., non-local workers) in the high local employment scenario, while between 30% and 50% of the indirect and induced positions will be filled in the low local employment scenario during the Operations Phase.

Once all the in-migrants are combined, there is a range of possible in-migration for Project-related in-migration to the LSA. The lowest expected number of in-migrants is 447 individuals. On the high end, 1,111 total in-migrants could be expected (Table 8.1-16). These figures include people filling direct, indirect, and induced positions, along with their family members.

Table 8.1-15. Total In-migration for Indirect and Induced Employment during Project Operation Employment

	High Local Employment Scenario		Low Local Employment Scenario	
	In-migrating Employees		In-migrating Employees	
Indirect and Induced Employment Created (Jobs)	378		401	
Percentage of In-migrating Employees	10%	30%	30%	50%
Number of In-migrating Employees	38	113	120	200
Average Family Size in B.C. (2011)	2.8	2.8	2.8	2.8
Total In-migration for Indirect and Induced Employment	106	318	337	561

Decommissioning and Closure Phase, and Post Closure Phase

There are no population projections for the Decommissioning and Closure or Post Closure phases because employment will decline and in-migration is not anticipated. The workforce is expected to gradually decrease as Project operations come to a close, and will continue to decrease throughout the Decommissioning and Closure Phase.

Table 8.1-16. High and Low In-migration for Direct, Indirect, and Induced Employment during the Operations Phase

	High Local Employment Scenario	Low Local Employment Scenario
	Total In-migration	Total In-migration
Direct Employment	122	197
Accompanying Family Members	219	353
Indirect and Induced Employment	38	200
Accompanying Family Members	68	361
TOTAL	447	1,111

Increased Demand for Housing and Accommodations

During the Construction and Operations phases of the Project, the non-local portion of the Project workforce will require housing and accommodations in the LSA, with a focus on Kamloops, which is the closest community to the Project. The aspects of housing and accommodations affected during each phase will be different due to the demographics of the non-local Project workforce during each phase and the duration of each phase. During construction, non-local workers are expected to work on the Project for periods of time ranging from a few weeks to multiple months, depending on the nature of work, and are unlikely to move to and settle in the LSA. Conversely, during operations, workers will be expected to commute to and from the Project daily; therefore, workers from outside

the LSA are expected to relocate with their families to the Kamloops or other communities in the LSA (i.e. within a reasonable commuting distance of the Project).

Construction Phase

The non-local workforce for the Construction Phase, which is expected to peak at between 648 and 950 non-local workers, is anticipated to make demands primarily on temporary and short-term accommodations. Construction contractors will be expected to find accommodations for their non-local employees. This will likely entail reserving blocks of hotel/motel rooms and potentially apartments/rental houses during the Construction Phase, and workers may use these facilities for varying lengths of time, or on rotation, depending on their duration of work on the Project.

Kamloops has approximately 3,000 hotel/motel rooms (City of Kamloops 2015b). In 2014, occupancy rates ranged from lows in the mid-30s percentage range during the winter months to a high of 81% in August. The rest of the summer months (i.e., June and July) had an average occupancy rate of 64.1% (Table 8.1-7). These rates were down from 2013 and occupancy rates so far in 2015 have generally been lower than in 2014 (Destination BC Corp. 2015a, 2015b). Using these rates, it is expected that during the summer months, which is when construction activities will likely peak, there will be between 1,077 rooms available (June) and 570 rooms available (August) in hotels and motels in the city. Based on these calculations, and considering the estimated maximum of 950 non-local workers at the peak of construction, it is possible that there will be fewer hotel/motel rooms available than required by the non-local workforce.

There are three potential effects that result from the increased demand for housing and accommodations: a potential effect on the City's ability to attract tournaments, a potential effect on the tourism market in general, and a potential decrease in housing affordability (and access to housing for vulnerable populations) if increased demand results in increased prices. Each effect will be discussed in turn.

Attracting Tournaments:

Kamloops has been branded as the "Tournament Capital of Canada" due to its capacity to host a wide variety of sports tournaments and other large-scale events. The key requirement of a municipality in attracting tournaments is the capacity to stage a successful event. Event planners look for organizational capacity and sufficient infrastructure (City of Kamloops and InterGroup Consultants 2012). Infrastructure would include venues, transportation infrastructure, and accommodations. For all but the large, multi-sport events, bids focus on participant accommodations. The City has the option, which it has used in the past, of housing participants at the TRU residences. Blocks of hotel rooms needed would be reserved at least a year in advance (McCorkell, pers. comm. 2015).

If Project construction contractors were to reserve blocks of rooms sufficient to accommodate the number of non-local workers anticipated in the low-local hire scenario during peak construction, there could be a shortage of hotel/motel rooms during the summer. This shortage could, in turn, impair the ability of Kamloops to attract and host tournaments during the summer of peak construction. Outside of the summer months, the market for hotel/motel rooms may be tight on occasion if there is a large tournament or other event, but it should otherwise be able to

accommodate the estimated in-migration. For example, in March 2014, Kamloops hosted the Men's Brier competition (Canadian Curling Association 2014). During that time, the occupancy rate was 57.8%, meaning that out of 3,000 rooms, 1,260 were still available during the month. This number of rooms would accommodate the non-local workforce during peak construction, based on the low local hire scenario.

Local Tourism:

In connection with tourism in general, Kamloops is often used as a stopover site for bus tours into the Rocky Mountains and the Rocky Mountaineer Rail Line, which offers service between Vancouver and the Rocky Mountains. A reduced availability of rooms could potentially affect the ability of tour lines to use Kamloops as a stopover location, although tour operators likely have pre-existing arrangements with the hotels they use. A high occupancy rate could affect independent travellers as well, as low vacancy levels could make it more challenging for people to visit and overnight in the community. Some travellers may opt for accommodations outside of Kamloops and/or in the various campsites and RV parks in and around Kamloops.

Housing Affordability:

A tight hotel/motel market may lead some contractors to turn to apartments and/or rental houses to accommodate workers during the Construction Phase. The use of rental units could, in turn, have an effect on affordable housing if the rental market were to become tighter. Affordable housing in Kamloops has been a municipal concern since at least the adoption of the Kamloops Social Plan in 2009, which notes that the city, like many other BC communities, has seen a reduction in rental housing stock. As building costs increase, rental housing is converted to private housing stock, with the result that new rental properties are not developed.

Certain segments of the population feel the impact of a lack of rental housing, and/or increased rental prices, more acutely than others. This includes "persons who are harder to house" (i.e. those whom landlords screen as being 'less suitable', including people dealing with addictions or mental illness), women and children, youth, and Aboriginal persons (Social Planning and Research Council of British Columbia 2009). There is also a notable "hidden homeless" population in Kamloops including people who lodge temporarily with friends or family, at hotels/motels, and in time-limited residential programs (Social Planning and Research Council of BC qtd. in ASK Wellness Society 2015). Municipal initiatives regarding housing include working with local developers and non-profits to facilitate the development of affordable housing and administering an affordable housing reserve fund; however, the City of Kamloops has no mandate to provide affordable housing (Mazzotta, *pers. comm.* 2015).

In general, it is not expected that the temporary construction workforce will have a direct effect on temporary supported housing, subsidized housing, or entry-level ownership. The first two are reserved for individuals who meet specific criteria (e.g., low income, individuals with disabilities) and entry-level ownership because it is unlikely that members of the construction workforce would purchase a house in Kamloops for seasonal or short-term employment. Of the types of affordable housing available in Kamloops, private market rentals are the type that could be most affected by Project Construction. Interviews conducted as part of the KPI Program note that one of the challenges to providing affordable housing is negotiating with landlords to dedicate rental units to

affordable housing, especially for individuals with barriers such as mental health and addictions challenges (Ajax KPI Program 2014-2015).

According to Canadian Housing and Mortgage Corporation (CMHC) data, as of April 2015, there were 3,341 rental dwelling units in Kamloops with a vacancy rate of 5.1% (CHMC 2015a). This means that there were approximately 170 vacant apartments as of April 2015. Some of the available units could likely house multiple workers (e.g., units with more than one bedroom). If contractors turn to rental housing to house a proportion of their workers, the increased demand could drive up rental rates as landlords attempt to take advantage of the increased demand for rental units. As a result of rental-rate increases, rental units could be less affordable for other renters.

There is literature supporting the adverse effects on housing by large resource extraction workforces (e.g., Goldenberg, et. al. 2010), although the contexts for these situations are different from the situation in Kamloops. Goldenberg, et al. (2010) discusses the difficulty in finding affordable housing in Fort St. John, which is a remote community that serves as a regional centre for BC's oil and gas industry. Closer to Kamloops, there are temporary housing shortages and increases in homelessness associated with a seasonal temporary influx of workers (e.g., tree planters) in Merritt (2011 population 7,113 [Statistics Canada 2013a]) (Ajax KPI Program 2014-15). Merritt is not as remote as Fort St. John but it is considerably smaller than Kamloops.

The demand for short-term and temporary accommodations during the Construction Phase could increase prices and make rent less affordable for some households seeking apartments or other rental units. Project-related use of hotels/motels could also affect the availability and pricing of these rooms, which could reduce the ability of the "hidden homeless" population to access these rooms for temporary use. While there are annual counts of the homeless (ASK Wellness Society 2015) and there has been an attempt at the enumeration of the hidden homeless population, it is difficult to predict the number of persons potentially affected in terms of access to affordable housing.

Operations Phase

While the non-local workforce during the Construction Phase is expected to be transient, the non-local workforce during the Operations Phase is expected to relocate to Kamloops since the Operations Phase will last 23 years. Due to this distinction Project-related in-migration during the Operations Phase is not expected to affect short-term and temporary accommodations. Instead, it would be expected to affect the rental and housing markets in the LSA and in particular in Kamloops. In terms of workers relocating to Kamloops between 121 and 197 non-local direct employees are expected to be employed on the project. In addition to direct employment, indirect and induced employment may require additional non-local workers to relocate to Kamloops. As a result of direct, indirect, and induced employment, up to 397 workers plus families are expected to in-migrate. If every household decided to purchase a home, 397 houses would be required in the LSA. Depending on when new workers arrive with their families, this could create a short-term increase in the demand for housing. The short-term increase in demand could affect the availability and affordability of housing in the LSA and Kamloops as the number of houses on the market decrease and prices increase.

Based on recent statistics from the Kamloops and District Real Estate Association, a short-term increase in demand for housing is not anticipated to affect the supply of houses or the overall affordability in the LSA, including Kamloops. There were 2,117 active residential listings at the end of June 2015. This is a decrease of 100 units when compared with the previous year (KDREA 2015a). The active residential listings include single-family homes (residential, waterfront; residential; and house and acreage) and multi-family homes (condos, multiplexes, and mobile homes) (KDREA 2015b). The Kamloops and District Real Estate Association does not track statistics for communities outside the LSA, such as Ashcroft and Logan Lake, where some workers may decide to live. In addition to the available units for sale, CMHC data on housing starts and dwelling completions demonstrate that housing stock in the Kamloops area is increasing.[3] Two hundred thirty-four single detached units were completed in 2013 and 251 were completed in 2014. Housing starts also increased between 2013 and 2014 with 219 starts for single detached units in 2014 and 281 in 2014. When the number of available residential units for sale (i.e., approximately 2,000 units), the consistent rate of housing starts and completion (i.e., approximately 200 units in recent years), and the availability of rental units are considered, the in-migrating workforce is expected to be sufficiently provided for. Therefore, the Project workforce during the Operations Phase is not expected to have an adverse effect on housing in the LSA, either on its affordability or its availability.

Increased Stress on Community Infrastructure and Services due to Project Workforce

The Project workforce is anticipated to place additional pressures on community infrastructure and services during the Construction and Operations phases, although the effect is expected to be different in each phase due to the nature of the in-migration, including workforce demographics. Each phase will be discussed separately.

Construction Phase

During the Construction Phase, the temporary workforce could create stress on municipal emergency services and healthcare services. Potential effects related to pressures on healthcare services are described in Section 10.7, Community Health and Well-being. Other community infrastructure and services (including education and recreation) are not expected to be affected as described in Section 8.1.4.1. Therefore, this section focuses on potential effects on emergency services, specifically policing.

Table 8.1-15 presents the estimated non-local workforce required to meet Project construction needs. The rationale for the estimated local and non-local workforce estimates is discussed in greater detail in Section 2.7 (Project Benefits). While a breakdown of workforce requirements by month or quarter is currently unavailable, the total number of workers required will likely fluctuate over the course of the year, with more workers likely required in summer.

[3] Housing data from the CMHC is for the Kamloops Census Agglomeration (CA), which includes Kamloops, Chase, the Kamloops 1 IR, Logan Lake, Sahhaltkum 4 IR, Sun Peaks Mountain, the TNRD-J, the TNRD-P, and Whispering Pines 4 IR.

The potential for temporary and non-local workers during the Construction Phase to have adverse interactions with local communities during resource-related developments has been documented (see Section 10.7, Community Health and Well-being). These adverse interactions tend to be fueled by disposable income, unstructured free time, and the absence of interpersonal connections with residents of the communities closest to the work site. Disposable income may support socially irresponsible spending, e.g., spending on alcohol, drugs. Unstructured free time may lead to adverse interactions and illegal activities because the worker has no other plans and the opportunity presents itself. The lack of social connection or accountability with the community removes a potential inhibitor to poor behaviour because social ramifications are reduced. Behaviours may include partying, alcohol and drug use, violence, and solicitation of prostitution. These behaviours can result in increased demand on local policing services to manage and/or respond to incidents. Potential health effects associated with these behaviours (e.g., as a result of increased alcohol and drug use and sexually transmitted infections), including implications for health services, are assessed in Section 10.7, Community Health and Well-being.

Kamloops is neither remote nor dependent on resource extraction, which suggests that the construction workforce may not have as substantive an impact on police services. The city's location suggests that many of the shortages and difficulties remote communities face, including housing shortages and difficulties retaining service providers, may not have as great an impact on Kamloops. Also, there are more opportunities for recreational activities in the area, including fishing, hiking, and mountain biking close to or in the community, which may attract workers. Further, Kamloops also offers a suite of amenities often not found in remote communities that will attract workers (e.g., movie theatres, restaurants and lounges, shopping).

While the RCMP's Kamloops City Detachment provides a high level of service, the average case load size of its officers in 2013 was one of the higher ones for communities with municipal RCMP detachments and populations of over 15,000, and the city's crime rate was higher than the provincial average (Table 8.1-8). In addition, the Kamloops City Detachment faces the same systemic capacity issues that municipal and provincial police forces across the country currently face. This capacity issue is caused by a series of overlapping factors, which include attrition through retirement, officers on leave for a variety of reasons, and competition among various law enforcement forces for limited human resources (Learned, *pers. comm.* 2015).

In terms of needing to expand capacity, population growth is only one factor, which means that a temporary influx of workers may not necessarily require more RCMP officers. When decisions are made regarding capacity, other factors taken into consideration include the overall calls for service, the types of calls for service being received because different calls make different demands on RCMP resources, and expanding program requirements that are either legislated externally or mandated internally (Learned, *pers. comm.* 2015).

Some of the conditions that tend to promote illegal activities by the workforce on resource development programs will be present; for example, a young, primarily male workforce many members of which will have no connection with Kamloops. Some conditions, however, will not be present; Kamloops is not remote and it offers a wide variety of amenities (e.g., movie theatres, recreational activities). The location and size of Kamloops are expected to minimize some of the

stress placed on the municipal RCMP detachment, but it is still anticipated to place additional demands on the detachment's capacity.

Operations Phase

Potential effects on policing and emergency services are not expected during the Operations Phase as the workforce will be composed of existing community members along with people (i.e. workers and their families) who move to the community in order to obtain employment or other opportunities related to the Project. As such, the workforce will have social ties to the community and the behaviours described above for the Construction Phase are not anticipated to occur. Consequently, a potential effect on local policing services during the Operations Phase is not identified.

The Operations Phase workforce may result in increased demand for, and stress on, healthcare services in the LSA. These potential effects are assessed in Section 10.7, Community Health and Well-being.

Increased Stress on Community Infrastructure and Services due to Project Activities

The Project will make use of municipal landfill and water treatment facilities to properly dispose of non-hazardous solid and liquid waste. The Construction and Operations phases are expected to generate the most waste, while the Decommissioning and Closure and Post-closure phases are expected to generate a negligible amount of waste (as shown in Table 8.1-11) due to the reduction in activities and staff.

Since the nature of the impact is the same for the Construction and Operations phases, these phases are described together, and the following discussion is divided based on the Project's use of solid waste (i.e. landfill) and wastewater management facilities.

Solid Waste Management

The solid waste management infrastructure for the Project will be established at the onset of the site preparation and construction activities and consists of a waste sorting and transfer facility and a secure hazardous waste storage and transfer facility. Recyclable non-hazardous, combustible and non-combustible waste will be stored in dedicated waste storage facilities located at the Project. Although specific waste storage and transfer locations have not been identified at this time, in general these facilities will be located within the mine site and in proximity to waste generators (i.e., process plant, truck shop and administration buildings). The Project will have both indoor and outdoor storage, and waste will be segregated and stored according to its susceptibility to exposure to the elements prior transport to an appropriate recycling or disposal facility.

For the purposes of this assessment, domestic waste is defined as putrescible (e.g., food waste and packaging) and certain non-putrescible waste (e.g. paper, cardboard, glass and plastic) that will be generated by on-site personnel. KAM currently expects to use the Mission Flats Landfill in Kamloops for the disposal of domestic waste that is not recyclable, which will includes domestic wastes including food, food containers, and packaging. Table 8.1-17 provides estimates of the quantity of domestic wastes that the Project expects to generate and dispose of at the Mission Flats Landfill.

The estimated waste tonnages are conservative as the values do not account for the implementation of waste diversion strategies to reduce the amount of waste landfilled. Diversion strategies for domestic waste will include recyclable materials such as paper, paperboard, glass, and plastic. Diversion strategies will also encompass commercial waste such as wood, heavy plastics, rubber, tires, and scrap metal (ferrous and non-ferrous).

Table 8.1-17. Estimated Annual Project Domestic (Putrescible) Waste Production, Construction and Operations

Activities	Duration	Total per Phase (Metric Tonnes)	Average Annual Domestic Waste (metric tonnes)	Monthly Average (metric tonnes)
Construction	2.5 years (Year -2 to 1)	2,700	1,080	90
Operations	23 years (Year 1 to 23)	16,800	730	61

Notes:
Estimates for domestic waste only; other wastes will be diverted from municipal land fill as required (hazardous wastes, recycling, scrap metal and wood, plastics, tires, etc.)
Annual and monthly domestic waste produced will vary based on personnel on site

The City of Kamloops is currently completing a design and operation plan for the Mission Flats Landfill, which is expected to be in operation until at least 2053. Initial talks between KAM and the City regarding the Project use of the municipal landfill have indicated that the additional waste produced by the Project that will be disposed of at the landfill will not substantially alter its capacity and/or shorten its current lifespan. KAM will enter into a service agreement with the City with respect to the Project's use of the landfill facility.

Wastewater Management

KAM is planning on using municipal wastewater treatment facilities for disposal of sewage sludge. Raw sewage will be treated on-site. The treatment process will produce liquid effluent and sludge. Treated water will ultimately be recycled in the plant on site without discharge to the receiving environment and sewage sludge disposed of off-site. The sewage sludge will be trucked to municipal sewage lagoons operated by the City of Kamloops. Estimates of the quantity of sewage sludge that the Project expects to generate and dispose of in the municipal sewage lagoons are shown in Table 8.1-18.

Table 8.1-18. Estimated Sewage Sludge Volumes for the Project, Construction and Operations

Activities	Duration	Sewage Sludge (tonnes)	Daily rate(kg)
Construction	2.5 years (year -2 to 1)	550	600
Operations	23 years (year 1 to 23)	2,435	290

Notes:
Sewage sludge production rate assumes 0.75 kg/day/person and estimated number of personnel on site.
Construction estimate assumes average rate of 600 kg/day however this will vary between 200 kg/day (construction start) and 900 kg/day (peak labour).

The City of Kamloops recently upgraded its wastewater treatment facilities, which are expected to be able to accommodate population growth through 2031. Initial talks between KAM and Kamloops

regarding the Project use of the City's wastewater treatment facilities have indicated that the additional waste produced by the Project can be accommodated by municipal facilities.

Increased Traffic Volumes and Effects on Public Road Infrastructure

Potential effects of the Project on traffic volumes (for roads and intersections) are summarized below, followed by discussion of potential effects related to the closure of a 6 km segment of Goose Lake Road. Potential Project effects on collision and accident incidences are discussed in Section 10.7, Community Health and Well-being.

Traffic Volumes

Increases in traffic volume over the life of the Project, particularly during the Construction and Operations phases, could affect the quality and safety of interchanges and roadways. A traffic impact assessment (TIA; Appendix 8.1-A) was conducted to assess the traffic impacts of the Project on the existing road network, analyze potential safety issues, develop typical road design schematics for the access roads to the mine site, and identify mitigation measures to address any impacts (Opus International 2015). The traffic consultant worked with the City of Kamloops and MoTI for the study design via development of a comprehensive Terms of Reference for the TIA. The study locations for the TIA included: Highway 5; Lac le Jeune Rd; Goose Lake Rd; the proposed intersection of Lac Le Jeune Road and the proposed Ajax Mine Access Road; and Highway 5 interchanges including the Inks Lake Interchange and the Copperhead Interchange.

During the Construction Phase, potential effects on the transportation network may stem from increased vehicular traffic associated with the delivery of materials, equipment and construction personnel to the Project. Access plans for the Project require the construction of a new Inks Lake Interchange on Highway 5. Prior to the completion of the Inks Lake Interchange upgrades, local access will be temporarily routed via the Copperhead Interchange and Lac le Jeune Rd. During this period, heavy loads will access the site from the south via the Walloper Interchange and Lac Le Jeune Rd. During the Operations Phase, the effects on the transportation network will also include truck traffic transporting concentrate to Port Metro Vancouver, for which the transportation routes travel through the RSA. The Decommissioning and Closure and Post-closure phases were not included in the TIA as traffic during these phases will be minimal.

Table 8.1-19 includes traffic volume for study area road segments over four horizon years and the percentage of change over baseline conditions. Traffic volumes are provided for base conditions. For the purposes of this study, the "base" condition refers to existing (i.e., pre-Project) background traffic plus the anticipated effects of other developments and population growth that is projected to happen in the area regardless of the proposed Project. The "total" condition refers to the sum of base conditions plus Project-generated trips. The horizon years for assessing base and total conditions' capacity were determined by Kamloops and MoTI, and include the following years representing different periods of Project activities:

- 2016: Construction Phase horizon year. Access will be provided through existing road network (under a temporary access plan) prior to the planned upgrade of the Inks Lake Interchange.

- 2018: Peak Construction Phase horizon year. Access plans assume that upgrades to the Inks Lake Interchange are complete.
- 2024: Typical Operations Phase horizon year.
- 2039: Long-term Operations Phase horizon year.

Table 8.1-19. Forecast of Total Traffic Volumes for Construction and Operations Phases[1,2,3,4]

Road	Segment	Direction	# Lanes	Total Volumes			
				2016	2018	2024	2039
HWY 5	Ironmask Interchange to Copperhead Interchange	Eastbound	3	7,658 (+0.0%)	9,408 (+20.0%)	8,741 (+3.8%)	10,392 (+3.1%)
		Westbound	3	7,658 (+0.0%)	9,408 (+20.0%)	8,741 (+3.8%)	10,392 (+3.1%)
	Inks Lake Interchange to Ironmask Interchange	Northbound	2	4,946 (+0.0%)	6,733 (+32.7%)	5,775 (+6.1%)	6,841 (+5.1%)
		Southbound	2	4,946 (+0.0%)	6,722 (+32.7%)	5,775 (+6.1%)	6,841 (+5.1%)
	Walloper Interchange to Inks Lake Interchange	Northbound	2	4,946 (+0.0%)	5,254 (+3.7%)	5,550 (+1.1%)	6,566 (+0.9%)
		Southbound	2	4,946 (+0.0%)	5,254 (+3.7%)	5,550 (+1.1%)	6,566 (+0.9%)
Lac le Jeune Rd	Sugarloaf Rd to Ajax Mine Access Rd	Northbound	1	944 (+76.4%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)
		Southbound	1	679 (+151.5 %)	390 (+0.0%)	419 +0.0%)	501 (+0.0%)
	Ajax Mine Access Rd to Goose Lake Rd	Northbound	1	538 (+0.6%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)
		Southbound	1	273 (+1.1%)	390 (+0.0%)	419 +0.0%)	501 (+0.0%)
Ajax Mine Access Rd (new road)	Lac le Jeune Rd to Project Site	Eastbound	1	412 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)
		Westbound	1	412 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)
	Highway 5 to Lac le Jeune Rd	Eastbound	1	0 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)
		Westbound	1	0 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)

Source: Opus International 2015.

[1] 2016 year was chosen to reflect use of the temporary access plan; and 2018 is a typical year under the primary access plan during construction. Years 2024 and 2039 represent operation phase horizon years, taking into account shift staggering, buses and car pooling.

[2] Based on 400 total personnel working at site at any one time in 2016, increasing to a maximum of 1,800 during the 2018 year.

[3] Based on assumption that all heavy vehicles enter in the AM peak and all leave in the PM peak.

[4] Based on operation estimates of 580 permanent staff being on site during any typical operation year, with 2/3 working shifts and 1/3 on their time off.

The TIA also predicted effects on traffic through intersections, including the intersection of Pacific Way/Hugh Allan Drive, and the roundabout at the intersection of Hugh Allan Drive/Versatile Drive. Increased traffic volumes at intersections could affect the level of service (LoS) for travel in one or more directions. Levels of service range from A to F with A representing free-flow traffic with minimal delays and F representing demand (i.e. traffic volumes) that exceeds the capacity of the intersection. When demand exceeds capacity, drivers will need to wait, sometimes for more than one signal cycle to move through an intersection.

According to the TIA, total traffic volumes at the peak of Project construction (in 2018) are expected to have an adverse effect on the traffic flows at the Inks Lake Interchange and at the intersection of Lac Le Jeune Rd and Ajax Mine Access Road. The effects are expected to be concentrated at these sites during this year because traffic accessing the Mine Site from all directions will meet at the Inks Lake Interchange and travel through the Lac le Jeune and Ajax Mine Access Road intersection.

Intersection traffic may also be affected in certain locations. Traffic through the Pacific Way/Hugh Allan Drive, Versatile Drive/Hugh Allan Drive, and Frontage Road/Copperhead Drive intersections may be delayed during peak hours in 2016. The roundabout at the intersection of Versatile Drive and Hugh Allan Drive, was noted in the baseline as having a low LoS, and would continue to have a low LoS in 2018 as the Project would exacerbate the pre-existing capacity constraints. The Project is expected to have minimal effects on traffic during the Operations Phase (years 2024 and 2039) compared to the base case.

Goose Lake Road Closure

The Project will also result in the permanent closure of approximately 6 km of Goose Lake Road. Goose Lake is within the footprint of the proposed Tailings Storage Facility (TSF) and accessed by Goose Lake Road. The TIA examined the effects of closing this segment of Goose Lake Road as the road will no longer connect Highway 5a with Highway 5 via Lac Le Jeune Road. The TIA indicates that closure of Goose Lake Road will require approximately 50 vehicles per day to use other routes in the network. Since the traffic volumes on Goose Lake Road are relatively limited, the displaced traffic is not anticipated to have a substantive impact on the road network.

Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works

The City of Kamloops and the TNRD have expressed concern that the labour force requirements of the Project could lead to increased competition for local skilled workers and consultants, which could affect municipal works if the City is not able to hire contractors or consultants to complete its projects. Consequently, the City may find it more difficult to maintain its infrastructure or expand infrastructure to meet growing demand.

This potential effect could be experienced during both Project construction and operations, although the effect is expected to be more pronounced during the Construction Phase, especially during peak employment. At the peak of construction, the Project will require a higher proportion of designated trades in its workforce (Section 2.7.3 presents a more detailed analysis of Project workforce requirements and assumptions regarding local versus no-local workforce composition). Designated

trades typically require at least three years of classroom and practical training and include carpenters, steelworkers, electricians, and pipefitters.

According to Venture Kamloops's 2013 *Business Retention and Expansion* study, over half of the businesses surveyed were very satisfied, satisfied, or neutral about the availability of qualified personnel, although over 20% of the businesses surveyed reported to be dissatisfied in this regard. While this study did not canvas government, it can be used to provide a snapshot of the current labour market in Kamloops. According to the same study (Venture Kamloops 2013), the other category of workers for which hiring is difficult is "other," which suggests that businesses are having difficulties hiring individuals with highly specialized skills and professional designations. Despite this shortage, over half the businesses surveyed were planning on expanding. The intent of businesses in the Kamloops area to expand suggests that these issues can be resolved.

Since the study, Venture Kamloops reports that the consultant market in Kamloops is saturated. In other areas, increased demand for contractors will present smaller operations with the opportunity to expand (Ajax KPI Program, 2011-2012, 2014-2015), which could help minimize any constraints faced by the City to hire qualified contractors and consultants. In addition, the skills required to maintain and expand municipal and regional infrastructure may not overlap directly with the skill required for Project-related work.

During the Operations Phase of the Project, there is the potential for the City of Kamloops to encounter similar labour shortages that could affect public infrastructure, although the effect is expected to be less than during construction. The difference is due to the duration of operations (23 years) as opposed to construction (two years) and the composition of the Project workforce in both phases. The majority of employment during operations is expected to be in the non-designated trades, which may require training, but will require less than positions in the designated trades and engineering and technical classifications (see Table 2.7-5 in Project Benefits for details). The engineering and technical positions in the Project workforce should not overlap with the needs of either Kamloops or the TNRD. Therefore, the potential for the Project to reduce the availability of skilled labour during operations should be less than during the Construction Phase.

8.1.4.3 Mitigation Measures for Infrastructure, Public Facilities, and Services

Mitigation measures that minimize potential adverse effects on Infrastructure, Public Facilities, and Services are described below. To address the fact that many of the effects are influenced by broader economic circumstances, future hiring patterns, and other uncertainties, many of the mitigation measures for potential social effects involve ongoing dialogue with potentially affected parties to facilitate monitoring and adaptive management.

<u>Increased Demand for Housing and Accommodations</u>

The extent of effects during the Construction Phase is difficult to predict as contractors will be responsible for finding accommodations for their non-local workers; however, KAM will provide the following mitigation measures during the Construction Phase:

- Before construction begins, KAM will complete and implement a Project Recruitment Strategy (See Section 7.2, Labour Force, Employment, and Training) to maximize local hires and reduce the number of non-local workers.
- Before construction begins, KAM will form an advisory committee comprising representatives from the City, the TNRD, social service providers, and other relevant organizations to discuss potential issues and solutions. This will include issues related to potential increases in rental prices and/or low vacancy levels that could make it more challenging for some households to find and retain suitable accommodation, as well as monitoring of local conditions in order to proactively address issues such as potential increases in homelessness. Given the relatively short time period for the Construction Phase and therefore the need to address challenges quickly, meetings will take place frequently.
- Before and throughout the Construction Phase, KAM will maintain an ongoing dialogue with the relevant organizations (e.g., Tourism Kamloops, the City in connection with Tournament Capital of Canada) to inform them of the Project's workforce requirements and timing.
- Before construction begins, KAM will discuss potential accommodation requirements and alternatives with relevant construction contractors and develop a Construction Phase Workforce Accommodation Plan. Local accommodation providers (e.g. hotels, developers, and related businesses) will be engaged to discuss their capacity to meet the Project's needs. If private sector ventures express an interest in developing Project-specific accommodation services on top of what is already present in the community, KAM will explore these options in consultation with relevant stakeholders (e.g., the City, social service providers, construction contractor). The Workforce Accommodation Plan will also include an evaluation of potential community concerns that could arise from the selected accommodation option, means of mitigating these concerns, and a plan for communication and engagement with relevant stakeholders.

No mitigation measures are proposed for the Operations Phase as the available housing stock in the LSA is considered sufficient to meet the potential demands of the workforce, and CMHC data shows that the housing stock in the LSA is increasing. As discussed in Section 8.1.4.2, no effects on housing affordability or availability are anticipated during the Operations Phase.

Increased Stress on Community Infrastructure and Services due to Project workforce

As described in Section 8.1.4.1, potential effects of the Project workforce on local infrastructure and services could occur during the Construction Phase, and are associated with potential behaviours of non-local construction workers which could increase demands on the municipal RCMP detachment in Kamloops. During the Construction Phase, KAM will provide the following mitigation measures:

- Before construction begins, KAM will complete and implement a Project Recruitment Strategy (See Section 7.2, Labour Force, Employment, and Training) to maximize local hires and reduce the number of non-local workers.

- Before construction begins, KAM will form an advisory committee comprising relevant representatives from the City of Kamloops, the TNRD, and service providers to discuss potential issues and solutions.
- Before and during the Construction Phase, KAM will engage in ongoing dialogue with potentially affected service organizations (e.g., RCMP) to inform them of workforce requirements.
- Before construction begins, KAM will develop a Code of Conduct for Project workers, including direct employees and contractor employees. The Code of Conduct will describe the expected behaviours of Project workers both on and off the job. The Code of Conduct will be a required part of the site orientation for all workers, and both direct and contractor employees will be required to acknowledge that they have been informed of and will comply with the Code of Conduct.
- KAM will facilitate recreational opportunities for Project workers, including direct employees and contractor employees. Recreational opportunities may include discounts at recreational facilities and organizing teams in recreational sports leagues. Arrangements will be made before construction begins.

No potential effects on policing services are expected during the Operations Phase as workers will be based locally and accountable as part of the community. Mitigation measures for potential stress on healthcare services in the LSA during the Construction and Operations phases of the Project are discussed in Section 10.7, Community Health and Well-being.

Increased Stress on Community Infrastructure and Services due to Project Activities

KAM plans to use the municipal landfill for disposing of domestic waste and will use the municipal water treatment facilities for disposing of sewage and greywater. Discussions with the City of Kamloops are in progress and the City has indicated that the landfill and water treatment facility will be able to accommodate Project waste. For use of both facilities, KAM will negotiate service agreements with the City to ensure that municipal infrastructure can accommodate Project waste.

Increased Traffic Volumes and Effects on Public Road Infrastructure

The TIA and Traffic Management Plan prepared by Opus International (2015) propose a variety of mitigation measures to reduce the potential effects of Project-related traffic during the Construction and Operations phases. For a complete list, please see Appendix 8.1-A and Section 11.20, Transportation Management Plan. Key mitigation measures include:

- Implementing carpooling incentives during construction and operations to increase the base car-pooling rate from 7% (the estimated rate of carpooling in Kamloops in 2011; Opus International, 2015) to 15%.
- Providing workforce personnel shuttles from key locations within the city to the Project Site to reduce personal vehicle traffic during construction.
- Staggering shifts during the Construction Phase and, to a lesser extent, during the Operations Phase to reduce traffic during AM and PM peak traffic periods.

- Improving signage on Lac le Jeune Rd and proportionate improvements to road infrastructure of Lac le Jeune Rd.

In addition, access plans for the Project require the construction of a new Inks Lake Interchange on Highway 5. The completion of these upgrades will reduce the effects of Project-related traffic on the Copperhead Interchange and Lac le Jeune Road, and represent an overall improvement for the road network.

Due to the low volume of traffic recorded on Goose Lake Road and the fact that users of Goose Lake Road can use other roads within the local network, no mitigation related to the closure of Goose Lake Road in connection with traffic impacts is currently proposed.

Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works

Ongoing communication and monitoring of changing circumstances, including any challenges of the City or TNRD in retaining skilled and qualified professionals to undertake municipal works, are the focus of mitigation for this effect, including the following measures:

- Before construction begins, KAM will form an advisory committee comprised of relevant representatives from the City, the TNRD, and Venture Kamloops to discuss potential issues and solutions (see further discussion in Section 11.29).
- Before and throughout Construction and Operations, KAM will engage the City of Kamloops and TNRD to inform them of Project workforce requirements and timing.

8.1.5 Residual Effects and Their Significance

8.1.5.1 Summary of Residual Effects

Residual effects are those Project effects that remain after mitigation is applied. This section describes in greater detail the post-mitigation effects for the Infrastructure, Public Facilities, and Services VC, which are summarized in Table 8.1-20. Some effects are expected to be adequately mitigated and not result in a residual effect, in which case this is explained below.

Increased Demand for Housing and Accommodations

During peak Construction, between 648 and 950 non-local workers are expected to work on the Project. Contractors will likely rent out blocks of rooms for the duration of the Construction Phase to accommodate their workers in the short term or on rotation. While this is not expected to stress the capacity of temporary and short-term accommodations during the winter months, demand for hotel/motel rooms in Kamloops could outstrip supply during the summer.

A short-term demand for worker accommodation is unavoidable and, even with mitigation measures in place, Project-related use of hotel/motel rooms to accommodate construction workers could affect local tourism (including tourists' access to rooms and/or the ability of the City of Kamloops to attract tournaments and events to the city) particularly during the summer months when both construction- and tourism-related demands are expected to peak. In addition, potential

increases in rental prices and/or low vacancy levels that could make it more challenging for some households to find and retain suitable accommodation.

During the Operations Phase, no mitigation measures have been proposed outside of monitoring because the housing stock around Kamloops is expected to be sufficient to house the in-migrating workforce.

Increased Stress on Community Infrastructure and Services due to Project Workforce

The temporary Construction Phase workforce—expected to be predominantly male, with disposable income and limited ties to the local community—could engage in behaviours that may place strain on policing services. As discussed in Section 8.1.4.2, experience with other mining projects (as documented in academic literature) indicates that a workforce of this nature can be prone to engaging in activities related to partying, alcohol and drug use, violence, and solicitation of prostitution. Mitigation measures, including the code of conduct, and facilitating the workforce in engaging in recreational activities, is expected to reduce the extent of socially irresponsible spending and behaviours, and reduce demands on the services of the Kamloops RCMP detachment. However, as the caseload for the Kamloops City Detachment is relatively high and the crime rate is higher than the provincial average, a potential residual effect is conservatively predicted in terms of increased pressure on emergency services.

Increased Stress on Community Infrastructure and Services due to Project Activities

No residual effects are expected related to the Project use of municipal landfill and wastewater facilities. The City has not expressed concern regarding accommodating solid waste, and sewage sludge from the Project and KAM is in the process of negotiating service agreements with the City to ensure that its facilities can accommodate Project-related waste.

Increased Traffic Volumes and Degradation of Existing Road Infrastructure

The following residual effects of the Project on transportation network performance are predicted after the implementation of mitigation measures (Opus International 2015):

- **Construction 2016:** The introduction of Project-generated traffic in 2016 during the Construction Phase, with mitigation measures in place, will have minimal effects on the road network as compared to the base condition, with the exception of potential delays for westbound traffic (through traffic and left-turns) at the Pacific Way/Hugh Allan Drive intersection.
- **Construction 2018:** The mitigation measures and newly constructed Inks Lake Interchange will ensure acceptable conditions at all intersections, with one exception. Conditions at the Versatile Drive/Hugh Allan Drive roundabout, which has a low Level of Service in the base case, will be slightly exacerbated by Project traffic at the peak of construction.
- **Operations 2024 and 2039:** The introduction of Operations Phase Project-generated traffic during 2024 and 2039, with mitigation measures in place, will result in minimal effects on the transportation network as compared to the base conditions for these years.

Table 8.1-20. Summary of Residual Effects on Infrastructure, Public Facilities, and Services

Potential Effect	Project Phase	Project Component	Description of Cause-Effect	Description of Mitigation Measure(s)	Description of Residual Effect
Increased demand for housing and accommodations	Construction	Contracted employment; direct staffing	Temporary in-migration of non-local construction workers may increase demand for temporary and short-term accommodations, including hotel/motel rooms. Decreased vacancy levels could make it more difficult for tourists or tournaments/events to access rooms in the city. Increased demand could also lead make it difficult for vulnerable households to find and retain affordable housing.	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, and other stakeholders to discuss potential issues and solutions related to workforce housing. • Ongoing dialogue with the City and service organizations (e.g., Interior Community Services) to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city. During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.

Potential Effect	Project Phase	Project Component	Description of Cause-Effect	Description of Mitigation Measure(s)	Description of Residual Effect
Increased stress on community infrastructure and services due to Project workforce	Construction	Contracted employment; direct staffing	Temporary in-migration of non-local construction workers may place additional demands on community infrastructure and services	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with service organizations (e.g., RCMP) to inform them of workforce requirements. • Code of Conduct for direct and contractor employees to govern behaviour on and off the job. • KAM will facilitate recreational opportunities in Kamloops for direct and contract employees.	Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.
Increased stress on community infrastructure and services due to Project activities	Construction, Operations	Generation of solid and liquid waste	Management and disposal of solid and liquid waste at the mine site may stress the capacity of municipal landfill and wastewater treatment facilities	• KAM will negotiate service agreements with the City related to the Project's use of municipal infrastructure.	No residual effect.

Potential Effect	Project Phase	Project Component	Description of Cause-Effect	Description of Mitigation Measure(s)	Description of Residual Effect
Increased Traffic Volumes and Effects on Public Road Infrastructure	Construction, Operations	Direct staffing; contracted employment; Waste transport; sewage transport; hazardous waste transport; concentrate transport	Project-related traffic may increase congestion and alter traffic flows on public roads used by Project.	• Implementing carpooling incentives during Construction and Operations. • Providing workforce personnel shuttles from key locations within the City to the Mine Site during construction. • Staggering shifts during the construction phase and, to a lesser extent, during the Operations Phase. • Improved signage for Lac le Jeune Rd. • Proportionate road infrastructure improvements to Lac le Jeune Rd.	Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.
Competition for labour may reduce availability of skilled workers and affect municipal works	Construction, Operations	Direct employment, contracted employment	Wage competition may attract skilled workers to the Project and reduce availability of skilled labour for municipal works in LSA.	• Forming an advisory committee comprised of relevant representatives from the City and the TNRD, services, and organizations to discuss potential issues and solutions regarding planning and coordination of construction/ engineering projects. • Ongoing dialogue with the City and the TNRD to inform them of workforce requirements.	Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.

Additional details regarding the predicted LoS at each intersection described above are provided in the TIA, which is included as Appendix 8.1-A (Opus International 2015).

Competition for Labour May Reduce Availability of Skilled Workers and Affect Municipal Works

While the extent of the effect is difficult to determine, ongoing dialogue between KAM and the appropriate level of government will help with municipal and regional infrastructure planning. However, if there is a shortage of appropriately skilled workers, some projects could be deferred by up to a year.

8.1.5.2 Criteria for Characterization of Residual Effects

Residual effects are characterized using the following standard criteria: magnitude, duration, frequency, geographic extent, reversibility, resiliency, and social value. The definitions of these terms for the assessment of Project effects on Infrastructure, Public Facilities, and Services is outlined Table 8.1-21, Definitions of Characterization Criteria for Residual Effects on Infrastructure, Public Facilities, and Services.

8.1.5.3 Characterization of Residual Effects

There are five anticipated residual effects of the Project on Infrastructure, Public Facilities, and Services (Table 8.1-20). Below, these effects are characterized using the criteria defined in Table 8.1-21, and a summary of all effects and criteria is provided in Table 8.1-22.

Accommodation of the workforce may increase hotel/motel occupancy rates and could constrain tourism

Demand for temporary and/or short-term accommodations is expected to peak during peak construction employment (Year 2) when there is the potential that up to 950 non-local workers will require accommodations. Kamloops has approximately 3,000 hotel/motel rooms, which contractors are expected to reserve in blocks and then have workers cycle through. According to the occupancy rates for 2014 prepared by Destination BC (2015), the occupancy rate in Kamloops ranges between mid- to upper 30% during the winter and above 60% during the summer, with August 2014 having an occupancy rate of 81%. In 2014, during the winter months, there were between 1,800 and 1,900 vacant rooms, but during the summer there were between approximately 500 and 1000 vacant rooms. If the non-local construction workforce is accommodated in hotel/motel rooms during the peak summer months, the Project could contribute to low vacancy levels that could affect the ability of tourists to find accommodation in the community, and could constrain the ability of the City to attract tournaments and other events during these months

After peak construction, the workforce is expected to decrease in size over the following 6 months to between 425 and 465 non-local workers, and there are expected to be a sufficient number of hotel/motel rooms to accommodate these workers.

- **Magnitude:** Demand for accommodations during peak construction could, at times, outstrip supply. Dialogue with the City and Tourism Kamloops, and coordinated planning with the

construction contractor, is expected to provide adequate mitigation and the magnitude of this effect is considered minor.

- **Duration:** As the construction workforce is expected to peak in Year 2 for a single year, the effect is expected to be short-term in duration since effects are anticipated only during the Construction Phase.
- **Frequency:** This effect will occur once since it occurs during a discrete period of time, i.e., peak construction.
- **Geographic Extent:** Due to the proximity of the Project to Kamloops, and the fact that Kamloops represents the majority of accommodations services in commuting distance of the Project, the geographic extent of the effect is local.
- **Reversibility:** The effect is reversible in the short-term as the pressure on temporary and short-term accommodations is expected to stop once the Project shifts to operations and the workforce is no longer transient.
- **Resiliency:** The community is determined to be low in resiliency as there are a finite number of hotel/motel rooms in Kamloops and if the Project workforce occupies enough of them, it will temporarily preclude tourists from staying in temporary accommodations in Kamloops. In connection with the ability of Kamloops to attract events, a shortage of rooms could translate into missed hosting opportunities.
- **Social value**: The social value for this effect is neutral as the Tournament Capital branding is an important part of the community's image (see Section 10.7, Community Health and Well-being) and fostering civic pride.

<u>Demand for rental accommodations could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation</u>

In interviews conducted during the KPI Program, it was pointed out that some vulnerable segments of society find it difficult to secure housing, including rental apartments, and often use hotel/motel rooms as a last resort. In light of the demands for accommodations expected from the non-local workforce during the Construction Phase and the potential for contractors to use both hotels/motels and apartments/rental houses to house their workers, there is a potential that the short-term demand created by the Project could lead to increases in rental prices and/or reduced vacancy levels if local businesses and landlords take advantage of increased demand. This could make housing less affordable and/or less available to lower income or hard-to-house individuals and households, particularly if they are not protected by a formal rental agreement or lease. Since this effect could have implications in terms of access to affordable housing and hidden homelessness, and local data regarding hidden homelessness is limited, the following characterization of residual effects is conservative.

Table 8.1-21. Definitions of Characterization Criteria for Residual Effects on Infrastructure, Public Facilities, and Services

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Social Value	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*How far will the effect reach?*	*To what degree is the effect reversible?*	*How resilient is the receiving environment or population?*	*How influential is the effect on the broader socio-economic environment?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change from baseline conditions.	**Short-term:** Effect lasts 1 to 2 years, e.g., during Construction	**Once:** Effect is confined to one discrete period in time during the life of the Project.	**Site-specific:** Effect extends less than 500 m from infrastructure or activity.	**Reversible Short-term:** Effect can be reversed relatively quickly.	**Low:** The receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.	**Low:** The effect has limited ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**High:** It is highly likely that this effect will occur.	**High:** >80% confidence. There is a good understanding of the cause-effect relationship and all necessary data are available for the Project area. There is a low degree of uncertainty and variation from the predicted effect is expected to be low.
Minor: Differs from the average value for baseline conditions to a small degree.	**Medium-term:** Effect lasts 3 to 25 years, i.e., to the end of Operations Phase	**Sporadic:** Effect an effect that occurs at sporadic or intermittent intervals during any phase of the Project.	**Local:** Effect is limited to the LSA.	**Reversible Long-term:** Effect can be reversed within 20 years of Post-closure.	**Neutral:** The receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.	**Neutral:** The effect has some ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Medium:** This effect is likely, but may not occur.	**Medium:** 50 to 80% confidence. The cause-effect relationships are not fully understood, there are a number of unknown external variables, or data for the Project area are incomplete. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident.
Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation.	**Long-term:** Effect lasts between 26 and 50 years, i.e., through the Decommissioning and Closure and Post-closure phases	**Regular:** Effect occurs on a regular basis during the life span of the Project.	**Regional:** Effect extends across the broader region (e.g., RSA).	**Irreversible:** Effect cannot be reversed (i.e., is permanent).	**High:** The receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.	**High:** The effect has moderate ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Low:** This effect is unlikely but could occur.	**Low:** < 50% confidence. The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project area are incomplete. High degree of uncertainty and final results may vary considerably.
Major: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation.	**Far Future:** Effect lasts more than 50 years.	**Continuous:** Effect occurs constantly during the life of the Project.	**Beyond Regional:** Effect extends beyond the regional scale, and may extend across or beyond the province.					

Table 8.1-22. Characterization of Residual Effects, Significance, Likelihood and Confidence on Infrastructure, Public Facilities, and Services

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.	Minor	Short-term	Once	Local	Reversible Short-term	Low	Neutral	Not Significant (minor)	High	Medium
During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	Minor	Short-term	Once	Local	Reversible Short-term	Low	High	Not Significant (minor)	Medium	Low
Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.	Minor	Short-term	Once	Local	Reversible Short-term	Neutral	High	Not Significant (minor)	Medium	Low
Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.	Minor	Short-term	Once	Local	Reversible Short-term	Neutral	Low	Not Significant (minor)	High	Medium
Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.	Minor	Medium-term	Sporadic	Regional	Reversible Short-term	Neutral	Neutral	Not Significant (minor)	Medium	Low

- **Magnitude**: The magnitude of this effect is anticipated to be minor as dialogue with the City and service providers is expected to help these organizations plan for the potential effect, and the coordinated development of the workforce accommodation plan (coordinated with the construction contractor and service providers) will help avoid sudden or opportunistic changes.
- **Duration**: As the construction workforce is expected to peak in Year 2 for a single year, the effect is expected to be short-term in duration.
- **Frequency**: The frequency is characterized as once since it occurs during a discrete period of time, i.e., peak construction.
- **Geographic Extent**: As the potentially affected accommodation facilities are in Kamloops, the geographic extent of the effect is local.
- **Reversibility**: The effect is reversible in the short-term as the pressure on temporary and short-term accommodations and rental rates is expected to stop once the Project shifts to operations and the workforce is no longer transient.
- **Resiliency:** The resiliency is characterized as low since there are a finite number of hotel/motel rooms and affordable rental accommodations, and housing affordability for low-income households is noted to be an existing challenge for local social service organizations.
- **Social Value**: Since housing is a basic human need, the social value is high.

Increased stress on policing services as a result workforce behaviour

During the Construction Phase, the presence of non-local construction workers could place additional stress on the RCMP if worker behaviours (e.g. partying and other unprofessional activities) require the attention of the RCMP.

- **Magnitude**: This effect is expected to be minor in magnitude as the amenities available in Kamloops and KAM's facilitation and promotion of recreational opportunities is expected provide workers with a wide range of legal and safe activities in which to engage.
- **Duration**: Since the effect is expected only during the Construction Phase, it is characterized as short-term in duration.
- **Frequency**: The effect is expected to last for a single Project phase. Therefore, it is once in frequency.
- **Geographic Extent**: Since most of the temporary construction workforce is expected to stay in Kamloops and the Project is close to the City of Kamloops boundary, the geographic extent of this effect is local.
- **Reversibility**: The effect is reversible short-term because it will end once the Construction Phase is over.
- **Resiliency**: The resiliency is neutral as the municipal RCMP detachment is currently facing reduced capacity in connection with human resources and no improvement is expected in the next three years.

- **Social Value:** The social value is high because maintaining order is an important aspect of personal and community well-being.

Project-related construction traffic could affect flow of traffic at certain intersections

Project-related construction traffic could increase traffic congestion and affect the flow of the traffic through two intersections at two different times. In 2016 (early construction, before the Inks Lake Interchcange is upgraded), the Pacific Way and Hugh Allan Drive intersection has a low LoS and insufficient capacity. In 2018 (peak construction), the roundabout at the Versatile Drive and Hugh Allan Drive intersection performs at a lower LoS (E) than it did in the baseline at peak hour traffic.

- **Magnitude:** In light of the localized (i.e., two intersections at peak traffic) and limited (peak traffic hours) effects of Project-generated traffic on the intersections and interchanges studied as part of the TIA, the magnitude of this effect is characterized as minor.
- **Duration:** Since the effect is expected for limited periods during the Construction Phase it is short-term in duration.
- **Frequency**: The effect is expected to be limited to the Construction Phase, therefore the frequency is characterized as once.
- **Geographic Extent:** The geographic extent is local since it will affect the LSA only.
- **Reversibility**: The effect is reversible in the short-term as improvements to storage capacity could alleviate these effects and the resiliency is neutral, although the responsibility for these upgrades would fall to the City or MoTI.
- **Resiliency**: The resiliency is characterized as neutral as there are some existing constraints for the affected intersections.
- **Social Value:** The social context is low as travel via the road network is important for tourism and trade (e.g., transporting goods and workers) and community well-being (e.g., accessing recreational opportunities). While traffic flow may be impeded, the road network will still be available.

Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour

Kamloops and the TNRD may not be able to adequately maintain and/or expand community infrastructure and services because of a lack of qualified individuals to hire if skilled workers are drawn away by Project-related opportunities. Instead, they may need to defer some projects until there is an adequate supply of workers.

- **Magnitude:** The effect is expected to be minor in magnitude because while there may be increased demand for skilled labour, it is expected that the City will be able to continue maintaining its infrastructure and services. There is a pre-existing shortage of skilled labour in Kamloops (Venture Kamloops 2013). In addition, many of the specialized skills needed by Project construction will be different from those required by the Kamloops and the TNRD to maintain infrastructure, although there may be overlap in connection with designated trades.

- **Duration:** The duration is expected to be medium-term as the largest effect on the labour supply is expected during peak construction when the Project requires the highest number of individuals with designated trades certification but the effect may continue into the Operations Phase.
- **Frequency:** The effect is expected to occur during the Construction Phase and on a less regular basis during the Operations Phase. The frequency is therefore expected to be sporadic.
- **Geographic Extent:** Since this effect may affect Kamloops and the TNRD, the geographic extent is regional.
- **Reversibility:** The Operations Phase workforce is considerably smaller and the estimated number of positions for individuals with designated trades certification is smaller (105), therefore, the effect is characterized as reversible short-term.
- **Resiliency:** The resiliency is neutral. All levels of government should be able to respond to changes in the labour marker, although it may take time and/or effort to recruit individuals with the necessary skills and/or accreditation. Projects may be delayed, but they will likely not be cancelled.
- **Social Context:** The social context is neutral as functioning and adequate community infrastructure is an important component of a community.

8.1.5.4 Significance of Residual Effects

<u>Accommodation of the workforce may increase hotel/motel occupancy rates and could constrain tourism</u>

With the anticipated need for accommodations for between 648 and 950 non-local workers during the Construction Phase (during peak employment), the demand for temporary and short-term accommodations may outstrip supply. In connection with attracting events to Kamloops during the summer, accommodation shortages are unlikely to prevent events from seriously considering Kamloops as housing participants is the primary concern and the City often uses Thompson Rivers University (TRU) residences for this purpose and books accommodations approximately a year in advance. Tour lines that use Kamloops as a stopover would typically book blocks of rooms in advance and should therefore be able to continue using Kamloops for stopovers. Independent travelers hoping to stay in Kamloops may not be able to do so during the summer months would likely be the most affected by high occupancy rates.

The Project is not expected to preclude the City hosting events or the continued use of Kamloops as a stopover destination. Due to duration, frequency, geographic extent, reversibility, and resiliency the residual effect is expected to be Not Significant (Minor).

<u>Demand for rental accommodations could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation</u>

With the anticipated need for accommodations for between 648 and 950 non-local workers during the Construction Phase (during peak employment), the demand for temporary and short-term

accommodations could outstrip the supply of hotel/motel rooms. There is therefore a potential for contractors to procure rental properties such as apartments, which could cause an increase in rental rates if landlords attempt to take advantage of the demand. A rate increase could make rental accommodations too expensive for some tenants, force out tenants with insecure leases, and make it more difficult for low-income households and the 'hidden homeless' to retain suitable shelter. A lack of available hotel/motel rooms could also make accommodation less accessible to those who need it. These changes could put pressure on local support shelters and organizations. KAM will maintain dialogue with service providers to identify solutions and monitor changes, and will work with the construction contractor to plan for workforce accommodation during the Construction Phase.

Due to duration, frequency, geographic extent, reversibility, and resiliency the residual effect is expected to be Not Significant (Minor).

Increased stress on policing services as a result of workforce behaviours

Experience with more remote major mining construction projects indicates that some of the non-local workers during the Construction Phase may engage in socially irresponsible activities, which may necessitate police involvement. The municipal RCMP detachment is currently short-staffed and its officers have a higher-than-average case load for communities of comparable size. However, there are also diverse amenities available in Kamloops and the experiences of more remote mines are therefore not easily transferable. In addition, the mitigation measures instituted by KAM (e.g., facilitating recreational opportunities and developing a code of conduct) are expected to minimize poor behaviour by the construction workforce. However, considering the existing capacity constraints of the municipal RCMP detachment, a potential increase in calls for policing services is conservatively predicted.

Due to duration, frequency, geographic extent, reversibility, and resiliency the residual effect is expected to be Not Significant (Minor).

Project-related construction traffic may affect flow of traffic at certain intersections

The TIA (Opus International 2015) determined that, by the peak of construction in 2018, the roundabout at Versatile Drive/Hugh Allan Drive will have unacceptable Levels of Service before the addition of Project generated traffic, and that Project traffic has only a minor effect on the roundabout's performance.

The analysis in the TIA (Appendix 8.1-A) indicated that left turn storage bays are insufficient before the addition of Project traffic by 2016 because of background traffic growth for a number of locations. Mitigated Project traffic conditions predicted that two interchanges will not have unacceptable Levels of Service due to inadequate vehicle storage in the left turn lanes: the eastbound left turn at Pacific Way and Hugh Allan Drive; and, the westbound left turn/through lane at Highway 1/Pacific Way. However the capacity of these two left turn storage bays will be exceeded in the base conditions during peak traffic hours in 2016. Therefore, it can be concluded that the Project traffic has only a minor effect on these two locations.

Due to duration, frequency, geographic extent, reversibility, and resiliency the residual effect is expected to be Not Significant (Minor).

Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour

Representatives for the City of Kamloops and the TNRD have expressed concern regarding the City's ability to hire consultants and contractors if highly skilled workers in the area opt to work on the Project instead. It would likely be temporally limited to peak construction employment as that is when the Project will require a larger, more skilled workforce.

Due to duration, frequency, geographic extent, reversibility, and resiliency the residual effect is expected to be Not Significant (Minor).

8.1.5.5 Characterization of Likelihood and Confidence

The characterization of likelihood and confidence does not affect the determination of significance for a residual effect, rather it describes the probability of the effect occurring and the certainty in the significance predictions and use of mitigation measures.

Accommodation of the workforce may increase hotel/motel occupancy rates and could constrain tourism

Based on qualitative data, including literature review, interviews, and engagement with relevant stakeholders, and quantitative data, including occupancy rates, room counts, and Project employment demands, there is a high likelihood that this effect will occur.

The confidence level is medium as there are a series of unknowns, including the exact number of non-local workers, a more detailed breakdown of when workers will be in Kamloops, rotation schedules, and future tournaments to be hosted by Kamloops.

Demand for rental accommodations could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation

Based on qualitative data, including literature review, interviews, and engagement with relevant stakeholders, and quantitative data, including occupancy rates for hotels/motels, apartment stock, and homelessness counts, there is a medium likelihood that this effect will occur.

The confidence in this prediction is low as there are numerous external variables involved. In addition, none of the individuals interviewed for this study had a firm recollection of in-migration during the recent capital expansion of Highland Valley Copper or the construction of New Gold, which would have provided some insight into potential effects. This was due to both not being in the community/position during these projects and not encountering any incidents that they remembered.

Increased stress on policing services as a result of workforce behaviours

Based on qualitative data, including literature review, interviews, and engagement with relevant stakeholders, there is a medium likelihood that this effect will occur as the residual effect during the Construction Phase.

There is medium confidence level for the likelihood of this effect as the Construction-phase effect is understood, although there are numerous external variables involved, including the effectiveness of mitigation measures meant to attract workers.

Project-related construction traffic may affect flow of traffic at certain intersections

The probability of this effect is considered high and the confidence is medium as the TIA indicated that there were pre-existing concerns for some of the interchanges in all horizon years assessed, which an increase in traffic is likely to exacerbate.

Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour

Based on qualitative data, including literature review, interviews, and engagement with relevant stakeholders, there is a medium likelihood that these effects will occur. Discussions with stakeholders have created a conflicting view of this potential effect as City representatives have expressed concern while Venture Kamloops feels that certain segments of the labour market or either saturated or capable of expanding.

The confidence in the analysis is low as there are too many external variables at play, including timing of community projects, labour demands for the Project and community infrastructure, and the available labour pool.

8.1.5.6 Summary of Residual Effects Assessment and Significance

As shown in Table 8.1-23, there are five adverse residual effects for Infrastructure, Public Facilities, and Services, all of which have been determined as Not Significant (Minor). The application of mitigation measures is expected to prevent these adverse residual effects from becoming more serious. These residual effects will be carried through to the cumulative effects assessment (Section 8.1.6).

Table 8.1-23. Summary of Residual Effects, Mitigation, and Significance on Infrastructure, Public Facilities, and Services

Residual Effects	Project Phase	Mitigation Measures	Significance
During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.	Construction	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, and other stakeholders to discuss potential issues and solutions related to workforce housing. • Ongoing dialogue with the City and service organizations (e.g., Interior Community Services) to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Not Significant (Minor)
During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	Construction	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, and other stakeholders to discuss potential issues and solutions related to workforce housing. • Ongoing dialogue with the City and service organizations (e.g., Interior Community Services) to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Not Significant (Minor)

Residual Effects	Project Phase	Mitigation Measures	Significance
Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.	Construction	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with service organizations (e.g., RCMP) to inform them of workforce requirements. • Code of Conduct for direct and contractor employees to govern behaviour on and off the job. • KAM will facilitate recreational opportunities in Kamloops for direct and contract employees.	Not Significant (Minor)
Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.	Construction; Operation	• Implementing carpooling incentives during Construction and Operations. • Providing workforce personnel shuttles from key locations within the City to the Mine Site during construction. • Staggering shifts during the construction phase and, to a lesser extent, during the Operations Phase. • Improved signage for Lac le Jeune Rd. • Proportionate road infrastructure improvements to Lac le Jeune Rd.	Not Significant (Minor)
Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.	Construction; Operations	• Forming an advisory committee comprised of relevant representatives from the City and the TNRD, services, and organizations to discuss potential issues and solutions regarding planning and coordination of construction/engineering projects. • Ongoing dialogue with the City and the TNRD to inform them of workforce requirement.	Not Significant (Minor)

8.1.6 Cumulative Effects Assessment

8.1.6.1 Introduction

Cumulative Effects Assessment (CEA) examines how the residual effects of multiple projects and/or activities can potentially interact to have an adverse effect on a VC. These interactions can be direct, indirect, additive, and synergistic. In the case of the Infrastructure, Public Facilities, and Services VC projects and/or activities that spatially and temporally overlap with expected Project residual effects may also call upon limited physical and human resources (e.g., the transportation network, medical services) thereby further straining capacity.

8.1.6.2 Identification of Other Actions that May Affect Infrastructure, Public Facilities, and Services

Chapter 5 (Assessment Methodology) describes the past, present, and reasonably foreseeable projects and activities that could interact with the effects of the Project. These projects are screened against the residual effects of the Project. For the Infrastructure, Public Facilities, and Services VC, the key concern from a cumulative effects perspective is whether these projects or activities will contribute involve a temporary in-migration of workers to the RSA and LSA during the same period as the Project's Construction Phase, and/or have overlapping demands for skilled workers, and/or increase traffic volumes on the same parts of the road network.

8.1.6.3 Interactions between Residual Project Effects and Other Project or Activity Effects

Table 8.1-24 screens potential interactions with other projects and activities. Only potential interactions ranked "M" or "H" are subject to further assessment as potential cumulative effects. Past projects that are no longer active (e.g., Vidette Lake Mine and Iron Mask Mine) are not expected to make further demands on infrastructure and services and are therefore no cumulative interactions are identified. Active projects and other existing activities that could interact with Project effects on Infrastructure, Public Facilities, and Services are also generally not considered further as they would have been captured in the baseline.

Of the future activities listed, potential interactions are identified for the Trans Mountain Pipeline System (TMPL) Expansion project, the Harper Creek mining project and plans for future city growth and expansion. These projects are expected to temporally and in the case of the Trans Mountain Pipeline System Expansion, spatially, overlap with Project construction:

- **Trans Mountain Pipeline System Expansion (TMPL Expansion**): Construction is expected from May 2016 to September 2018 (Kinder Morgan n.d.). The actual number will differ among months, from a low of 9 workers per month to nearly 900 workers per month during the summer. Approximately 10% of the workforce is expected to be sourced from the combined Fraser-Fort George and Thompson-Nicola regional districts (TMPL 2013). For the construction segment of the TMPL Expansion, Kamloops is identified as a construction hub (where staging, worker accommodations are expected to be organized) (TMPL 2013). As both projects could have non-local construction workforces based in Kamloops at the same time, the potential cumulative interaction for workforce-related effects is moderate ("M").

- **Harper Creek:** Harper Creek is an open pit copper mine near Vavenby, BC, which is approximately 150 km northeast of Kamloops. Construction is expected from Quarter 2 2016 to Quarter 2 2018 with a workforce of about 600 workers, who will be housed in a construction camp (ERM Consultants 2015). The Harper Creek workforce will not be based in Kamloops, but could contribute to a regional increase in demand for skilled workers. Due to the distance from Kamloops, this interaction is considered to be negligible-to-minor ("L").
- **City Growth and Expansion:** Kamloops' official community plan (KAMPLAN; 2004) and associated neighbourhood plans (specifically the Aberdeen Area Plan; 2008) describe the expected community development, population growth, and associated changes in land use. These plans have been developed based on forecasts that the Kamloops population will grow to 120,000 by 2036, with an associated increase of up to 10,000 new residents in the Aberdeen neighbourhood. Thus, a total of 4,000 new residential units are planned in Aberdeen, including both single- and multi-family dwellings. These plans for growth and expansion could increase demand for skilled labour. However, the intensity of activities is not likely to vary substantially from existing levels, and the potential for a cumulative effect with the Project on municipal and regional district projects is considered to be negligible ("L").

Table 8.1-24 ranks the interactions between those projects scoped into the CEA and the Project's anticipated residual effects. Only those interactions ranked as "M," moderate, and "H," Key are carried through to the CEA. Of the Projects scoped into the CEA, only the TMPL Expansion is expected to have a potential moderate interaction with four of the Project's residual effects:

- During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.
- During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.
- Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.
- Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.

Table 8.1-24. Ranking Potential for Residual Effects to Interact Cumulatively with Effects of Other Human Actions on Infrastructure, Public Facilities, and Services

Residual Effect	Industrial Projects/Activities														Natural Resources and Land Use			Tourism and Commercial Recreation Activities					Community Infrastructure			Transportation					
	Vidette Lake Mine	Afton Mine (Historical)	Iron Mask Mine	Bonaparte Mine	New Afton Mine (New Gold)	Highland Valley Copper Mine (Teck)	Domtar Kamloops Pulp Mill	Tolko-Hefley Creek Plywood and Veneer	LaFarge Cement Plant	Trans Mountain Pipeline System (Kinder Morgan)	Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Harper Creek	Highland Valley Copper – Bethlehem Expansion	Kamloops Forest District	Agriculture	Ranching	Tranquille on the Lake	Lac Le Jeune Resort	Tobiano Golf Course	Recreational Hunting, Fishing, Foraging	Recreational Trails	City of Kamloops Wastewater Management	Water Treatment Centre	City Expansion and Growth	Lac le Jeune Road	Highway 1	Highway 5A	Highway 5 (Coquihalla Highway)	Kamloops Airport	Rail Yards and Lines (CP and CN)
During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.	-	-	-	O	O	O	O	O	O	O	M	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	-	-	-	O	O	O	O	O	O	O	M	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.	-	-	-	O	O	O	O	O	O	O	M	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.	-	-	-	O	O	O	O	O	O	O	M	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.	-	-	-	O	O	O	O	O	O	O	L	L	O	O	O	O	O	O	O	O	O	O	O	L	O	O	O	O	O	O

For the remaining anticipated residual effect of the Project, the potential interaction with the TMPL Expansion is ranked as "L", negligible or minor, and is not considered further in the CEA:

- Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour: For workforce competition only 10% of the TMPL Expansion workforce is expected to be sourced locally from the combined Fraser-Fort George and Thompson-Nicola regional districts, which means at peak construction, 90 workers could be from the two regional districts, which include other population centres.

The following analysis of potential cumulative effects of the Project focuses on potential interactions with the TMPL Expansion.

The TMPL Expansion will twin an existing pipeline in Alberta and BC, build new and modified facilities, and build three new berths at the Westridge Marine Terminal in Burnaby, BC (Trans Mountain Pipeline ULC [TMPL] 2013). In and around Kamloops, the TMPL Expansion will reroute a section of the pipeline to avoid Project infrastructure, twin sections of the pipeline, and build a new pump station. Table 8.1-25 presents the interactions expected between the TMPL Expansion and residual effects from the Project.

The interactions between the Project and the TMPL Expansion are based primarily on the presence of the construction workforces. Before discussing potential effects, the respective workforce requirements and timing of construction for each project are:

- **The Project:** Construction is expected to last from Quarter 4 of 2016 to Quarter 1 of 2019. Peak construction is expected to last from Quarter 4 of 2017 through Quarter 3 of 2018. The total construction workforce is expected to be 1,175 workers in Year 1, 1,800 workers in Year 2, and 898 workers in Year 3. Of these between 231 and 425 are expected to be non-local in Year 1, between 648 and 950 are expected to be non-local in Year 2, and between 305 and 465 are expected to be non-local in Year 3.
- **TMPL Expansion:** Construction is expected from May 2016 to September 2018 (Kinder Morgan n.d.). The actual number will differ among months, from a low of 9 workers per month to nearly 900 workers per month during the summer. Approximately 10% of the workforce is expected to be sourced from the combined Fraser-Fort George and Thompson-Nicola regional districts (TMPL 2013). For the construction segment of the Trans Mountain Pipeline System – Expansion, Kamloops is identified as a construction hub (where staging and worker accommodations are expected to be organized) (TMPL 2013).

<u>Accommodation of the workforce could increase hotel/motel occupancy rates and could constrain tourism</u>

During peak construction, contractor demand for hotels/motels to accommodate non-local construction workers could exceed the available supply of rooms during peak summer months. The addition of additional non-local workers for the TMPL Expansion project will also increase demand. If the peak construction periods for both projects coincide during the summer (peak tourism) months, the TMPL Expansion project will be looking to house approximately 900 workers in Kamloops during months where the available rooms (based on 2014 occupancy rates) ranged from

1,077 rooms in June to 570 rooms in August. It is also expected that crews using commercial accommodations in Kamloops would be there for a guaranteed 30-day stay (TMPL 2013).

As described in Section 8.1.5, low vacancy rates are not expected to be an issue in connection with Kamloops attracting sports events since the focus is on housing participants, who often stay at TRU residences; bids are made well in advance, Tourism Kamloops is part of the bid committee, and the City is not currently focused on bidding for large multi-sport events that would require spectator accommodations. Similarly, low vacancy rates are not likely an issue for tour lines that use Kamloops as a stopover as rooms are typically booked in blocks in advance for tours. However, independent tourists may be affected by high occupancy rates as they may not be able to secure a room in Kamloops and may need to pursue accommodations outside of the city and in nearby communities.

Demand for rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation

The risks that the Project could lead to increased rental prices and associated housing challenges for low-income, hard-to-house, and other vulnerable persons, could be exacerbated by similar pressures associated with the TMPL Expansion workforce, particularly if the peak construction workforces for both projects required accommodation in Kamloops during the same peak summer months.

Project-related construction traffic may affect flow of traffic at certain intersections

The TMPL Expansion expects its activities to increase traffic volumes for highways and access roads during construction (TMPL 2013); however, detailed information was not included in the application as "detailed traffic estimates and logistics plans were not available for the proposed movement of Project workers, equipment and material. Project effects on regional highway traffic, and how Project traffic compares to overall daily traffic volumes, will ultimately depend on the source of construction equipment, construction camp modules and other supplies and materials (especially pipe), as well as the methods used to transport these items to constructions sites." Logistics will be reportedly developed at a later date (TMPL 2013).

To assess potential interactions between the TMPL Expansion and the Project, it is assumed that workers and construction materials will be transported from between Kamloops and the construction site. Based on these assumptions and the location of the Project, this assessment is concerned with TMPL Expansion activity south of Kamloops.

During Project construction, mitigated Project-related traffic is expected to exacerbate existing issues surrounding storage capacity and traffic flow at two intersections: Pacific Way/Hugh Allan Drive, and Versatile Drive/Hugh Allan Drive. Should traffic for the TMPL Expansion use these intersections to access the construction site, there may be further congestion and delays at these locations; other nearby intersections could also be affected by the accumulated traffic.

Table 8.1-25. Summary of Cumulative Effects Mitigation Measures and Residual Effects on Infrastructure, Public Facilities, and Services

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Presence of temporary non-local workforce in Kamloops during construction of the Ajax Project	Residence of temporary construction workforce TMPL Expansion	The presence of up to 1,850 non-local workers temporarily residing in Kamloops will stress temporary and short-term accommodations, especially during peak tourist season.	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, and other stakeholders to discuss potential issues and solutions related to workforce housing. • Ongoing dialogue with the City and service organizations (e.g., Interior Community Services) to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Accommodation of the combined workforces could increase hotel/motel occupancy rates and could constrain tourism

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Presence of temporary non-local workforce in Kamloops during construction of the Ajax Project	Residence of temporary construction workforce TMPL Expansion	The presence of up to 1,850 non-local workers temporarily residing in Kamloops will stress temporary and short-term accommodations and apartments and rental housings, displacing the hidden homeless who use hotels/motels and people who cannot afford rental rate increases	• Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, and other stakeholders to discuss potential issues and solutions related to workforce housing. • Ongoing dialogue with the City and service organizations (e.g., Interior Community Services) to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	The combined demand for hotel/motel rooms and rental accommodations (including apartments) during construction could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Presence of temporary non-local workforce in Kamloops during construction of the Ajax Project	Residence of temporary construction workforce TMPL Expansion	The presence of up to 1,850 non-local workers temporarily residing in Kamloops with no connections to the community and	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, social services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with service organizations (e.g., RCMP) to inform them of workforce requirements. • Development of Code of Conduct for direct and contractor employees • KAM will facilitate recreational opportunities in Kamloops for direct and contract employees.	Increased stress on policing services as a result of the non-local construction workforces if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours
Use of transportation network to transport workforce and supplies	Use of transportation network to transport workforce and supplies by TMPL Expansion	Transporting construction material and workers to and from construction sites	• Implementing carpooling incentives during construction and operations. • Providing workforce personnel shuttles from key locations within the City to the Mine Site during construction. • Staggering shifts during the construction phase and, to a lesser extent, during the operations phase. • Improved signage for Lac le Jeune Rd. • Proportionate road infrastructure improvements to Lac le Jeune Rd.	Increased traffic increase congestion and affect the flow of traffic during the Construction Phase.

Increased stress on policing services as a result of workforce behaviours

The presence of the TMPL Expansion construction workforce could potentially create additional stress on the RCMP during the Construction Phase of the Project. Similar to the Project, the construction workforce is likely to include non-local workers, predominantly male and with disposable income and a lack of ties to the community. These characteristics may lead to disruptive or irresponsible behaviour requiring police intervention (TMPL 2013). If there is overlap between the presence of construction workforces in Kamloops, the City RCMP detachment, which faces systemic challenges in connection with maintaining staffing levels (Learned, *pers. comm*. 2015), may be under additional pressure with increased demand for policing services.

8.1.6.4 Proposed Mitigation Measures

Both the Project and the TMPL Expansion have proposed mitigation measures to minimize their effects on infrastructure and services, including police services and road infrastructure.

For the Construction Phase effects of the Project on police services and other community matters, KAM will form an advisory committee with relevant stakeholders, including representatives from the City, the TNRD, and service providers (e.g., RCMP) and ensuring there is an ongoing dialogue to inform service organizations such as the RCMP of workforce requirements. While these activities may not directly minimize Project effects, they will help KAM develop adaptive management solutions, especially since the precise nature of these effects are unknown.

Both the Project and the TMPL Expansion mitigation measures include the development of a code of conduct for the temporary workforce that are intended to minimize its effects on local services.

Regarding road infrastructure, TMPL proposes to transport workers by shuttle where feasible to worksites and promoting carpooling where shuttles are not feasible. TMPL is also committed to developing a Traffic and Access Control Management Plan and Traffic Control Plans for specific contracts. As described in Section 8.1.4.3, the Project will also promote carpooling and workforce shuttles.

Also similar to the Project's planned mitigation measures, TMPL will develop and implement a Worker Accommodation Strategy in collaboration with contractors and local municipalities in order to manage temporary accommodations for the construction workforce. Where practicable, KAM will engage with TMPL to align and coordinate relevant aspects of the Project's workforce accommodation plan.

It is not within the operational control of the Project to minimize the effect of another project on local infrastructure and services; however, KAM will maintain an ongoing dialogue with TMPL during Project construction as the TMPL Expansion involves a reroute of the pipeline around the Mine Site to avoid Project infrastructure.

8.1.6.5 Evaluation of Significance of Residual Cumulative Effects

After the implementation of mitigation measures, four residual cumulative effects are anticipated on Infrastructure, Public Facilities, and Services as a result of interactions between the Project and the TMPL Expansion (Table 8.1-25).

The residual cumulative effects on temporary and short-term accommodations are expected to be Not Significant (Moderate). The effect is expected to limited in geographic extent (local) and limited in duration and frequency (short-term and once, respectively). Despite the geographic and temporal limits, the presence of multiple construction workforces in Kamloops could result in a short-term strain on temporary and short-term accommodations including hotels and motels. Ongoing dialogue with the City in connection with sports tourism, with Tourism Kamloops in connection with tourism in general (tour lines and independent tourists), and with service organizations is planned to allow organizations and groups to prepare for potential effects should they occur. These organizations will also be engaged in the development of the workforce accommodation plan for the Project, which will also be coordinated, where practicable, with TMPL.

The construction workforces for the Project and TMPL Expansion could place additional demands on police services in Kamloops since temporary non-local construction workers for both projects are expected to be accommodated in the city. This residual effect is ranked as Not Significant (Minor) as the effect is expected to be limited to the LSA and will occur during a limited timeframe.

A cumulative residual effect is anticipated in connection with traffic. A conservative assessment of this residual effect is Not Significant (Moderate) since the TMPL Expansion will provide additional detail regarding its traffic impacts; however, assuming that workers will be staying in Kamloops and accessing the reroute near the Mine Site via either Lac Le Jeune Road or Hwy 5, the intersections that the Project TIA (Appendix 8.1-A) expect will experience reduced storage capacity and LoS, will likely experience further reduced storage capacity and LoS.

8.1.7 Conclusion

There are five Project residual effects on the Infrastructure, Public Facilities, and Services VC, four of which overlapped with other projects and were therefore assessed in the CEA (Table 8.1-27). The pathway between the Project and VC was population growth – temporary and permanent – except for the residual effect on traffic, which was driven primarily by Project activities.

The presence of the non-local workers during the Construction Phase is anticipated to place additional demands on hotel/motel rooms, and potentially, apartments and rental housing, in Kamloops as contractors secure accommodations for their employees. Kamloops has over 3,000 hotel/motel rooms and a number of RV parks and campgrounds. The occupancy rate for Kamloops hotels in 2014 averaged 55%, which was almost a 3 percentage point decline from the previous year. In 2014, August had the highest occupancy rate at 81% and January the lowest at 34.8%. As of April 2015, there was a 5.1% vacancy rate for apartments (CMHC 2015a).

In light of the current rates at which hotel/motel rooms and apartments are rented out, the demand for accommodations during peak construction months could exceed than the supply. The increased

demand could have two effects. Tourism (sports tourism, tour lines, and independent tourists) could be constrained if visitors are unable to find local accommodation. Demand for accommodation could also increase rental prices, which could make it more challenging for some households to find and retain suitable accommodation. Both effects are predicted to be Not Significant (Minor) following mitigation, although they may be exacerbated if the Construction Phase for the Project overlaps with construction of the TMPL Expansion. Ongoing dialogue with Kamloops, service providers, and Tourism Kamloops, and the establishment of a community Advisory Committee, is expected to help mitigate these effects. Strategies to support local hiring will also minimize the effect by reducing the number of non-local workers requiring accommodation. In addition, KAM will work with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify accommodation needs and suitable options for workforce accommodation, and will develop a Construction Phase Workforce Accommodation Plan in consultation with these parties in advance of the start of construction.

The temporary Construction Phase workforce—expected to be predominantly male, with disposable income and limited ties to the local community—could engage in socially irresponsible behaviours (e.g. partying) that may place strain on policing services. As Kamloops is a mid-sized city with abundant opportunities for recreation and entertainment, the experience of more rural communities affected by large workforces is not expected. Mitigation measures, including the code of conduct, and facilitating the workforce in engaging in recreational activities, is expected to reduce the extent of socially irresponsible spending and behaviours, and reduce demands on the services of the Kamloops RCMP detachment. However, as the caseload for the Kamloops City Detachment is relatively high and the crime rate is higher than the provincial average, a potential residual effect is conservatively predicted in terms of increased pressure on these services. The Project effect is expected to be Not Significant (Minor), though a cumulative effect is identified if the construction workforces for the Project and the proposed TMPL Expansion overlap in Kamloops at the same time.

In regard to traffic, the Project is expected to affect a limited number of intersections during the Construction Phase as mitigation measures (carpooling incentives, staggering shifts, and providing shuttles during the Construction Phase) are expected to reduce the number of vehicles accessing the Mine Site. After mitigation, Project traffic may affect flow of traffic through at the Pacific Way/Hugh Allan Drive intersection during 2016 and the Versatile Drive/Hugh Allan Drive roundabout in 2018. This residual effect is expected to be Not Significant (Minor) because it is highly localized and temporally limited. A conservative assessment of cumulative effects notes that this effect could be exacerbated when traffic from the TMPL Expansion is considered, although limited information is available regarding the traffic impacts of the TMPL Expansion.

Table 8.1-26. Characterization of Cumulative Residual Effects, Significance, Likelihood and Confidence on Infrastructure, Public Facilities, and Services

Cumulative Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Accommodation of the combined workforces could increase hotel/ motel occupancy rates and could constrain tourism	Medium	Short-term	Once	Local	Reversible Short-term	Low	Neutral	Not Significant (moderate)	High	Medium
The combined demand for hotel/motel rooms and rental accommodations (including apartments) during construction could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	Medium	Short-term	Once	Local	Reversible Short-term	Low	High	Not Significant (moderate)	Medium	Low
Increased stress on policing services as a result of the non-local construction workforces if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours	Minor	Short-term	Once	Local	Reversible Short-term	Neutral	High	Not Significant (minor)	Medium	Low
Increased traffic could increase congestion and affect the flow of traffic during the Construction Phase.	Medium	Short-term	Once	Local	Reversible Short-term	Neutral	Low	Not Significant (moderate)	High	Low

Table 8.1-27. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Infrastructure, Public Facilities, and Services

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, Tourism Kamloops to discuss potential issues and solutions. • Ongoing dialogue with the City and Tourism Kamloops to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Not Significant (Minor)	Not Significant (Moderate)
During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, Tourism Kamloops to discuss potential issues and solutions. • Ongoing dialogue with the City and service organizations to inform them of workforce requirements. • Working with contractors and relevant	Not Significant (Minor)	Not Significant (Moderate)

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
		stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.		
Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with service organizations (e.g., RCMP) to inform them of workforce requirements. • Development of Code of Conduct for direct and contractor employees • KAM will facilitate recreational opportunities in Kamloops for direct and contract employees.	Not Significant (Minor)	Not significant (Minor)
Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.	Construction	• Implementing carpooling incentives during construction and operations. • Providing workforce personnel shuttles from key locations within the City to the Mine Site during construction. • Staggering shifts during the construction phase and, to a lesser extent, during the operations phase. • Improved signage for Lac le Jeune Rd. • Proportionate road infrastructure improvements to Lac le Jeune Rd.	Not Significant (Minor)	Not Significant (Moderate)

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.	Construction, Operations	• Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with the City and TNRD to inform them of workforce requirement.	Not Significant (Minor)	No residual cumulative Effect

Officials from Kamloops and the TNRD both expressed concern that skilled workers may be attracted to Project work, making it more challenging for the municipality and regional district to hire the skilled workers needed to maintain and/or expand public works. Businesses in Kamloops have also noted that there is a shortage of skilled workers in Kamloops (Venture Kamloops 2013). While there may be some overlap between the workforce requirements of the Project, especially in connection with designated trades during peak construction, other skilled workers required by the Project (technical and engineering) will likely possess a skillset specific to employment in the mining sector. Ongoing dialogue about workforce requirements is anticipated to help Kamloops and the TNRD plan future projects; projects may need to be deferred but it is unlikely that they would need to be canceled, and the effect is predicted to be Not Significant (Minor). In light of the temporary nature of construction employment for the TMPL Expansion and the fact that it anticipates sourcing about 10% of its workforce from the combined Thompson-Nicola and Fraser-Fort George regional districts, no cumulative effect is identified.

Potential effects on community infrastructure, including solid waste (landfill) and liquid waste (sewer) management facilities, are not expected. No concerns regarding the capacities of these systems have been identified and KAM will establish service agreements with the relevant authorities for the authorized use of these facilities.

8.2 DARK SKY

8.2.1 Rationale

This section includes a description of the scoping process used to identify Dark Sky for inclusion in the assessment. Scoping is fundamental to focusing the Application/EIS on those issues where there is the greatest potential to cause significant adverse effects. Valued components (VCs) are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (CEAA 2006; BC EAO 2013). To be included in the EA, there must be a perceived likelihood that the VC will be affected by the proposed Project. Valued components are scoped into the environmental assessment based on issues raised during consultation with Aboriginal communities, government agencies, the public and stakeholders. Consideration of certain VCs may also be a legislated requirement, or known to be a concern because of previous project experience.

There are no specific regulatory requirements in place in British Columbia regulating maximum illumination levels and obtrusive light. However, the International Commission on Illumination (CIE) has developed recommendations around maximum spill light and glare to avoid hazardous situations, minimize environmental disturbance and conserve energy. Some of these recommendations have been adopted by several industries in Canada among which is the LEED Green Building Council Certification Program of Canada (LEED 2004).

"Dark Sky" has been chosen as a VC based on specific concerns expressed by the public during Project-related consultation to date. Residents of Kamloops have expressed concerns about potential health issues related to the illumination of the sky during the night, while the Kamloops Astronomical Society (KAS) has expressed concern about their ability to conduct scientific research and recreational sky gazing and astronomy.

Information developed to support the analysis of the effects of the Project on this VC also contributes to other analyses of other VCs, as shown in Figure 8.2-1. For example, this VC may be linked with human and community health.

8.2.2 Background

8.2.2.1 Regional Overview

KGHM Ajax Mining Inc. (KAM) proposes to construct and operate an open pit copper-gold mine south of the city of Kamloops, British Columbia. The Ajax property includes two historic pits: the Ajax West Pit, and the Ajax East Pit. Both pits were formerly mined in the 1980s and 1990s. The newly proposed 65,000 tonnes of ore per day open-pit operation has a predicted mine life of 23 years. Figure 8.2-2 shows the footprint of major mine facilities which cover an area of approximately 2,300 ha. Within this footprint are an open pit, internal mine roads, processing plant and administration facilities, an ex-pit crusher and conveyor, explosive storage and magazine structures, water collection ponds, fence lines, dams, seepage collection ditches, water and tailings pipelines, a tailings storage facility (TSF), mine rock storage facilities (MRSFs), ore stockpiles, as well as topsoil and overburden stockpiles.

Figure 8.2-1
Valued Component Interaction - Dark Sky

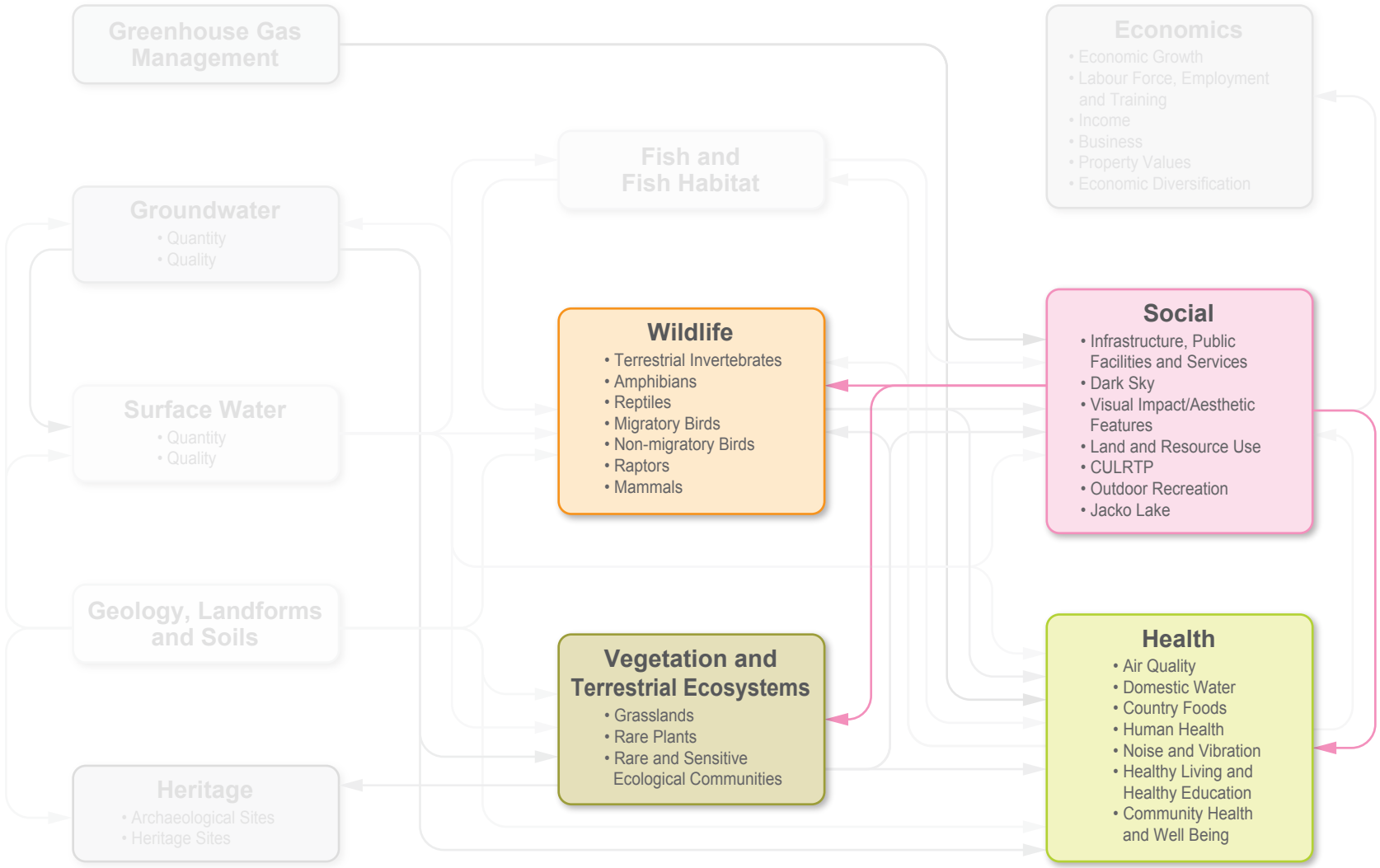
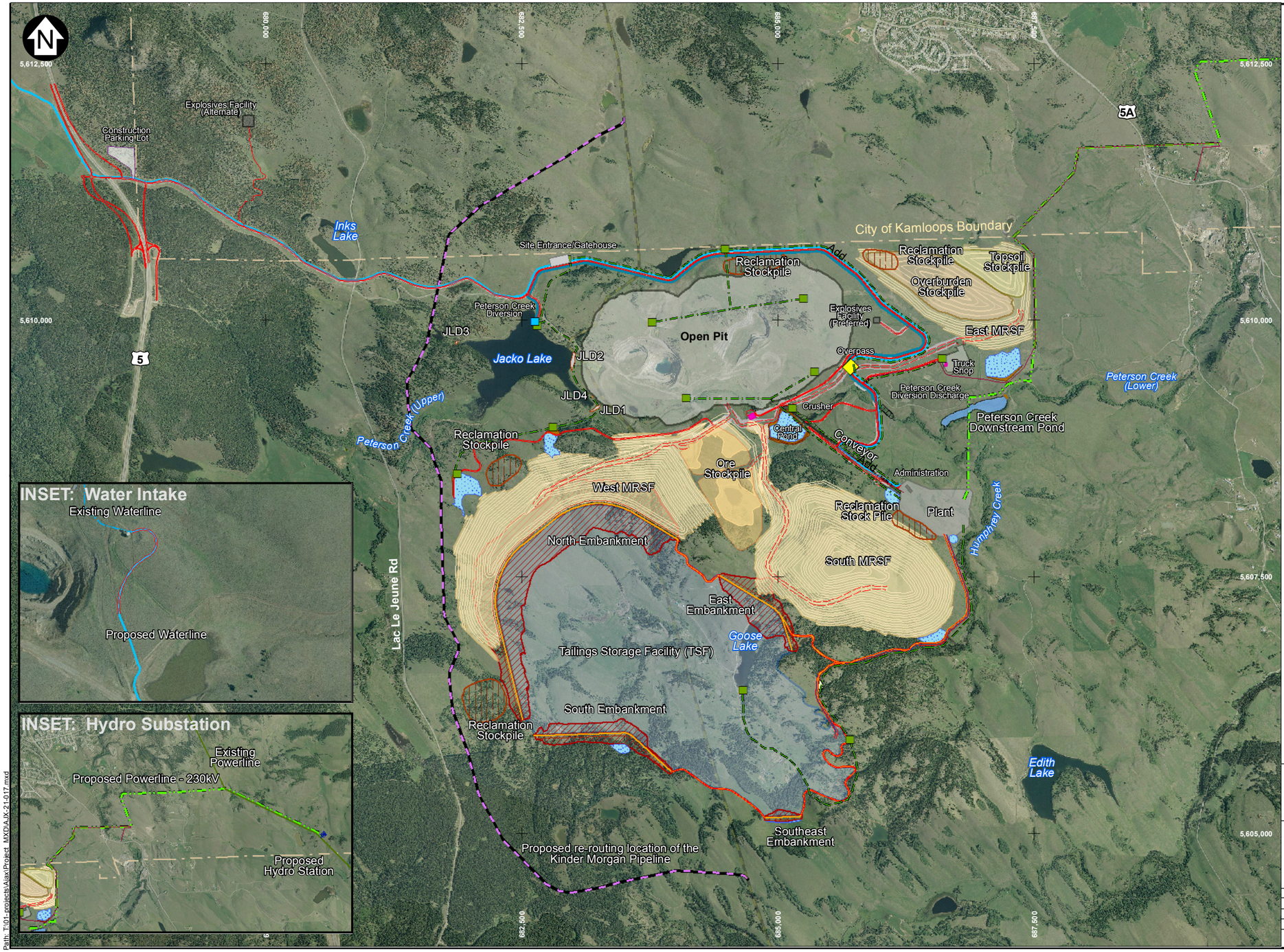


Figure 8.2-2
Ajax Project Proposed Mine Facilities



Natural Gas Line (approx. location)
Hydroline Existing
Kinder Morgan Pipeline - Current
Kinder Morgan Pipeline - Rerouted
Waterline Existing
City of Kamloops

Proposed Structures

- Overpass
- Electrical Infrastructure
- Powerline - 230kV
- Powerline - 25kV
- Powerline - Cable
- Reclaim Waterline
- Waterline
- Mine Rock Storage Facility (MRSF)
- Pit Outline
- Tailings Storage Facility (TSF)
- TSF Embankment
- Tailings Line
- Road
- Road - Haul
- Cut / Fill
- Other Infrastructure
- Construction Parking Lot
- Fuel Island
- Ore Stockpile
- Overburden Stockpile
- Reclamation Stockpile
- Topsoil Stockpile

Water Management

- Water Management Pond
- Water Management Berm

Layer

- Dam Outline

Peterson Creek

- Diversion Intake
- Peterson Creek Diversion
- Downstream Pond
- Diversion Discharge

NOTES:

1. BASE MAP: Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:40,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 0.4 0.8 1.2 Kilometres

KGHM

KGHM Ajax Mining Inc.

2015 July 21			
DATE			
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REF NO.	AJX-21-017		REV H

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The mine location is currently being used primarily for ranching purposes (i.e. cattle grazing). While there are many range roads and fence lines crossing the property, no permanent outdoor light sources currently exist at the historic mine sites. Neighbouring farms along Lac Le Jeune Rd, Goose Lake Rd, Long Lake Rd, and Edith Lake Rd also currently utilize outdoor lighting systems and vary in distance to proposed facilities from 0.73 km to more than 3 km. The nearest Kamloops residential light source is in the neighborhood of Knutsford along Hwy 5A. The residences of the unincorporated community of Knutsford are located along Long Lake Road and are 1.5 km from the proposed facilities.

The New Afton Mine, an underground operation owned by New Gold Inc., is located approximately 10 kilometers northwest of the Ajax Project.

The Stake Lake Observatory is located approximately 8.6 km straight-line distance southwest of the southern border of the Mine Site. The observatory is operated by the Kamloops Astronomical Society (KAS): a local group that requires a minimum level of sky darkness for meaningful astronomical observations.

8.2.2.2 Historical Activities

The region surrounding the Project has a long history of human activity that contributes to the current development of the landscape and the associated dark sky conditions, which is defined more specifically in the following section of this assessment.

British Columbia officially became part of Canada in 1871, and construction of the transcontinental railroad was completed in 1885, encouraging the growth of a small village on the shore of the Thompson River. The village grew and by 1893 the population had risen to approximately 500 and became incorporated as a city with public works. In the following years, there were a number of infrastructural developments, including bridges that connected villages on either side of the rivers. During this time, the timber industry grew, as did vegetable and orchard farming industries concentrated in the fertile river valley.

The Canadian Northern Railway was completed in 1915, and the Kamloops airport was operational in 1939. The Trans-Canada Highway, located west of the Project, was completed in 1962, and the Yellowhead Highway in 1970. The Kamloops area grew after the First World War until development slowed during the Depression and the Second World War. After the war, the City began to grow again, and much of the land that had formerly been used for farming in the valley was used for residential development. Ranching (including cattle grazing) also developed, and is currently ongoing immediately within and adjacent to the Project.

Mining activity in the Project area can be traced back over 100 years with exploration beginning in the 1880s and continuing intermittently to present. Copper, gold, and iron mineralization was discovered at the Iron Mask Mine near Kamloops in 1896, and nearby properties, including the Wheal Tamar, Ajax, and Monte Carlo claims, were explored in the following years.

The historic Afton Mine went into operation in 1977. Mining operations were initiated on the Ajax East and Ajax West pits in 1989 and subsequently suspended in 1991 due to depressed metal prices. A second period of production began in 1994 and was again suspended in 1997. The raw ore from the

Ajax pits was trucked approximately 10 km west to the processing plant adjacent to the Afton pit. During these periods of production, it is estimated that 17 Mt of ore was mined and 13 Mt of ore was milled. In the late 1990s, the tailings facility and other mine components were decommissioned and reclaimed by the Afton Mine in accordance with their closure plan. At the Ajax Mine Site, this includes reclaimed waste rock dumps adjacent to Peterson Creek in the location of the planned Ore Stockpiles.

The New Afton Mine occupies the site of the historic Afton Mine infrastructure, approximately 10 km northwest of the Project. New Afton began underground mining immediately beneath the historic Afton Mine open pit in June 2012.

8.2.2.3 Baseline Studies

Baseline data was gathered between June 2012 and September 2014. The objective of the baseline study was to assess the current light conditions and to identify the effects of existing light sources on the area surrounding the Project and at specific receptor locations.

Natural light is an important component that affects the behaviour of living things. The invention of artificial light has given humans the ability to alter day and night patterns. In many cases it has enhanced human lifestyles and well-being, but when not properly controlled, obtrusive light (i.e. light pollution) may lead to problematic changes in environmental and human health (ILE 2005).

While "useful light" is intended to illuminate a specific area, the leakage of light beyond the intended area is considered "obtrusive light". Obtrusive light can be classified as Spill Light, Glare and Sky Glow. Figure 8.2-3 visualizes the different aspects of obtrusive light as a result of artificial lighting.

- Spill Light is the light that falls outside the area that needs to be lit. This type of obtrusive light could shine into windows of nearby residences and disrupt sleeping patterns. The CIE recommends that this type of light should not exceed 1 lux (1 lumen/m^2) (CIE 2003).
- Glare is the light that is in sharp contrast to its surrounding and a nuisance to the human eye. This is the type of light that can cause hazardous situations because it could potentially limit visibility.
- Sky Glow is the dome of light that can be identified during the night from a distance, hanging over a town, city or other illuminated feature. It is caused by upward directed light and reflected light. Sky Glow can be assessed by measuring the amount of contrast of the night sky. In an area without any artificial light sources and during a moonless night the contrast between the stars and the blackness of space will be at maximum. The measurement units for sky glow is defined as the magnitude per square arc-second (mag/arcsec^2) where the magnitude corresponds to the brightness difference and one square arc-second is the area described by 1/3600 by 1/3600 of an angular degree.

Typical values for Sky Glow range from approximately 22 mag/arcsec^2 in natural environments to approximately 17 mag/arcsec^2 in highly urbanized areas. The baseline values around the Project area range on average from as low as 19.04 mag/arcsec^2 in the Pine View area of the City of Kamloops to 20.84 mag/arcsec^2 near the Stake Lake observatory (KAM 2014). On the Bortle Classification Ratings scale these values correspond with a bright suburban sky class to a rural / suburban transition class (Bortle, John E., 2001). Table 8.2-1 shows the correlation between the Bortle Classification and Sky Brightness readings.

Figure 8.2-3
Types of Obtrusive Light

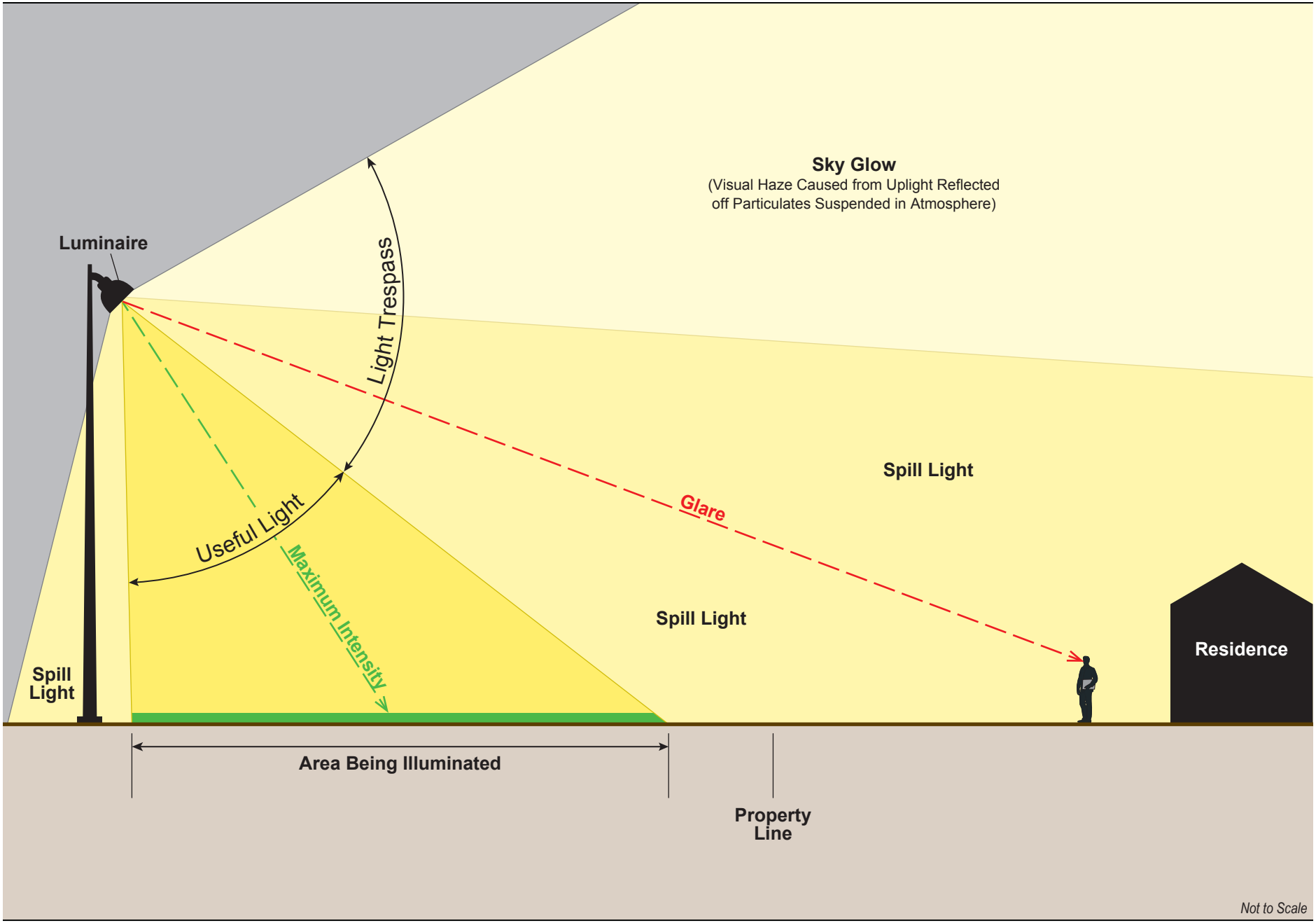


Table 8.2-1. Correlation between Bortle Classification and Sky Brightness Readings

Class	Title	Artificial / Natural Sky Brightness	Naked-eye Limiting Magnitude (NELM)	Stellar Limiting Magnitude (mag/arcsec^2)	Description
1	Excellent dark-sky site	< 0.01	7.6 – 8.0	> 21.99	the zodiacal light is visible and colorful the gegenschein is visible the zodiacal band is visible airglow is readily visible the Scorpius and Sagittarius regions of the Milky Way cast obvious shadows many Messier and globular clusters are naked-eye objects M33 is a direct vision naked-eye object limiting magnitude with 12.5" reflector is 17.5 (with effort)
2	Typical truly dark site	0.01 - 0.11	7.1 – 7.5	21.99 -21.89	the zodiacal light is distinctly yellowish and bright enough to cast shadows at dusk and dawn airglow may be weakly visible near horizon clouds are only visible as dark holes against the sky surroundings are barely visible silhouetted against the sky the summer Milky Way is highly structured many Messier objects and globular clusters are naked-eye objects M33 is easily seen with naked eye limiting magnitude with 12.5" reflector is 16.5
3	Rural sky	0.11 - 0.33	6.6 – 7.1	21.89 - 21.69	the zodiacal light is striking in spring and autumn, and color is still visible some light pollution evident at the horizon clouds are illuminated near the horizon, dark overhead nearer surroundings are vaguely visible the summer Milky Way still appears complex M15, M4, M5, and M22 are naked-eye objects M33 is easily visible with averted vision limiting magnitude with 12.5" reflector is 16

(continued)

Table 8.2-1. Correlation between Bortle Classification and Sky Brightness Readings (continued)

Class	Title	Artificial / Natural Sky Brightness	Naked-eye Limiting Magnitude (NELM)	Stellar Limiting Magnitude (mag/arcsec²)	Description
4	Rural / suburban transition	0.33 - 3.00	6.1 – 6.5	21.69 - 20.49	the zodiacal light is still visible, but does not extend halfway to the zenith at dusk or dawn light pollution domes visible in several directions clouds are illuminated in the directions of the light sources, dark overhead surroundings are clearly visible, even at a distance the Milky Way well above the horizon is still impressive, but lacks detail M33 is a difficult averted vision object, only visible when high in the sky limiting magnitude with 12.5" reflector is 15.5
5	Suburban sky	3.00 - 9.00	5.6 – 6.0	20.49 - 19.5	only hints of zodiacal light are seen on the best nights in autumn and spring light pollution is visible in most, if not all, directions clouds are noticeably brighter than the sky the Milky Way is very weak or invisible near the horizon, and looks washed out overhead limiting magnitude with 12.5" reflector is 15
6	Bright suburban sky	9.00 - 15.59	5.1 – 5.5	19.50 - 18.95	the zodiacal light is invisible light pollution makes the sky within 35° of the horizon glows grayish white clouds anywhere in the sky appear fairly bright surroundings are easily visible the Milky Way is only visible near the zenith M33 is not visible, M31 is modestly apparent limiting magnitude with 12.5" reflector is 14.5
7	Suburban/ urban transition	15.59 - 27.00	4.6 – 5.0	18.95 - 18.38	light pollution makes the entire sky light gray strong light sources are evident in all directions clouds are brightly lit the Milky Way is invisible M31 and M44 may be glimpsed, but with no detail through a telescope, the brightest Messier objects are pale ghosts of their true selves limiting magnitude with 12.5" reflector is 14

(continued)

Table 8.2-1. Correlation between Bortle Classification and Sky Brightness Readings (completed)

Class	Title	Artificial/ Natural Sky Brightness	Naked-eye Limiting Magnitude (NELM)	Stellar Limiting Magnitude (mag/arcsec²)	Description
8	City sky	27.00 - 46.77	4.1 – 4.5	18.38 - 17.80	the sky is light gray or orange - one can easily read stars forming familiar constellation patterns may be weak or invisible M31 and M44 are barely glimpsed by an experienced observer on good nights even with a telescope, only bright Messier objects can be detected limiting magnitude with 12.5" reflector is 13
9	Inner-city sky	> 46.77	4	> 17.80	The sky is brilliantly lit many stars forming constellations are invisible and many fainter constellations are invisible aside from the Pleiades, no Messier object is visible to the naked eye the only objects to observe are the Moon, the planets, and a few of the brightest star clusters

Data Sources

The baseline methodology was developed with assistance from the Kamloops Astronomical Society (KAS) and the Royal Astronomical Society of Canada. Several consultation sessions were held throughout the two-year sampling period between the proponent and KAS to help identify useful sample locations, instrumentation, and literature related to the study. These include formal meetings prior to the start of sampling to finalize an agreeable methodology, as well as other periodic formal and informal correspondence and presentations during the sampling period.

Methods

To establish baseline conditions, key locations were sampled using a Unihedron Sky Quality Meter (KAM 2014). This device was developed for astronomical purposes and records the brightness of the sky. The unit measures the brightness over a 60 degree angle in all directions at the sensors eye. The results are recorded in magnitude per arcsecond² (mags/arcsec²).

At each location, three readings, each taken at the zenith, were recorded. The values were compared and averaged to eliminate any outliers or incorrect readings. At the Kamloops Astronomical Society's observatory near Stake Lake, horizon glow was also measured at 30 degrees altitude from the horizon towards the west, south, east and north.

All readings were recorded manually on a custom log sheet also indicating surface conditions, meteorological conditions, data and time and GPS location.

Measurements were taken from June 2012 to September 2014 within 3 days of a new moon. Due to meteorological conditions and safety concerns (e.g. road and weather conditions), a total of 17 measurement events occurred covering 19 locations.

In order to produce a more detailed description of baseline dark sky values around the Project, 40 additional sites were sampled in a similar fashion as the original 19 sites. The results from these sites were combined with the average values from the original 19 sites to produce a thematic map showing an interpolated image of the dark sky readings. The result of the interpolation as well as the sampling locations can be seen on Figure 8.2-3.

Characterization of Dark Sky Baseline Condition

A total of 17 sampling events took place over the period spanning June 2012 to September 2014, covering 19 sites, plus the sampling of 40 additional sites on September 27, 2014 for thematic mapping purposes. Figure 8.2-3 shows the location of all sampling locations and the contours of the dark sky interpolation against a topographic relief background. Table 8.2-2 is an amalgamation of baseline sampling locations and thematic mapping locations from Appendix 8.2-A Baseline Report on Dark Sky. The table shows a list of all the sampling locations, average readings used for the thematic mapping, average readings of baseline sampling locations from 2012 to 2014 and the Bortle classes extrapolated from the clear sky, no snow cover average readings. It also indicates the relationship of each location with the locations specifically mentioned in the AIR (i.e. Aberdeen, Knutsford, Sahali, Pineview Valley, Stake Lake Observatory, Edith Lake Road and Lac Le Jeune Provincial Park). The urban readings were strongly influenced by existing artificial lights found on city streets, homes, and businesses in and around the Kamloops' neighbourhoods of Sahali, Pineview, and Aberdeen. Dark sky measurements on the urban-rural periphery indicate that Coal Hill provides an effective topographic barrier to light pollution as light levels decrease significantly beyond this point towards the KAS Observatory.

The role of topography and distance was also demonstrated by the limited effect of obtrusive light reduction from the adaptive lighting program that was rolled out by the City of Kamloops in 2012/2013. While dark sky readings increased in the three urban neighbourhoods sampled during the baseline program, the benefits of the program did not seem to extend to the rural periphery and facilities such as the KAS Observatory (KAM 2014).

Sky darkness levels around the KAS Stake Lake Observatory received special consideration throughout this study. At the observatory location, five readings were gathered on each visit: one at zenith (an average of three individual readings), and four at each cardinal direction. The goal of the cardinal directional readings was to provide information on horizon glow light pollution that could affect astronomical observations. Should the Ajax Project proceed through permitting and approval into construction and operations, the horizon glow baseline readings at the observatory will help determine Project-related changes as a result of the Project's outdoor lighting systems and inform mitigation strategies throughout the mine life.

Table 8.2-2. Baseline Sampling Average Readings and Bortle Classification

Sampling Type	Location ID	Coordinates		Average SQM Reading June 2014	Thematic Mapping ID	Reading 2012 to 2014			Bortle Class
		X	Y			Average	Average, Clear Sky	Average, Clear Sky, No Snow	
Baseline Sampling Locations, sampled between 2012 to 2014	1[3]	687486	5613665	20.05		19.04	19.78	19.93	5
	2[1]	685912	5612632	19.97		19.46	19.93	20.06	5
	3[4]	684102	5614222	19.28		18.88	19.33	19.64	5
	4	680434	5610403	21.23		20.11	20.78	20.83	4
	5[5]	678608	5598433	21.54		20.84	21.25	21.31	4
	6	681695	5603940	21.45		20.78	21.08	21.09	4
	7	684700	5605929	21.36		20.85	21.06	21.07	4
	8	688918	5609811	21.09		20.49	20.79	20.85	4
	9	685680	5609366	21.12		20.33	20.81	20.85	4
	10	683426	5610902	19.58		19.83	20.46	20.48	5
	11	683239	5612758	19.96		19.70	20.27	20.35	5
	12	684683	5612151	20.17		19.33	20.17	20.27	5
	13	684665	5612000	20.44		19.63	20.53	20.63	4
	14	685001	5611736	20.35		19.73	20.25	20.34	5
	15	678410	5611393	21.14		20.56	20.93	20.97	4
	16	680434	5610403	20.66		19.56	20.43	20.51	5
	17[6]	689683	5608208	21.05		20.47	20.83	21.00	4
	19[6]	687451	5605855	21.05		20.68	21.20	21.20	4
	20[7]	678069	5595786	21.55		21.63	21.55	21.55	4
Thematic Mapping Sampling Locations	22	680979	5611576	20.75	1				4
	23	680988	5609000	20.86	2				4
	24	681746	5605608	21.01	3				4
	25	680941	5601814	21.11	4				4
	26[5]	678689	5599473	21.12	5				4
	27[7]	677711	5596466	21.15	6				4
	28	675328	5595676	21.16	7				4
	29	675994	5595979	21.03	8				4
	30[5]	678233	5598344	21	9				4
	32	678983	5610170	20.74	11				4
	33	680802	5610324	20.72	12				4
	34	680053	5614030	20.48	13				5
	35	681172	5614831	20.31	14				5
	36[4]	683249	5614803	19.92	15				5
	37[1]	684887	5614598	19.52	16				5
	38	682380	5615908	19.29	17				6
	39	684549	5615716	19.79	18				5

(continued)

Table 8.2-2. Baseline Sampling Average Readings and Bortle Classification (completed)

Sampling Type	Location ID	Coordinates		Average SQM Reading June 2014	Thematic Mapping ID	Reading 2012 to 2014			Bortle Class
		X	Y			Average	Average, Clear Sky	Average, Clear Sky, No Snow	
Thematic Mapping Sampling Locations *(cont'd)*	40	685880	5614958	18.59	19				7
	41	685711	5616611	19.23	20				6
	42	686022	5617429	19.42	21				6
	43[3]	687104	5616045	13.65	22				9
	44[3]	686858	5615029	19.46	23				6
	45[3]	687854	5615083	19.39	24				6
	46[1]	686767	5613882	19.68	25				5
	47[1]	687471	5612848	19.92	26				5
	48[2]	688640	5611413	20.47	27				5
	49	689920	5606623	21	28				4
	50	689747	5607747	20.93	29				4
	51[6]	687602	5607560	20.94	30				4
	52	689497	5609103	20.82	31				4
	53	687240	5609370	20.73	32				4
	54	686607	5609138	20.75	33				4
	55	685522	5609158	20.76	34				4
	56	685252	5608846	20.79	35				4
	57	684827	5608552	20.85	36				4
	58	684929	5607906	20.86	37				4
	59	685074	5607552	20.9	38				4
	60	684717	5607073	20.95	39				4
	61	679355	5613061	20.78	40				4

Note: ID 18, 21 and 31 have been removed from the list due to GPS malfunction (18 and 31) or faulty reading (21).
1,2, 3, 4, 5, 6 and 7 reference sampling locations in areas indicated in the AIR. These areas are respectively City of Kamloops neighbourhood Aberdeen (1), City of Kamloops neighbourhood Knutsford (2), City of Kamloops neighbourhood Sahali (3), City of Kamloops neighbourhood Pineview Valley (4), Stake Lake observatory (5),residences along Edith Lake Road (6) and Lac Le Jeune Provincial Park (7)

A noteworthy finding of this study is that outdoor lighting currently present on the Stake Lake cross country ski trail network has an effect on sky darkness around the KAS observatory during winter months. Measurements showed that, when the outdoor trail lights are in use (i.e. in winter months, between approximately 4 and 10 pm), sky darkness at the observatory is reduced to levels comparable to urban neighbourhoods.

In general, sky darkness readings were shown to be strongly influenced by atmospheric conditions (i.e., the presence of cloud cover) and whether or not snow was present at the surface. Light-to-moderate cloud with snow on the ground increased the presence of obtrusive light due to additional scattering and reflective influences.

8.2.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part of scoping for the Dark Sky assessment, and encompasses possible direct, indirect, and induced effects of the Project on sky darkness, as well as the trends in processes that may be relevant.

8.2.3.1 Spatial Boundaries

The spatial boundaries were developed through meetings and discussions with Kamloops Astronomical Society (KAS), the Royal Astronomical Society of Canada and the City of Kamloops. The consultations sessions resulted in the identification of key locations, important to residents of the City of Kamloops and members of KAS; participants also recommended literature to help determine the theoretical extent of Dark Sky effects.

Figure 8.2-4 shows the local and regional study areas in relation to the Project.

Local Study Area

To perform any outside work or travel efficiently and safely during low light situations there will be a need for lighting. Some of this light will fall outside of the target areas unintentionally because of the location and design of the light fixture or the shape of the target area.

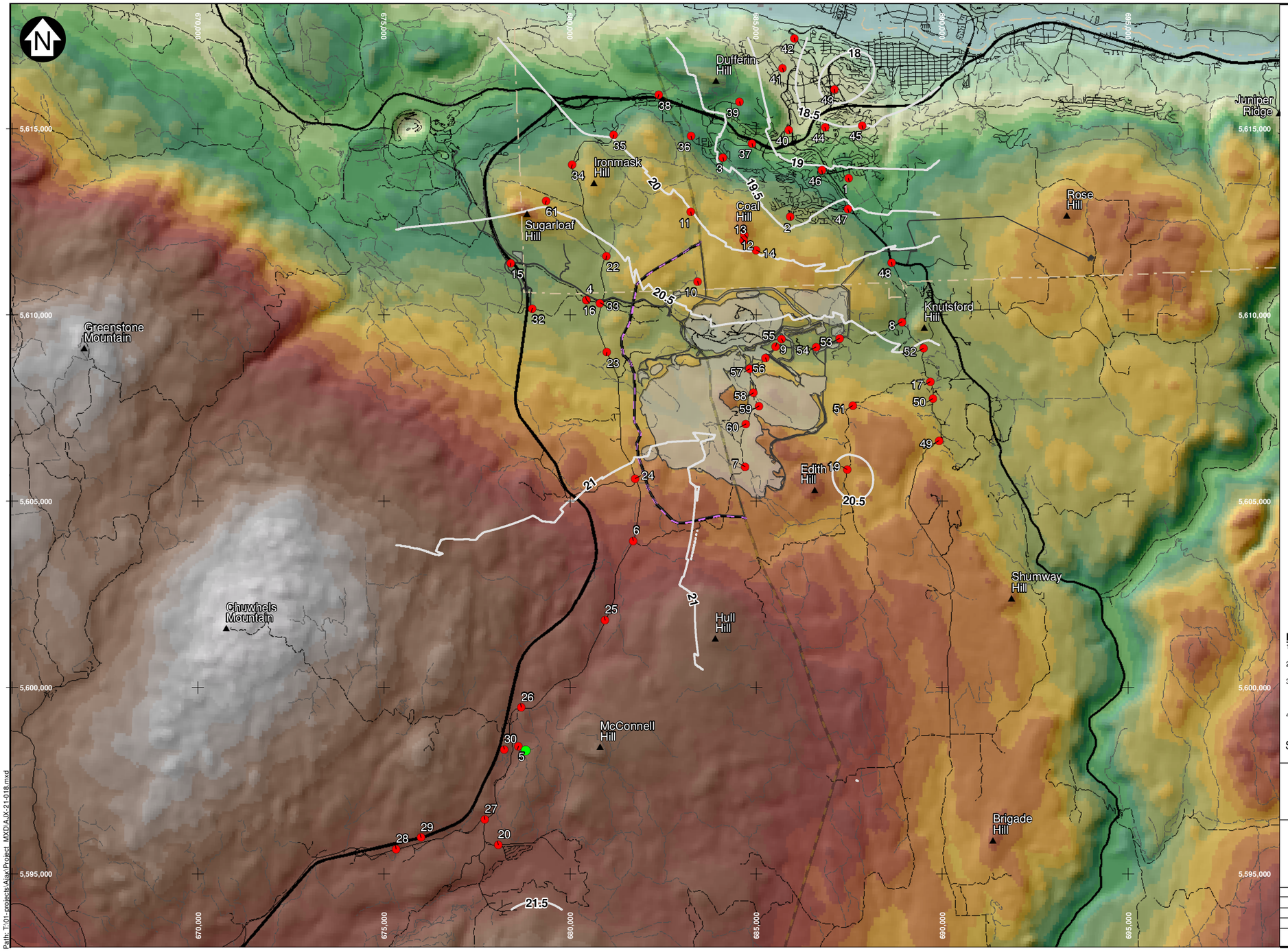
The landscape surrounding the Project will have a limiting influence on the extent of the effects. North of the Project an elevated area running from east to west, connecting Knutsford Hill, Coal Hill, Ironmask Hill and Sugarloaf Hill, forms a physical barrier for the light to reach the residential areas North and Northeast of the Project. To the South the elevation gradually increases from 950 metres at the Plant Site to 1450 metres, the peak of Hull Hill. The effect of light spill and glare will therefore be only measurable at a local scale in the vicinity of the Project.

The area affected by Light Spill and Glare is confined by the physical character of the landscape and will therefore not extend beyond 500 metres from the lit areas like the Plant Site, Tailings Release Locations, Gate House, Truck Shop and Explosives Facilities. The effects are local in character and therefore define the extent of the LSA.

Regional Study Area

Any light being reflected off the surface or dispersed by particulates suspended in the atmosphere, as well as light directed upwards, will cause a visual haze. This haze will be noticeable from a distance as a glow, referred to as Sky Glow, around the illuminated area and affects the sky darkness of the area within the glow. As opposed to the Glare and Spill Light effect, the extent of the Sky Glow effect is not directly influenced by topography or other physical barriers, and is more related to the prevailing atmospheric conditions, aerosols in the atmosphere and reflectivity of the illuminated surface.

Figure 8.2-4
Sky Darkness Interpolation Contours, Elevations and Baseline Sampling Locations



Kinder Morgan Pipeline - Current
Kinder Morgan Pipeline - Rerouted
Highway
Paved Road
Gravel Road
Rough Road
Recreational
City of Kamloops
Proposed Infrastructure
Landmark
KAS Observatory
Dark Sky Baseline Sampling Location
Sky Darkness Contour (mag/arcsec²)

Elevation (m)

340 - 350	1,100 - 1,150
350 - 400	1,150 - 1,200
400 - 450	1,200 - 1,250
450 - 500	1,250 - 1,300
500 - 550	1,300 - 1,350
550 - 600	1,350 - 1,400
600 - 650	1,400 - 1,450
650 - 700	1,450 - 1,500
700 - 750	1,500- 1,550
750 - 800	1,550 - 1,600
800 - 850	1,600 - 1,650
850 - 900	1,650 - 1,700
900 - 950	1,700 - 1,750
950 - 1,000	1,750 - 1,800
1,000 - 1,050	1,800 - 1,850
1,050 - 1,100	1,850 - 1,900

NOTES:
1. BASE MAP: Digtal Elevation Model and Hillshade (source Ministry of Forests, Lands and Natural Resource Operations - GeoBC)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:110,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 1 2 3 Kilometres

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KGHM Ajax Mining Inc.

2015 July 21			
DATE			
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REF NO.	AJX-21-018		REV A

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The Highland Valley Copper Mine located approximately 32 km Southwest from the Project is an operation, approximately double in production size compared to the Proposed Ajax Project, for which the effect of project lighting can be identified and measured using the information from the Visible Infrared Imaging Radiometer Suits (VIIRS) published by the NGDC Earth Observation Group related to the National Oceanic and Atmospheric Administration (NOAA/EOG, 2015). The imagery from different years (2012, 2014 and 2015) indicate a maximum effect radius of approximately 5 kilometres. Using this information plus the comments and concerns of Kamloops Astronomical Society (KAS) the extent of the Regional Study Area (RSA) has been defined as shown on Figure 8.2-5. The figure describes the RSA as a 5 kilometre buffer around the Mine Site.

8.2.3.2 Administrative Boundaries

There are no administrative boundaries regarding Dark Sky.

8.2.3.3 Temporal Boundaries

The four phases of Project development will exhibit distinct illumination characteristics.

- **Construction**: 2 years; this phase is characterised by the construction of essential Project infrastructure. Activities will need sufficient lighting for workers to be able to perform their duties efficiently and safely. Night-time activities will be limited in order to minimize the effect of illumination of work areas, but cannot be avoided completely. Construction activities and associated illumination effects will peak in Year 1.
- **Operation**: 23 years; the Mine Site will operate 24 hours per day, and various types of lighting will be required in outdoor work areas. Areas of high activity (such as around the exterior of the process plant) will require constant bright light at night to ensure safe working conditions, while less frequently used areas and travel corridors may require lower illumination and/or intermittent lighting.
- **Decommissioning and Closure**: 5 years (includes project decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); decommissioning activities will be mainly during the daytime and night-time lights on site will be dimmed or completely turned off.
- **Post Closure**: 5+ years (includes ongoing reclamation activities and post-closure monitoring); reclamation activities will only take place during daytime. Lighting will be reduced to current levels.

8.2.4 Potential Effects of the Project and Proposed Mitigation for Dark Sky

8.2.4.1 Identifying Potential Effects on Dark Sky

Outdoor lighting at the Mine Site is only needed where people will be working. As indicated by the Occupational Health and Safety Regulation for WorkSafe BC, there are two levels of minimum illumination required. For non-regular work areas, an illumination level of 22 lux is required while 54 lux is required in areas of high activities (Work Safe BC 2008). For areas that are not in use, or only used for short periods of time, lighting will be managed with dimmers, timers and motion sensors.

Table 8.2-3 indicates lighting level requirements for Project activities and components that are expected to contribute to effects on the Dark Sky (i.e. the activities and components that involve outdoor lighting).

The construction phase will require lighting for a range of activities taking place over the full extent of the Mine Site. The roads, the power line, pads and buildings will be built within a limited timeframe. The effect of these activities will therefore be extensive, but relatively short term.

During the operations phase, a Project-specific Environmental Management Plan will be implemented in order to limit the effect of illumination of the Project on its surroundings. Lighting will be required for night-time activities and during low-light circumstances. In addition, access roads and other areas which are regularly visited (but not in constant use) will require a minimum amount of lighting. Lighting use patterns will be relatively consistent over the operation phase.

During the decommissioning and closure phase, some level of illumination may be required while decommissioning activities are underway if activities occur during low light situations. However, activities requiring lighting will be limited and/or adjusted, as far as practicable, to limit the use of lighting during these circumstances. No decommissioning activities are planned to occur at night.

In the post-closure phase, the illumination level will return to baseline conditions as no permanent night-time lighting will be required. Monitoring and maintenance will take place during daytime.

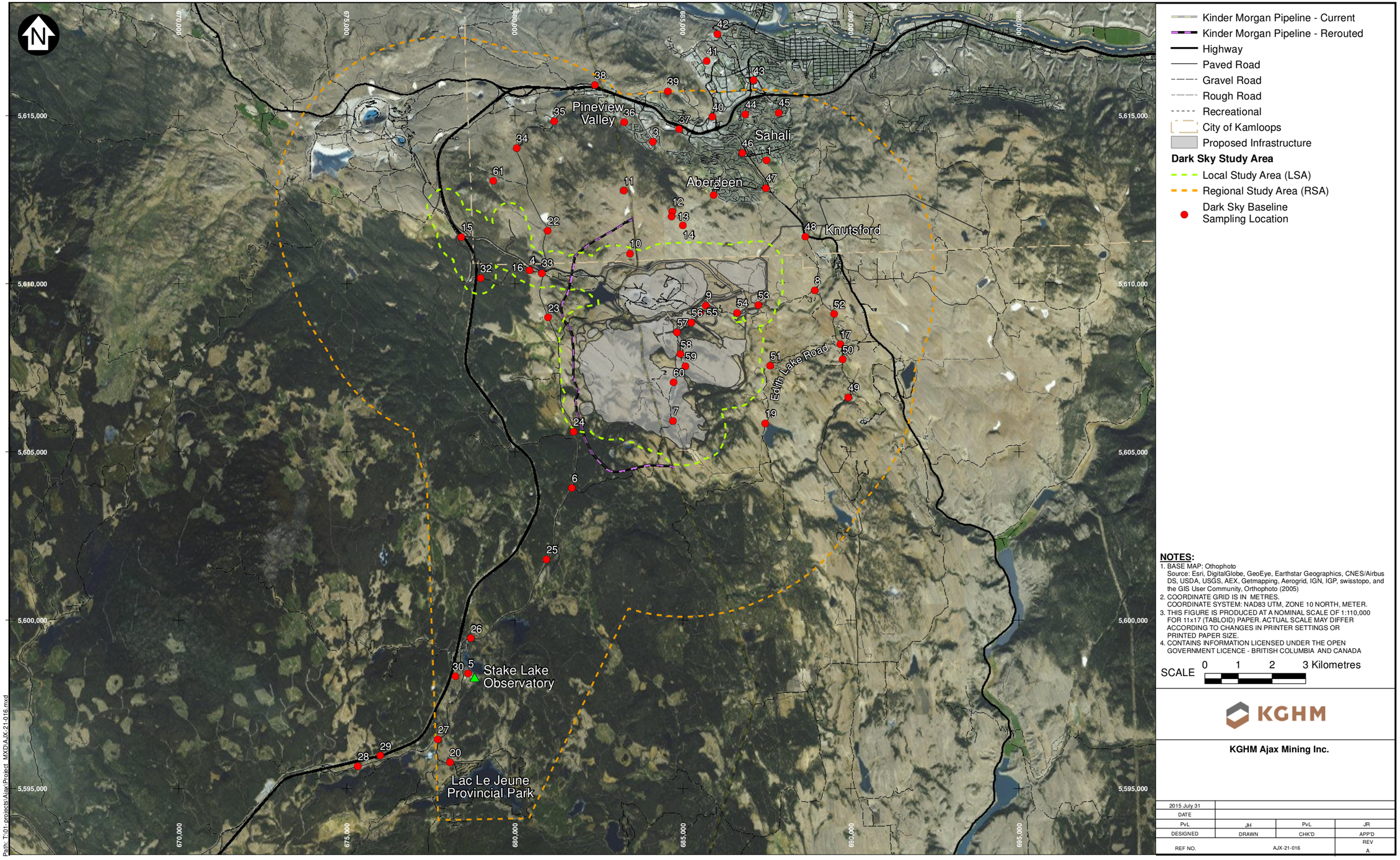
8.2.4.2 Effects on Dark Sky

Spill Light and Glare

Spill light has the potential to affect an area several hundred metres beyond its target area. Topography and vegetation form natural barriers which will reduce the extent of the effect. Figure 8.2-4 shows the topography around the Project including the hills and elevated areas limiting the extent of spill light. Figure 8.2-6 shows those areas around the Project which have a direct line of sight to the Process Plant and the TSF. Past activities and current land use around the Project have opened up the landscape and the only remaining stands of trees are located south of the Project. However, a ridge from Knutsford Hill to Iron Mask Hill will block any spill light or glare towards the surrounding residential areas and farms to the north and northeast of the project.

The highest potential for spill light or glare during the construction phase will be along the Coquihalla Highway, Lac Le Jeune Road, and at Jacko Lake. Although it is expected that construction activities will only take place during regular daytime hours, the activities might extend into dark when days are short or when continuation of construction is required; in these situations, and in low-light circumstances, lighting will be required.

During the operations phase, the process plant will operate 24 hours per day. Buildings, access roads, haul roads, bridges and other work areas will also need appropriate illumination as required by WorkSafe BC. The work areas like the Process Plant, Open Pit and Crusher, will require continuous illumination at 54 lux, while less frequently visited areas will require 22 lux.



NOTES:

1. BASE MAP: Othophoto
   Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Orthophoto (2005)
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:110,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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SCALE 0 1 2 3 Kilometres

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KGHM Ajax Mining Inc.

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Figure 8.2-6
Visibility of Ajax Project at Night for nearby Residents

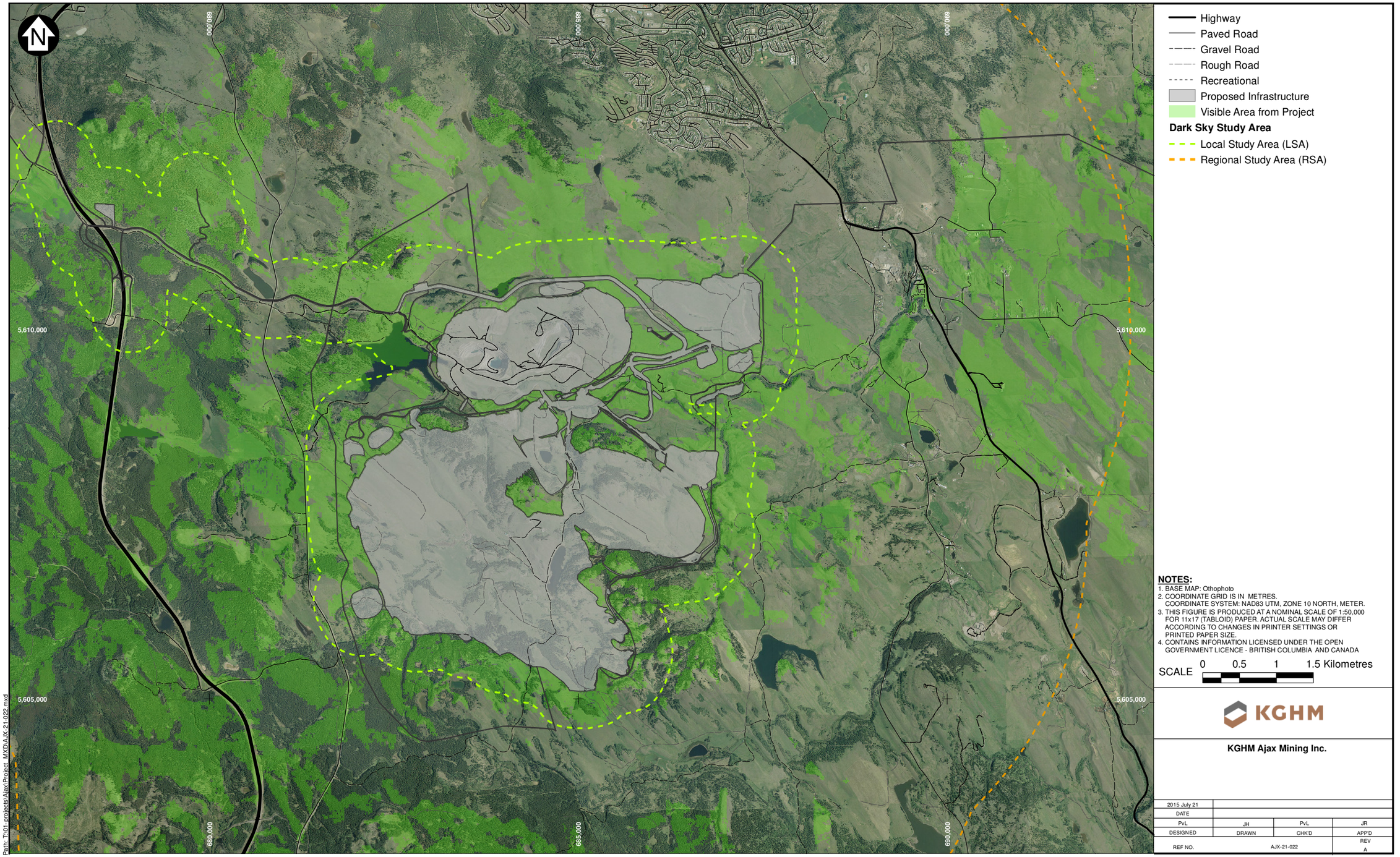


Table 8.2-3. Lighting Level Requirements for Project Components and Activities

Project Activities		Lighting Level Requirements			
		None	22 Lux	54 Lux	Duration
Construction	Clearing and Grubbing	√			
	Earthworks	√			
	Overburden/Topsoil Stockpile	√			
	Laydown Areas and Storage Yards		√		
	Project Lighting		√		When needed
	Site Security and Fencing		√		Continuous
	Fuel Storage and Filling Area		√		Continuous
	Hazardous Wastes Transport, Storage, and Disposal	√			
	Construction Wastes Transport, Storage, and Disposal	√			
	Sewage Infrastructure and Disposal	√			
	Public Road Realignment, Use, and Maintenance		√		When needed
	Site Road Construction, Use and Maintenance		√		When needed
	Haul Road Overpass Construction, Use, and Maintenance	√			
	Site Buildings and Process Plant			√	Continuous
	Explosives Magazine and Storage Facilities	√			
	Open Pit Development	√			
	Drilling and Blasting	√			
	Crushing Mine Rock	√			
	Loading, Hauling, and Deposition of Mine Rock	√			
	Temporary Ore Stockpile	√			
	Tailing Storage Facility Development	√			
	Power Transmission, Distribution	√			
	Natural Gas Line	√			
	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	√			
	Water Intake from Kamloops Lake	√			
	Fire Suppression Infrastructure	√			
	Contact Water	√			
	Non-contact Water	√			
	Haul Road Overpass	√			
	Water Management Dams	√			
Operation	Open Pit Development		√	√	When needed
	Drilling		√	√	When needed
	Blasting	√			
	Hauling Mine Rock and Ore from Pit		√		When needed
	Crushing and Conveying Ore			√	When needed
	Temporary Ore Stockpile	√			
	Development of Mine Rock Storage Facilities	√			
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	√			

Project Activities		Lighting Level Requirements			
		None	22 Lux	54 Lux	Duration
Operation (*cont'd*)	Revegetation through Progressive Reclamation	√			
	Process Plant Operation			√	Continuous
	Deposition to Tailing Storage Facility		√		Continuous
	Site Road Use and Maintenance (Materials, Personnel, Supplies)		√		When needed
	Concentrate Transport and Storage	√			
	Explosives Magazine and Storage Facilities		√		Continuous
	Fire Suppression Infrastructure		√		Continuous
	Fuel Storage and Filling Area		√		Continuous
	Hazardous Wastes Transport, Storage, and Disposal	√			
	General Wastes Transport, Storage, and Disposal	√			
	Sewage Infrastructure and Disposal	√			
	Laydown Areas and Storage Yards		√		When needed
	Power Transmission, Distribution	√			
	Site Access, Security and Fencing		√		Continuous
	Water Intake from Kamloops Lake	√			
	Contact Water	√			
	Non-contact Water	√			
	Potable Water Treatment and Use	√			
	Haul Road Overpass	√			
Decommissioning and Closure	Dismantling of Ancillary Buildings	√			
	Pit Lake Planning	√			
	Site Road Decommissioning	√			
	Tailing Storage Facility Decommissioning and Reclamation	√			
	Mine Rock Storage Facilities Reclamation	√			
	Fuel Storage and Filling Area	√			
	Hazardous Wastes Transport, Storage, and Disposal	√			
	General Wastes Transport, Storage, and Disposal	√			
	Sewage Infrastructure and Disposal	√			
	Laydown Areas and Storage Yards	√			
	Power Transmission, Distribution	√			
	Project Lighting	√			
	Site Access, Security and Fencing		√		When needed
	Contact Water	√			
	Non-contact Water	√			
	Potable Water Treatment and Use	√			
	Haul Road Overpass	√			
	Road use to the Project (Materials, Personnel, Supplies)		√		When needed
Post Closure	General Site Inspections and Maintenance	√			
	Contact Water	√			
	Non-contact Water	√			
	Road use to the Project (Materials, Personnel, Supplies)	√			

The decommissioning and closure phase is characterised by the decommissioning of Project components, including the process plant and other buildings, explosives facilities and roads, and reclamation of MRSFs and the TSF. These activities will mainly take place during the daylight. All lighting installations will be decommissioned resulting in illumination levels equal to baseline conditions.

Sky Glow

Sky glow is not typically influenced by topography and its extent can be perceived much further than spill light and glare. This phenomenon is more related to the amount of aerosols (dust or water droplets) in the air, the presence or absence of clouds and reflectivity of the illuminated surface. Undirected light will spill upward into the sky as will light being reflected by the surface. Aerosols in the air will scatter the light in all directions creating a glow around the illuminated area. Clouds can strengthen the effect by reflecting the glow back to the surface.

As described above, night-time construction activities are not planned. However, there may occasionally be a need to continue construction into the night, and when days are short or light levels are low, illumination will be needed to continue work safely and efficiently.

During the operations phase, the process plant will operate 24 hours per day. Buildings, access roads, haul roads, bridges and other work areas will also need appropriate illumination as required by WorkSafe BC. The work areas like the Process Plant, Crusher, and Tailings Release locations will require continuous illumination at 54 lux, while less frequently visited areas will require 22 lux. Figure 8.2-7 uses the radiometric information from the Highland Valley Copper mine site and displays it in relation to the area surrounding the Ajax Project. The area being affected by the Project extends up to 5 kilometres from the Project Boundaries. The KAS observatory does not fall within the radius of 5 kilometres. Table 8.2-4 lists the Baseline Sampling locations and the Bortle Scale associated with the information as shown on Figure 8.2-7. The Sampling Locations located within the Project area will increase to a level generally associated with lighting level experienced within city boundaries. Further away from the project the changes become less.

The closure and reclamation phase will not require illumination during the night. The intent is to perform all activities during the day although, as previously mentioned, lighting may be required when days are short and in low-light circumstances. In these conditions, mobile lighting systems will be used. All lighting installations will be decommissioned resulting in illumination levels equal to baseline conditions.

8.2.4.3 Mitigation Measures for Dark Sky

Management and mitigation of the effect of illumination can be achieved with relatively simple measures and results not only in less environmental disturbance, but can also lead to energy and associated cost savings. A lighting mitigation and management plan will be developed and implemented for the operations phase. Although the short-term construction and decommissioning phases will not have specific lighting management plans, lighting tools and techniques like the use of LED lighting, directed lighting and appropriate scheduling, will be used to limit the effects across all phases.

Illumination Management

A very effective way of mitigating spill light, glare, and sky glow effects is to avoid using lighting when not required. This can be achieved by setting timers, placing motion sensors and planning work efficiently. During the summer season when the number of daylight hours is at its peak there is an advantage to concentrate the work around this season. When nighttime work is required, timers and motion sensors will be used to limit duration of illumination in areas that are not in constant use, including the Explosives Facility, Truck Shop and Site Roads.

Historically, mines have preferred to use high intensity discharge lighting for outdoor purposes. This type of lighting guarantees a sufficient amount of illumination and the lamps last for a long time. However, a disadvantage of this type of lighting is the warm-up and cooling-down period that is needed for optimal performance and as a result lights were often not turned off. In recent times, with increased use of LED lighting (with no warm-up or cool-down period), lights can be turned on and off more frequently and even be dimmed when only lower illumination levels are required. KAM has committed to using LED lighting systems and directed lighting to limit spill light and glare.

Shielding and Directed Lighting

By directing the light in the direction of the target area to be illuminated and/or shielding the light, less light will be spilled beyond the intended areas. This can be achieved by using fixtures that cut off the light and use a more concentrated beam, the so called Fitted Target Efficacy. Along linear features, such as site roads, the efficient use of directed fixtures along the route means that less lumen will be required to achieve minimum lighting needs. While conventional lighting systems illuminate the area in a circular shape, the use of specific LED systems can be shaped to the feature requiring illumination. Shielding can be achieved by leaving or developing vegetation or artificial barriers around the Project area.

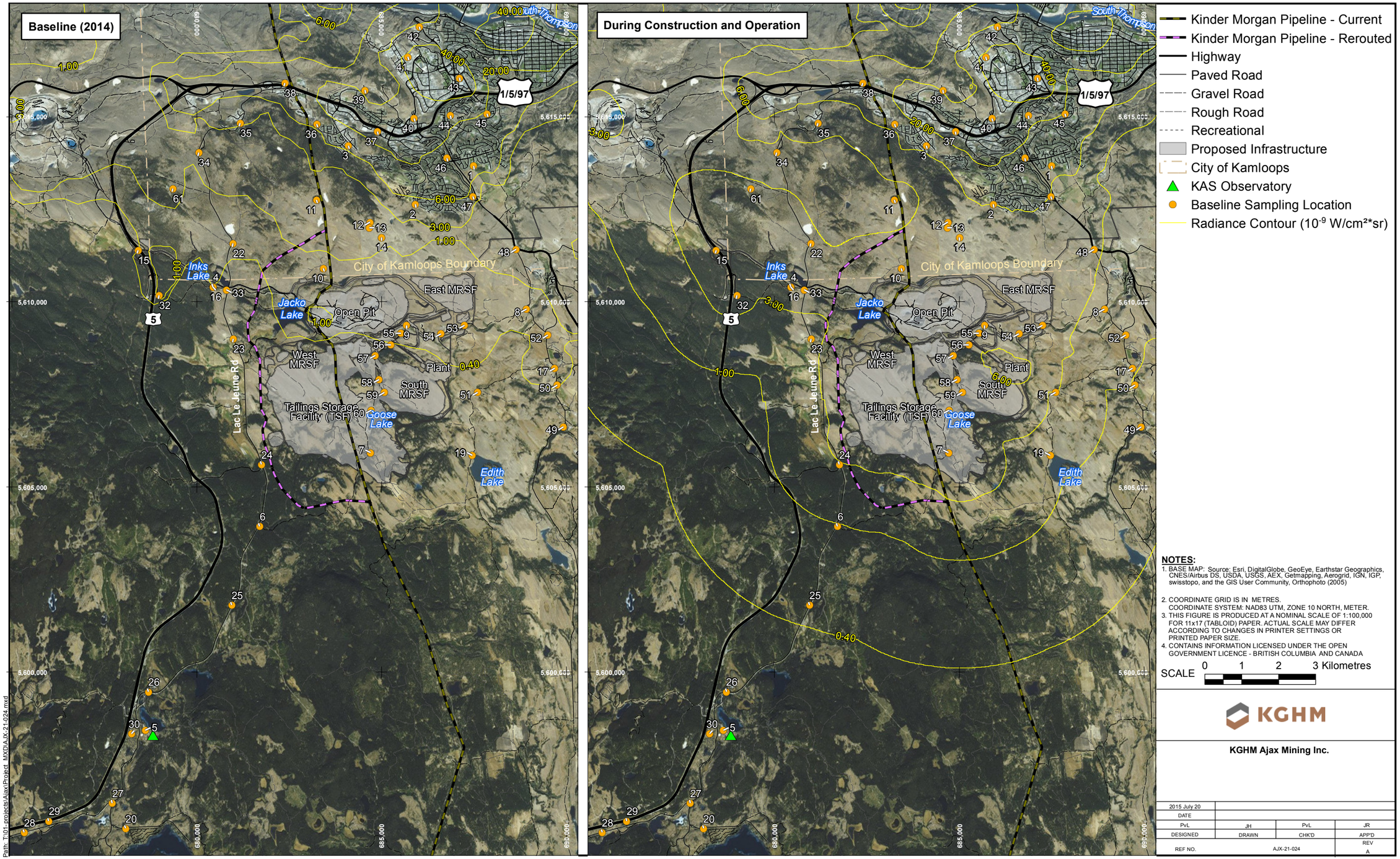
The height of the fixture above the target area plays an important role as well. The preference is to create a near vertical light beam that simulates the light from the sun to give a more natural working environment with fewer shadows. This is important to optimize the visual aspect for workers and also for safety reasons since it will make it less likely for workers, drivers or other visitors to the area to become blinded by the light, the so called the glaring effect.

KAM will use properly installed and applied LED lighting systems with higher Fitted Target Efficacy than conventional lighting systems. Shielding elements like tree stands or high bushes in the landscape will be left intact to act as a barrier for the light.

Spectral Control

Conventional Lighting systems emit light in the wavelength range from 300 nm to 800 nm (ultraviolet to near-infrared). The ultraviolet to green wavelengths are important in identifying astronomical phenomena and therefore any light within this wavelength range spilling into the atmosphere as Sky Glow could influence the outcome of the observations.

Figure 8.2-7
Radiometric changes around the Project during Construction and Operations



NOTES:

1. BASE MAP: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:100,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 1 2 3 Kilometres

KGHM

KGHM Ajax Mining Inc.

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REF NO.	AJX-21-024		REV A

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Table 8.2-4. Bortle Classification of Baseline Sampling Locations during Operation before Mitigation

Sampling Type	Location ID	Coordinates		Baseline Bortle Class	Project Bortle Class
		X	Y		
Baseline Sampling Locations, sampled between 2012 to 2014	1	687486	5613665	5	5
	2	685912	5612632	5	5
	3	684102	5614222	5	5
	4	680434	5610403	4	6
	5	678608	5598433	4	4
	6	681695	5603940	4	4
	7	684700	5605929	4	6
	8	688918	5609811	4	4
	9	685680	5609366	4	8
	10	683426	5610902	5	6
	11	683239	5612758	5	5
	12	684683	5612151	5	5
	13	684665	5612000	4	5
	14	685001	5611736	5	5
	15	678410	5611393	4	5
	16	680434	5610403	5	5
	17	689683	5608208	4	4
	19	687451	5605855	4	5
	20	678069	5595786	4	4
Thematic Mapping Sampling Locations	22	680979	5611576	4	5
	23	680988	5609000	4	5
	24	681746	5605608	4	5
	25	680941	5601814	4	4
	26	678689	5599473	4	4
	27	677711	5596466	4	4
	28	675328	5595676	4	4
	29	675994	5595979	4	4
	30	678233	5598344	4	4
	32	678983	5610170	4	5
	33	680802	5610324	4	5
	34	680053	5614030	5	5
	35	681172	5614831	5	5
	36	683249	5614803	5	5
	37	684887	5614598	5	5
	38	682380	5615908	6	6
	39	684549	5615716	5	5
	40	685880	5614958	7	7

(continued)

Table 8.2-4. Bortle Classification of Baseline Sampling Locations during Operation before Mitigation (completed)

Sampling Type	Location ID	Coordinates		Baseline Bortle Class	Project Bortle Class
		X	Y		
Thematic Mapping Sampling Locations (*cont'd*)	41	685711	5616611	6	6
	42	686022	5617429	6	6
	43	687104	5616045	9	9
	44	686858	5615029	6	6
	45	687854	5615083	6	6
	46	686767	5613882	5	5
	47	687471	5612848	5	5
	48	688640	5611413	5	5
	49	689920	5606623	4	4
	50	689747	5607747	4	4
	51	687602	5607560	4	5
	52	689497	5609103	4	5
	53	687240	5609370	4	7
	54	686607	5609138	4	7
	55	685522	5609158	4	8
	56	685252	5608846	4	8
	57	684827	5608552	4	8
	58	684929	5607906	4	8
	59	685074	5607552	4	8
	60	684717	5607073	4	8
	61	679355	5613061	4	5

KAM will use 500 nanometre filtered LED fixtures for areas less frequently visited like roads and parking lots to control the colour of the light and limit the effect of spill light at the local scale and the effect of Sky Glow at the regional scale.

8.2.5 Residual Effects and Their Significance

8.2.5.1 Summary of Residual Effects

During construction, operation and decommissioning and closure the effect of Glare and Spill Light will be managed by controlling the period, timing and intensity, and the shielding and directing of the light. Since there are only a limited number of night-time human receptors, in the form of traffic passing by, that will be affected by these light emissions, the controls are considered to effectively mitigate the effects of Glare and Spill Light and no residual effects are anticipated.

Sky Glow from the Project will not be completely mitigated; however, illumination management, shielding and directed lighting and spectral control will reduce the effect.

After the closure and reclamation phase all lighting systems will be decommissioned bringing the illumination levels back to baseline conditions Table 8.2-5 summarizes the Residual Effects on Dark Sky.

8.2.5.2 Criteria for Characterization of Residual Effects

Specific criteria for the characterization of residual effects on Dark Sky are described in Table 8.2-6. These criteria are based on definitions established in Section 5.2.5.2, with the exception of the Geographic Extent criterion.

8.2.5.3 Characterization of Residual Effects

The residual effect on dark sky will mainly occur during the construction and operation phase. Table 8.2-7 shows the residual effects characterication criteria as they apply to Glare, Spill Light, and Sky Glow by applying the definitions as indicated in Table 8.2-6. The effect of glare and light spill will be mitigated by implementing mitigation measures whereas the effect of sky glow will be limited.

Glare is caused by straylight from light plants and traffic. By implementing mitigation measures like shielding and directing of the light in most case this form of obtrusive light can be prevented. There are however instances mainly due to traffic in the Mine Site passing over higher elevated areas when glare will occur. Nearby residence will not be affected, but traffic on the Coquihalla Highway or along Lac le Jeune Road might endure brief moments of nuisance. Applying the definitions as listed in Table 8.2-6 the magnitude will be medium since the light will be substantially different from its surroundings. The effect will take place while the Project will be in the operations phase which means the duration will be medium term, but the frequency will be sporadic, because traffic at night along Hwy 5 and especially along Lac le Jeune road will be very light and the chance of both traffic driving by along these road and Project related traffic shining in the direction of the oncoming traffic is very small. The extent of the effect will not reach beyond 500 metres from infrastructure which means local in character The effect can be reversed relatively quickly, and the resiliency is high because of the presence of a large city nearby and the fact that traffic along the roads will experience substancially more effects from on coming traffic on the same road. These conditions also lead to the ecological context to be considered low.

Sky Glow is caused by upward-directed light, and by reflection of light off the surface and particles in the air. Sky Glow will be partially mitigated by the use of directed lighting methods (Fitted Target Efficacy), spectral control and managing illumination levels and duration; these measures will reduce the effect, but will not eliminate sky glow. The residual effect is expected to be medium in magnitude. The duration will be for as long mine activities will be taking place and will extend beyond the Local Study Area up to a maximum distance of 5 kilometres from the Project. The effect will be fully reversible when the illumination ceases to exist.

Table 8.2-5. Summary of Residual Effects on Dark Sky

Potential Effect	Project Phase (timing of effect)	Project Component/Physical Activity	Description of Cause-Effect	Description of Mitigation Measure(s)	Description of Residual Effect
Glare	Construction,	Construction of Access roads and site roads, building pad, Process Plant, Pit Development	Construction of the components and operation activities at night and low light situations	Shielding and directed lighting, Illumination management	No residual effect
Glare	Operation	Constant lighting: process plant and Pit. Intermittent lighting: along travel corridors and less frequently visited areas Traffic headlights	Night-time lighting at the Mine Site may create Glare which could be seen by drivers on Lac Le Jeune Road road , Hwy 5 and nearby residences and farms	Shielding and directed lighting, Illumination management	No residual effect
Light Spill	Construction	Construction of highway ramp, access roads and site roads, building pad, Process Plant, Pit Development	night time lighting could create Spill Light that could be seen by local resident and traffic along Hwy 5 and Lac Le Jeune Road.	Shielding and directed lighting, Illumination management	No residual effect
Light Spill	Operation	Constant lighting at process plant, Pit and frequently visited areas. Intermittent lighting along travel corridors and less frequently visited areas	Night-time lighting could create Spill Light which could be seen by local residents and traffic along Lac Le Jeune Road and Hwy 5	Shielding and directed lighting, Illumination management	No residual effect
Sky Glow	Construction, Operation	Access roads and site roads, building pad, all major components	Construction of the components and operation activities at night	Shielding and directed lighting, Illumination management, Spectral control	Sky glow illumination of area above/around the mine site.

Table 8.2-6. Definitions of Characterization Criteria for Residual Effects on Dark Sky

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Ecological Context	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*How far will the effect reach?*	*To what degree is the effect reversible?*	*How resilient is the receiving environment or population?*	*What is the current condition of the ecosystem and how commonly is it represented in the LSA?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change from baseline conditions.	**Short-term:** Effect lasts 1 to 5 years.	**Once:** Effect is confined to one discrete period in time during the life of the Project.	**Local:** Effect extends less than 500 m from infrastructure or activity.	**Reversible Short-term:** Effect can be reversed relatively quickly.	**Low:** The receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.	**Low:** The receptor is considered to have little to no unique attributes or provision of functions is severely degraded.	**High:** It is highly likely that this effect will occur.	**High:** < 80% confidence. There is a good understanding of the cause-effect relationship and all necessary data are available for the Project area. There is a low degree of uncertainty and variation from the predicted effect is expected to be low.
Minor: Differs from the average value for baseline conditions to a small degree.	**Medium-term:** Effect lasts 6 to 25 years.	**Sporadic:** Effect an effect that occurs at sporadic or intermittent intervals during any phase of the Project.	**Landscape:** Effect is limited to the LSA or one watershed (i.e., Sub-area).	**Reversible Long-term:** Effect can be reversed within 20 years of Post Closure.	**Neutral:** The receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.	**Neutral:** The receiving environment considered to have some unique attributes and provides most functions that an undisturbed environment would provide.	**Medium:** This effect is likely, but may not occur.	**Medium:** 50 to 80% confidence. The cause-effect relationships are not fully understood, there are a number of unknown external variables, or data for the Project area are incomplete. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident.
Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation.	**Long-term:** Effect lasts between 26 and 50 years.	**Regular:** Effect occurs on a regular basis during the life span of the Project.	**Regional:** Effect extends across the broader region (e.g., RSA, multiple watersheds, etc.).	**Irreversible:** Effect cannot be reversed (i.e., is permanent).	**High:** The receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.	**High:** The receiving environment or population is uncommon and occurs in a natural state and provides functions at a maximum capacity.	**Low:** This effect is unlikely but could occur.	**Low:** < 50% confidence. The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project area are incomplete. High degree of uncertainty and final results may vary considerably.
Major: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation.	**Far Future:** Effect lasts more than 50 years.	**Continuous:** Effect occurs constantly during the life of the Project.	**Beyond Regional:** Effect extends beyond the regional scale, and may extend across or beyond the province.					

Table 8.2-7. Characterization of Residual Effects, Significance, Likelihood and Confidence on Dark Sky

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Ecological Context		Probability	Confidence
Glare	Minor	Short-term	Sporadic	Local	Reversible Short-term	Low	Neutral	Not Significant (minor)	High	Medium
Spill Light	Negligible	Medium-term	Regular	Local	Reversible Short-term	Neutral	Neutral	Not Significant (minor)	High	Medium
Sky Glow	Medium	Medium-term	Continuous	Regional	Reversible Short-term	Neutral	Neutral	Not Significant (moderate)	High	Medium

8.2.5.4 Significance of Residual Effects

All residual effects of Glare and Spill Light are expected to be Not Significant (Minor). Mitigation measures will effectively reduce these effects. Residual effects will be mainly related to periodic night-time traffic on site roads (which could cause instantaneous glare for road users on Lac Le Jeune Road and Hwy 5 roads, similar to headlights from all other vehicles).

The residual effect of Sky Glow is expected to be Not Significant (Minor). Sky Glow can be perceived from a greater distance, and is more difficult to manage. Directional lighting and shielding will reduce the effect, and the wavelengths of light will be controlled to further minimize sky glow.

8.2.5.5 Characterization of Likelihood and Confidence

The likelihood of the effects of Glare, Spill Light and Sky Glow occurring are considered high. There will be a need for illumination of the Project Site during low light hours. There is a Regulatory requirement to illuminate working areas to a minimum level.

The confidence of the effects is considered medium. Neither the extent nor the duration of illumination is exactly known. The assessment has assumed illumination to be only required for processing ore at the mill, which will take place in two 12 hour shifts within 24 hours, at the tailings release locations, in areas of active hauling on the MRSFs, and for drilling, mining and pit development activities

8.2.5.6 Summary of Residual Effects Assessment and Significance

During the Construction phase and Operation phase lighting will have an effect in the areas surrounding the project. Glare and Light Spill will peak during the construction when the construction activities will be most extensive. Appropriate planning and Shielding and directing the light will be very effective measures to mitigate the effect and result in being minor and not significant. Table 8.2-8 Summarizes the Residual Effects, Mitigation, and Significance on Dark Sky.

Table 8.2-8. Summary of Residual Effects, Mitigation, and Significance on Dark Sky

Residual Effects	Project Phase	Mitigation Measures	Significance
Glare	Construction, Operation	Illumination Management, Shielding and directed lighting	Not Significant (minor)
Spill Light	Construction, Operation	Illumination Management, Shielding and directed lighting, Spectral Control	Not Significant (minor)
Sky Glow	Construction, Operation	Illumination Management, Shielding and directed lighting, Spectral Control	Not Significant (moderate)

Sky Glow on the other hand is expected to extend further beyond the project boundaries. Mitigation in the form of illumination management and spectral control will limit the effect but will not eliminate it completely. The resulting effect will lead to a moderate and not significant effect.

Due to the regional character of the residual effect of Sky Glow the result will be discussed in relation to other developments surrounding the project in a cumulative effect assessment.

8.2.6 Cumulative Effects Assessment

8.2.6.1 Introduction

The cumulative effects assessment (CEA) considers the effects on Dark Sky of the Project in conjunction with the effects of other projects and activities (past, present, or future) in the RSA. The effect of developments on the Dark Sky only has an influence when actively illuminated. Table 8.2-9 lists other activities relatively near the project.

8.2.6.2 Identification of Other Actions that May Affect Dark Sky

As soon as the lights are turned "off" the effect of lighting cannot be measured anymore. This means that past project will not have an effect in Dark Sky and will therefore not be considered. The effects of present and future developments on Dark Sky will be considered along with the residual effects of the Project identified in this assessment to determine if any interactions are evident, and if any cumulative residual effect could occur.

8.2.6.3 Interactions between Residual Project Effects and Other Project or Activity Effects

There have been 4 activities identified as contributors to the effects on Sky Glow within the Dark Sky CEA boundaries (Table 8.2-10). They involve the expansion of the Trans Mountain Pipeline System, Transportation along Lac le Jeune Road and Highway 5 (Coquihalla Highway) and the expansion and growth of the city of Kamloops.

The construction and expansion activities of the Trans Mountain Pipeline System will require sufficient lighting for the work to be performed safely and efficiently. The potential effect of lighting could be considerable if not mitigated and managed appropriately. However the activities are planned to take place over a period of 1 year along a 994 kilometre route. The construction taking place near the Ajax Project will be over a short period of time and it is anticipated that the pipeline will not need additional lighting after the construction phase.

Transportation along Lac le Jeune Road and Highway 5 could potentially contribute to the effect on Dark Sky. The illumination of the routes is needed for safety reasons, but will only be necessary near junctions and other potentially hazardous locations. Also the traffic along the routes could add to the potential effect.

The expansion of the growing city of Kamloops could have a potential effect on the VC as well. The construction of buildings and infrastructure might require lighting for nighttime or low light hours. Street lights will be required for safety reasons and some home owners may light up their homes for security or festive reasons.

8.2.6.4 Proposed Mitigation Measures

The construction of the Trans Mountain Pipeline System will require illumination for a short period of time. Managing the activities to only take place during daylight hours will limit the effects considerably while measures like shielding and directing light and spectral control could manage

the remainder of the effects when night time or low light hours construction is needed. The expectation is that the effect will be very limited.

The current effects of Lac le Jeune Road and Highway 5 on the Dark Sky are already part of the Baseline situation. The baseline observations do not show obvious influences from these roads on Sky Glow. The roads are not illuminated along the complete route, but only at hazardous location. There might however potentially be an effect from the increase in traffic volumes. The occurrence will not be continuous and therefore less intrusive. Shielding and directing of light can mitigate these effects considerably.

The use of light for construction, safety and security can be managed through bylaws by the community. The bylaws could restrict the type of fixtures, spectral control and intensity and limit the duration of illumination. These measures could limit the effect of construction and residential activities on Dark Sky.

8.2.6.5 Evaluation of Significance of Residual Cumulative Effects

The mitigation strategies described above will considerably limit the cumulative residual effect. It is expected that there will however remain a residual effect after implementing these measures. The extent of the effects on Dark Sky is anticipated to be minor. Table 8.2-11 summarizes the residual effects on Dark Sky after the implementation of Cumulative Effects mitigation measures. Table 8.2-12 describes the significance, likelihood and confidence of the Cumulative Residual Effects. A summary of the Project and Cumulative Residual Effects, Mitigation, and Significance for Dark Sky is given in Table 8.2-13.

8.2.7 Conclusion

Dark Sky was considered as a VC as part of the assessment of the effects of Project activities. The Dark Sky assessment has been divided into three potential effects, Glare, Light Spill and Sky Glow, caused by project activities. The effects have been assessed using a qualitative effects assessment method. The effects on Glare and Light Spill can be eliminated by implementing the appropriate mitigation measures, while the effect of Sky Glow can be limited considerably. The residual effect of sky glow has been carried forward into the CEA to be examined against a more holistic assessment approach involving project and other activities surrounding the Project. The concluding effect from the combined project after mitigation will result in a Not Significant (Moderate) effect.

Table 8.2-9. Ranking Potential for Residual Effects to Interact Cumulatively with Effects of Other Human Actions on Dark Sky

	Industrial Projects/Activities													Natural Resources and Land Use			Tourism and Commercial Recreation Activities					Community Infrastructure			Transportation					
Residual Effect	Vidette Lake Mine	Afton Mine (Historical)	Iron Mask Mine	Bonaparte Mine	New Afton Mine (New Gold)	Highland Valley Copper Mine (Teck)	Domtar Kamloops Pulp Mill	Tolko-Hefley Creek Plywood and Veneer	LaFarge Cement Plant	Trans Mountain Pipeline System (Kinder Morgan)	Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Harper Creek	Highland Valley Copper - Bethlehem Expansion	Kamloops Forest District	Agriculture	Ranching	Tranquille on the Lake	Lac Le Jeune Resort	Tobiano Golf Course	Recreational Hunting, Fishing, Foraging	Recreational Trails	City of Kamloops Wastewater Management	Water Treatment Centre	City Expansion and Growth	Lac le Jeune Road	Highway 1	Highway 5A	Highway 5 (Coquihalla Highway)	Kamloops Airport	Rail Yards and Lines (CP and CN)
Sky Glow	-	O	O	O	O	O	O	O	O	O	L	O	O	O	O	O	O	O	O	O	O	O	O	M	L	O	O	L	O	O

Notes:

(-) *No spatial or temporal overlap.*

O *Spatial or temporal overlap, but no interaction anticipated OR No change from current condition anticipated, and already captured as part of baseline characterization. No further consideration warranted.*

L *Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*

M *Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*

H *Key interaction; warrants further consideration.*

Table 8.2-10. Cumulative Effects Interactions Matrix for Dark Sky

Other Projects/Residual Effects	Sky Glow
Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Y
City expansion and growth	Y
Lac le Jeune Road	Y
Highway 5 (Coquihalla Highway)	Y

Table 8.2-11. Summary of Cumulative Effects Mitigation Measures and Residual Effects on Dark Sky

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Project Component construction and operation	Transportation, City Expansion and Pipeline Expansion and Construction	Regional Illumination of the night sky	Lighting Management and control, Shielding and directing of light; Spectral Control	Local illumination of night sky

Table 8.2-12. Characterization of Cumulative Residual Effects, Significance, Likelihood and Confidence on Dark Sky

Cumulative Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Sky Glow	Medium	Medium-term	Continuous	Regional	Reversible Short-term	Neutral	Neutral	Not Significant (moderate)	High	Medium

Table 8.2-13. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Dark Sky

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Sky Glow	Construction, Operations	Illumination Management, Spectral Control	Not Significant (Moderate)	Not-Significant (Moderate)

8.3 VISUAL IMPACT AND AESTHETIC FEATURES

8.3.1 Rationale

This section includes a description of the scoping process used to identify Visual Impact/Aesthetic Features for inclusion in the assessment. Scoping is fundamental to focusing the Application/EIS on those issues where there is the greatest potential to cause significant adverse effects. Valued Components (VCs) are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (CEAA 2006; BC EAO 2013). To be included in the EA, there must be a perceived likelihood that the VC will be affected by the proposed Project. Valued components are scoped into the environmental assessment based on issues raised during consultation with First Nations communities, the public, stakeholders, and government agencies. Consideration of certain VCs may also be a legislated requirement, or known to be a concern because of previous project experience.

The BC Environmental Assessment Office (EAO) defines Valued Components as components "that are considered important by the proponent, public, First Nations, scientists, and government agencies involved in the assessment process" (BC EAO 2013). To be included in the Application/ Environmental Impact Statement (EIS), there must be a perceived likelihood that the VC will be affected by the Project. VCs proposed for assessment were identified in the Application Information Requirements (AIR/EISG; BC EAO 2015). In the AIR/EISG (BC EAO 2015), Visual Impact/Aesthetic Features is identified as a VC. The AIR/EISG states the assessment will consider potential visual impacts of the Project on views and sight lines from various locations including residential, recreational areas (including Jacko Lake), transportation routes (including the Coquihalla Highway, Lac Le Jeune Road, Highway 5, Highway 5A, Goose Lake Road, Long Lake Road, and Edith Lake Roads, etc.) and commercial areas (BC EAO 2015).

In British Columbia, the *Forest and Range Practices Act* (2002) recognizes "scenic areas" as an element of the province's resource base and establishes Visual Quality Objectives (VQOs) for those areas. However, non-forestry resource development activities are not subject to this legislation with respect to visual quality, and the procedures established by the by the BC Ministry of Forests, Lands and Natural Resource (FLNRO) are difficult to adapt for resource development projects that are of different scale and scope than typical forestry operations. While the VQOs provide useful context, the Hassell Matrix (Hassell 2005) method (described in Section 8.3.4.2) is employed for this assessment as the basic framework to objectively examine the changes to visual quality. This method has been applied to other resource projects in BC at the environmental assessment stage (ERM 2014, Finevera, 2011).

The Project lies within the Kamloops Land and Resource Management Plan (LRMP), which is a sub-regional land use plan, and is therefore subject to legislation, policies and regulations for Crown land and resource management. The Kamloops LRMP includes VQOs for visually sensitive areas, which are areas in view of established communities, public use and recreational areas, and travel corridors (BC ILMB 1995) where maintaining visual quality is important. However, the LRMP also notes that non-forestry resource development should be encouraged but given that the legislation governing visual quality in the FRPA applies to forestry developments only, it directs the management of visual quality in these instances to follow provincial guidelines where applicable. The guidelines

referenced in the LRMP are specific in scope, and have limited applicability to the Project (e.g. the Ministry of Energy, Mines, and Petroleum Resource's Handbook for Mineral and Coal Exploration (EMPR 2008) only references visual quality with respect to the location and design of drill sites).

The Project is adjacent to southern boundary of the city of Kamloops, BC. Major transportation routes nearby include the Trans-Canada Highway (Hwy 1, north of the Project), the Coquihalla Highway (Hwy 5, west of the Project) and Highway 5A (east of the Project). Within the property are several water bodies. Only one water body, Jacko Lake, is known to support a fish population, and is used for recreational fishing. Inks Lake and Goose Lake retain water throughout the year, and Inks Lake is used primarily as a recreational lake. The Supporting Topic - Jacko Lake, Section 8.7, serves to aggregate summaries for all VCs that have potential pathways of effect from the Project on Jacko Lake. The intent of the section's summaries is to provide a snapshot of residual effects, mitigations and the determination of significance for each of the relevant VCs.

The proposed Project infrastructure will be located primarily on private land owned by KAM, with some utilisation of Crown land. The area had been previously mined until 1997 and the historic facilities have been reclaimed with the exception of the mine roads and pits, which are still used.

During consultation with government agencies and the public, including nearby residents, local business owners, and recreational users of the landscape, concerns were raised about potential visual quality effects of the mine and power line. Informed by noted concerns learned through these interactions, KAM's comprehensive Project re-design (2012-2014) resulted in significant changes to the Project footprint. Many of the proposed facilities, in particular the former Tailings Storage Facility, North Mine Rock Storage Facility, East Mine Rock Storage Facility and Temporary Ore Stockpile, would have been significantly more visible from a variety of viewpoints on account of their previously proposed locations and structure.

The information developed to support the assessment of effects on Visual Impact/Aesthetic Features contributes to other analyses for other VCs, as shown in Figure 8.3-1. For example, changes in visual quality could have an economic effect on property values in areas with a view of the Project, or on business sectors such as tourism which rely in part on the visual aesthetics of the landscape.

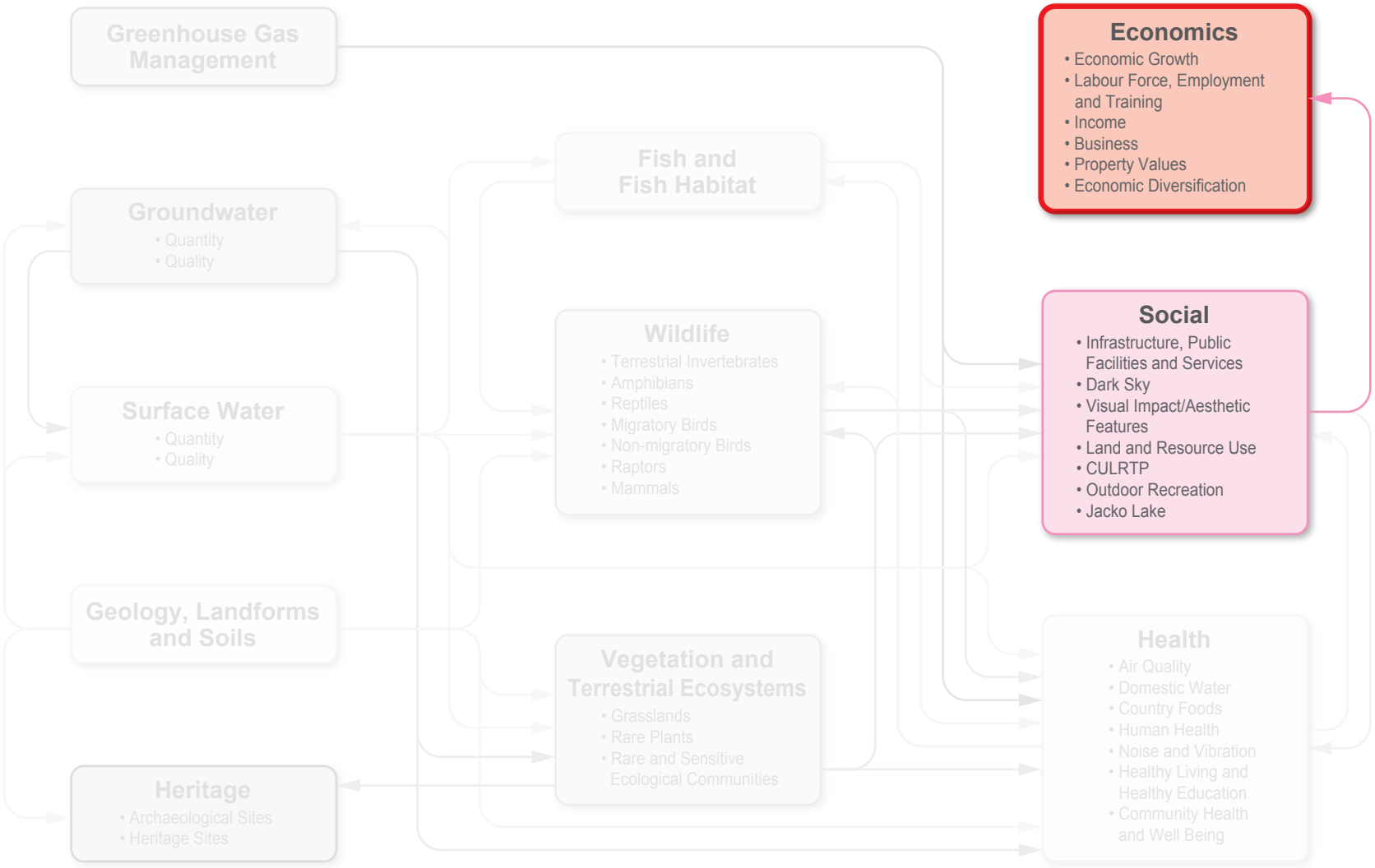
8.3.2 Background

8.3.2.1 Regional Overview

The Project is located on Thompson Plateau in southern BC, in the Bunchgrass and Ponderosa Pine Biogeoclimatic Zone. The landscape of the area can be described as a post-glacial grassland landscape with scattered, mixed coniferous stands and sage brush on an undulating and hilly topography. The site is within the Thompson Rivers Forest District at approximately 800 to 1,100 metres above sea level (masl).

The proposed Project facilities lie south of the City of Kamloops, at a distance of approximately 1.5 km from the neighbourhoods of Aberdeen and. Major transportation corridors exist nearby to the north (Trans-Canada Highway), east (Coquihalla Highway) and west (Highway 5A). Although there are no designated provincial parks or protected areas in the immediate vicinity of the Project, the area is subject to frequent recreational use including activities such as hiking, boating, and fishing; these activities occur primarily at Jacko Lake which has an access road and boat launch.

Figure 8.3-1
Valued Component Interactions - Visual Impact/Aesthetic Features



8.3.2.2 Historical Activities

The region surrounding the Project has a long history of human activity that contributes to the current "baseline" condition. This section describes the historic and more recent influences that have shaped the region, while the visual quality baseline is defined more specifically in Section 8.3.2.3.

Kamloops derives its name from the Secwepemc word "Tk'emlúps", which refers to the meeting of the North and South Thompson rivers. The area was first inhabited by approximately 3,000 members of the Shuswap tribe, part of the Interior Salish Nation.

Fur trading began in the area in the early 1800s. The fur trading posts were located in various locations in what is now Kamloops.

British Columbia officially became part of Canada in 1871, and construction of the transcontinental railroad was completed in 1885, encouraging the growth of a small village on the shore of the Thompson River. The village grew rapidly and by 1893 the population had risen to approximately 500 and became incorporated as a city with public works. In the following years, there were a number of infrastructural developments, including bridges that connected villages on either side of the rivers. During this time, the timber industry was growing, and the vegetable and orchard farming industry grew, with most of the land used for this purpose located in the valley.

The Canadian Northern Railway was completed in 1915, and the Kamloops airport was operational in 1939. The Trans-Canada Highway (Hwy. 1) was completed in 1962, and the Yellowhead Highway (Hwy. 5) in 1970. The Kamloops area grew after the First World War until development slowed during the Depression and the Second World War. After this period, the City began to grow again, and much of the land that had formerly been used for farming in the valley was used for residential development. Ranching (including cattle grazing) also developed, and is currently ongoing within, and adjacent to, the Project footprint.

The Project is located within the Kamloops Forest District, which is part of the Kamloops Timber Supply Area (TSA). Tree-killing bark beetles (including mountain pine beetle, spruce beetle, and Douglas fir beetle) continue to pose a threat to the forests. The Project is located in the Greenstone Beetle Management Unit, where more than 30% of the area is identified as susceptible to the mountain pine beetle. In response to the pine beetle, in 2008, the Annual Allowable Cut for the TSA was determined to be 4 million cubic metres; this harvest level (and priority for beetle management) will remain in place until 2018 unless otherwise altered.

The Domtar Pulp Mill is located immediately west of Kamloops on the Thompson River. This pulp mill was originally built by Weyerhaeuser in 1972 and became part of Domtar in 2007. Numerous capital improvements have been made to the mill over the years. One of the pulp lines was closed in 2013; Domtar reports that this closure has corresponded with a significant reduction in odour complaints, and in particulate emissions (Domtar 2014).

Mining activity in the Project area can be traced back over 100 years with exploration in the Project area beginning in the 1880s and continuing intermittently to present. Copper, gold, and iron mineralization was discovered at the Iron Mask Mine near Kamloops in 1896. Nearby properties, including the Wheal Tamar, Ajax, and Monte Carlo claims were explored in the following years.

The Afton Mine went into operation in 1977. Mining operations were initiated on the Ajax East and Ajax West pits in 1989 and subsequently suspended in 1991 due to depressed metal prices. A second period of production began in 1994 and was again suspended in 1997. The raw ore from the Ajax pits was trucked approximately 10 km west to the processing plant adjacent to the Afton pit. During these periods of production, it is estimated that 17 Mt of ore was mined and 13 Mt of ore was milled. In the late 1990s, the tailings facility and project components were decommissioned and reclaimed by the Afton Mine in accordance with their closure plan. At the Ajax site, this includes reclaimed waste rock storage facilities adjacent to Peterson Creek in the location of the proposed Ore Stockpiles.

The New Afton Mine occupies the site of the historic Afton Mine infrastructure. New Afton began underground mining immediately beneath the historic Afton Mine open pit in June 2012. This mine is able to produce up to 11,000 tonnes per day of raw ore though the processing plant. Currently the mine is licenced to draw up to approximately 7,000 m^3/d from Kamloops Lake for water supply to the processing plant. An application to withdraw an additional approximately 5,000 m^3/d is currently in review.

8.3.2.3 Baseline Studies

A baseline study was completed in March 2015. The study included a review of applicable VQOs, identification of potential sensitive areas, and documentation of photographic evidence collected to establish the existing aesthetic qualities of the area around the Project. The baseline study can be found in Appendix 8.3-A.

Data Sources

Input from the City of Kamloops, public consultation, as well as a field reconnaissance program was used to determine potentially important viewpoints. Additionally, the British Columbia Visual Landscape Inventory spatial database maintained by the BC Government's Forest Resource Practice Branch was queried to collect spatial information relating to viewpoints, scenic areas, and any associated VQOs within the Kamloops LRMP. Although these VQOs are not carried through this assessment, they do provide some context to the visual resources in the landscape around the Project.

Through in-person meetings and interviews with key City of Kamloops personnel in 2012 and 2013, KAM was able to refine a list of viewpoint locations for assessment. An additional 16 viewpoints were added based on requests by City of Kamloops staff.

Methodology

The baseline report established two study areas. The study areas were based on the potential effects of the Project on visual quality, and were thus defined by the ability to view the Project and the sensitivity of the areas around the Project to changes to the visual landscape.

Identification of Sensitive Areas

In preparation for the field work, data were gathered to determine potentially sensitive locations used by the public, including local residents and other land users. The areas and locations were initially identified through consultation with the City of Kamloops, members of the public, and the Technical Working Group. During a comprehensive field reconnaissance program, personnel from KGHM Ajax Mining Inc (KAM) and BC MFLNRO visited all major transportation corridors, neighbourhoods, and sites of civic and economic importance with a potential view of the Project based on an initial viewshed analysis (Figure 8.3-2).

To identify the areas that could potentially be viewed from the proposed infrastructure, a viewshed analysis was performed using the Viewshed tool in ArcGIS 10.2. The viewshed was defined as any location that had a view of the highest points of the large Project components, specifically the Mine Rock Storage Facilities the Tailings Storage Facility, and the overburden, topsoil, and ore stockpiles. For the analysis, location data for the proposed infrastructure was inserted into a digital elevation model (DEM) to determine the viewshed of the Project. The DEM represented the "bare-earth" surface where the effects of vegetation and other obstructions such as buildings were not included. This analysis thus represented a conservative approach to the viewshed analysis. The viewshed results were compared to the sensitive locations to assess whether the infrastructure would potentially be visible from these locations. As a result of this analysis and comparison, several locations, for example along roadways, were identified as viewpoints for further study.

At each viewpoint, the current (i.e., baseline) conditions were recorded and photographs were taken, following the photography and presentation criteria outlined in Appendix 3 of the Visual Impact Assessment Guidebook. The following information was gathered at each viewpoint:

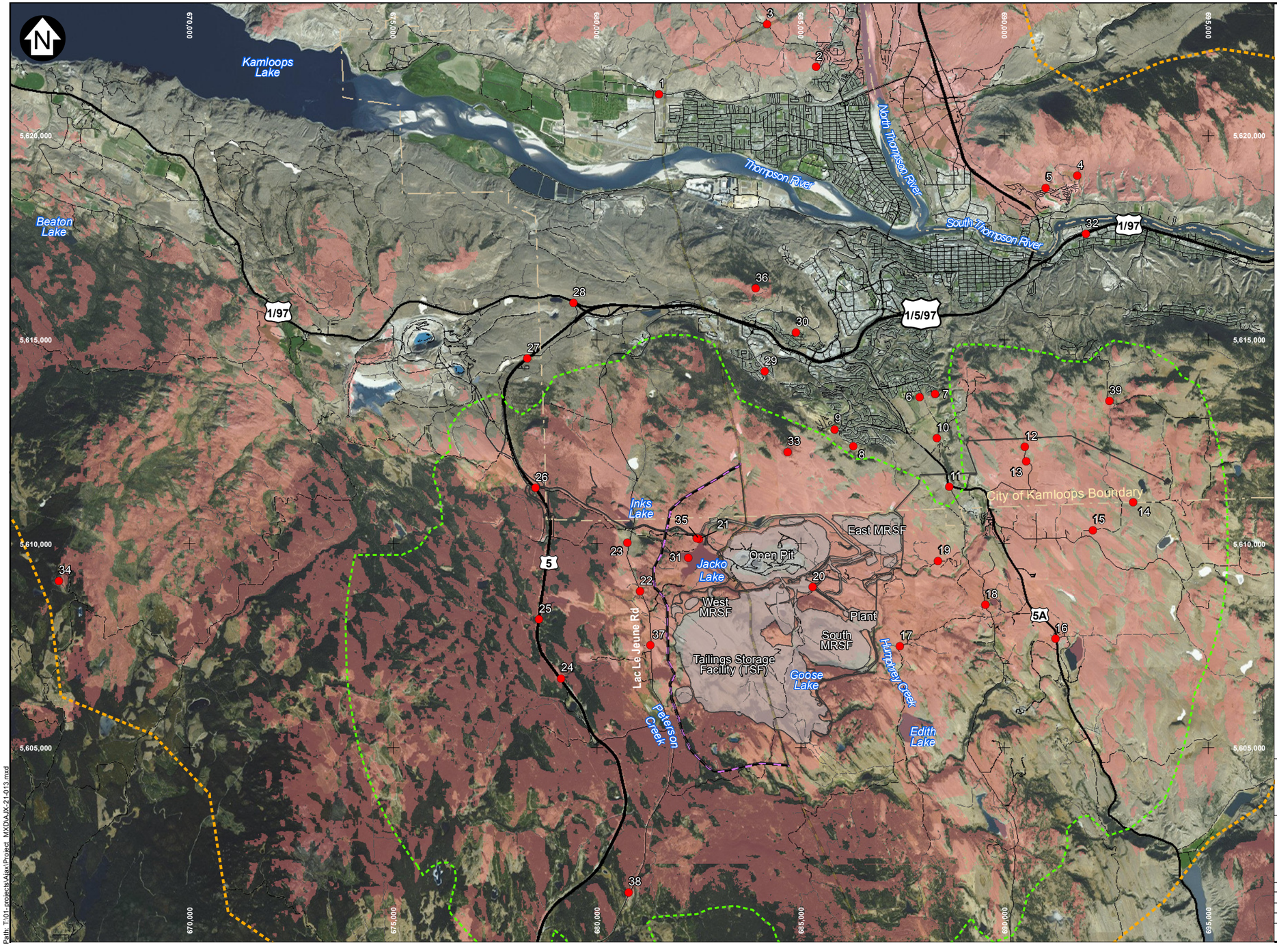
- area description;
- GPS coordinates;
- elevation (in masl[1]);
- camera angle, in degrees;
- Azimuth(s)[2], in degrees; and
- Site Identification number.

Additional reference aerial images (taken in September 2009) were used to assess the broader baseline inventory from an alternative vantage point.

[1] Metres above sea level

[2] Azimuth is the direction the camera was facing, measured in degrees from 0 to 360, where 0 represents north.

Figure 8.3-2
Viewpoint Locations



- Viewpoint
- Kinder Morgan Pipeline - Current
- Kinder Morgan Pipeline - Rerouted
- Highway
- Paved Road
- Gravel Road
- Rough Road
- Recreational
- City of Kamloops
- Proposed Infrastructure

Viewshed
- Project Visible

Visual Quality Study Area
- Local Study Area (LSA)
- Regional Study Area (RSA)

NOTES:
1. BASE MAP: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
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Solar Insolation

In addition to the viewshed and viewpoint analysis, an analysis of total solar insolation (amount of solar energy per unit area) was also conducted. An earlier version of the Project design proposed for infrastructure to be placed nearer to the neighborhood of Aberdeen. As such, the AIR/EISG requires that an analysis of the potential for the infrastructure to cast shadows upon the neighborhood be undertaken. Although the infrastructure plan has since been relocated, this analysis was still completed. The Area Solar Radiation tool in the ArcGIS 10.1 software package was used to fulfill this AIR/EISG requirement.

Summary of Existing Conditions

The baseline study showed that the previous land use, including ranching, forestry and mining, has left a visual impact on the landscape. The impacts can be seen from transportation routes and recreational areas. Some features include the previous mining activities, such as open pits, mine rock storage facilities and seepage collection structures, as well as ranching fence lines and access roads.

Identification of Sensitive Areas

The review of relevant literature and land use data identified several potentially sensitive areas. The following is an overview of the general land use areas within the Local Study Area (LSA) and Regional Study Area (RSA) and a summary of where the Project could be potentially visible, based on a comparison to the viewshed analysis.

Communities and Travel Corridors

Based on the viewshed analysis, the Project could be visible from the communities of Knutsford, 2 km east of the Project, and Rose Hill, 6 km northeast. Other Kamloops neighbourhoods, including Aberdeen less than 2 km north, are within the RSA; however, based on the surrounding topography they are not likely to be able to see the Project. The Project could also potentially be visible from Highway 5, Highway 5A, Lac La Jeune Road, Goose Lake Road, and Edith Lake Road.

Parks and Protected Areas

Greenstone Mountain Provincial Park is 14 km west and Lac du Bois Grasslands Protected Area is 10 km north of the Project, within the LSA. The Project is not visible from Greenstone Mountain, but it may be visible from a significant portion of the Lac du Bois Grasslands Protected Area.

Viewpoints

A total of 39 sites were selected as viewpoint locations (Figure 8.3-2; Table 8.3-1). Ten viewpoints were designated by the City of Kamloops, with six additional viewpoints added for several of the City's locations to account for local differences in viewing geometry and obstructions. The remaining 23 points were selected based on a field reconnaissance program in which personnel from KAM and BC MFLNRO visited all major transportation corridors, neighbourhoods, and sites of civic and economic importance with a potential view of the Project, as identified by the viewshed analysis. A comprehensive selection of viewpoints was developed that was representative of the use of the surrounding area by potential viewers of the landscape. Given the proximity of the Project to communities and other areas heavily used by businesses or members of the public, it was important to ensure that even locations with no view of the Project based on the viewshed analysis were selected to

explicitly show that the Project was not visible from those locations. With respect to the Lac Du Bois Grasslands Protected Area, Viewpoints 2 (Batchelor Heights Urban) and 3 (Batchelor ATV Trails) have very similar viewing geometry and can be considered representative of the view from the area.

Viewpoint 20 (Goose Lake Road West) is located in an area that is surrounded by land owned by KAM, and will not be accessible to the public. It will therefore not be carried forward in this assessment.

Table 8.3-1. Viewpoint Locations

ID	Name	Easting (m)	Northing (m)	Elevation (m)	Azimuth (°)	Description	Sensitivity
1	Ord Road Dog Park	681522	5621014	346	166	Recreation	Low
2	Batchelor Heights Urban	685373	5621691	465	172.5	Residential	Moderate
3	Batchelor ATV Trails	684169	5622735	533	130	Recreation	Low
4	Sun Rivers Golf Course Hole 12	691781	5619016	472	234	Recreation\ Tourism	Moderate
5	Sun Rivers Parking Lot	691006	5618724	446	222	Residential	Moderate
6	McGowan Elementary	687912	5613589	690	195	Residential	High
7	Upper Sahali neighbourhood	688293	5613669	725	148	Residential	High
8	Aberdeen at Abbyglen	686288	5612399	888	232.5	Residential	High
9	Pacific Way Elementary	685829	5612805	854	235	Residential	High
10	Running Horse Rd	688334	5612592	738	215	Residential	Moderate
11	Knutsford Mailboxes	688645	5611404	789	168.5	Residential	Moderate
12	Knutsford Hill Rd	690497	5612376	885	337	Residential	Moderate
13	Simms Rd	690533	5612020	886	233.5	Residential	Moderate
14	Upper Rose Hill Rd	693151	5611015	1015	210	Residential	Moderate
15	Lower Rose Hill Rd	692159	5610340	998	250.5	Residential	Moderate
16	Beresford Rd	691246	5607672	902	311.5	Residential	Moderate
17	Edith Lake Rd	687433	5607491	1029	333.5	Transportation\ Recreation	Moderate
18	Long Lake Rd	689527	5608505	912	309.5	Transportation	Low
19	Goose Lake Rd East	688360	5609583	878	299.5	Transportation	Low
20	Goose Lake Rd West[1]	685291	5608942	908	330	Transportation	Low
21	Jacko Lake Boat Launch	682506	5610123	900	49	Recreation\ Tourism	High
22	Lac Le Jeune Haul Rd	681059	5608836	921	16.5	Transportation	Moderate
23	LLJ South of Haul Rd	680747	5610035	886	342.5	Transportation	Moderate
24	Coquihalla Hwy 1	679116	5606705	1050	28.5	Transportation	Low
25	Coquihalla Hwy 2	678577	5608156	978	31	Transportation	Low
26	Coquihalla Hwy 3	678491	5611375	822	75	Transportation	Low

(continued)

Table 8.3-1. Viewpoint Locations (completed)

ID	Name	Easting (m)	Northing (m)	Elevation (m)	Azimuth (°)	Description	Sensitivity
27	Coquihalla Hwy 4	678289	5614546	789	114	Transportation	Low
28	Iron Mask Interchange	679420	5615905	730	125	Transportation	Low
29	Pine View	684115	5614226	733	227.5	Residential	High
30	Mt Dufferin Dr	684883	5615178	735	199	Residential	High
31	Jacko Lake	682243	5609654	892	47.5	Recreation\ Tourism	High
32	Valleyview neighbourhood	691997	5617604	341	210	Residential	High
33	Coal Hill	684678	5612252	1091	170	Recreation\ Tourism	Moderate
34	Greenstone Mtn Park	666791	5609097	1800	85	Recreation	Moderate
35	Jacko Lake Boat Launch	682450	5610137	980	170	Recreation\ Tourism	High
36	Kenna Cartwright Park	683891	5616261	886	165	Recreation	Moderate
37	Lac Le Jeune Rd 1	694683	5581666	979	98.5	Transportation	Low
38	Lac Le Jeune Rd 2	680776	5601461	1263	40	Transportation	Low
39	Rose Hill neighbourhood	692571	5613506	908	78.5	Residential	High

[1] *Goose Lake Road West will not be accessibly by the public once construction begins, and will not be carried forward in this assessment.*

Viewpoint Sensitivity

Table 8.3-1 also includes a basic description of the nature of the activity that takes place at the each viewpoint. These descriptions provide some context regarding how sensitive they are to alterations in the visual landscape. Each point was examined for type, frequency, and duration of use, as well the importance of the view to the viewpoint (e.g. the view for residential areas is likely more important to viewers than transportation corridors such as the Coquihalla Highway). The sensitivity rating will be applied when assessing the significance of the effect of the Project on visual quality.

Visual Quality Objectives

Scenic area polygons were obtained from DataBC and overlaid with the Project to determine how much of the Project overlaps VQOs. These polygons represent Visual Sensitivity Units (VSUs), defined as areas that have an aesthetic appeal when viewed from a distance. The Project falls within several scenic area polygons with defined VQOs established by MFLNRO. The pit and tailings storage facility (TSF) are located within a polygon that has a VQO classified as Partial Retention; and a small section of the East Mine Rock Storage Facility and topsoil stockpile are located within a scenic area polygon defined as having a VQO of Modification (Figure 8.3-3).

These VSUs have been assigned specific VQOs, which are ratings establishing the desired visual condition for that area inclusive of any development that may take place . Table 8.3-2 indicates the possible VQOs assigned as part of the VLI, where the percentage alteration of view refers to the

amount of the landscape within that a VSU that may be visually altered when viewed from a given perspective. The VQOs were assigned based on viewing locations along transportation corridors for the Coquihalla Highway, Highway 5A, and Lac Le Jeune Road (BC ILMB 1995). However, those VQOs do not have specific viewpoints associated with them. It is assumed that points selected along these corridors are representative of viewpoints that could be used to view these landscapes.

Table 8.3-2. Potential Visual Quality Objectives

Objective	Code	Description	% Alteration of View
Preserved	P	No visible human-caused alterations	0%
Retained	R	Human-caused alterations are visible but not evident	0 - 1.5%
Partially Retained	PR	Human-caused alterations are evident but subordinate and therefore not dominant	1.5 – 7%
Modified	M	Human-caused alterations are dominant but have natural appearing characteristics	7 – 20%
Maximally Modified	MM	Human-caused alterations are dominant and out of scale	20 – 30%
Excessively Modified	EM	Human-caused alterations are excessive and greatly out of scale	>30%

Solar Insolation

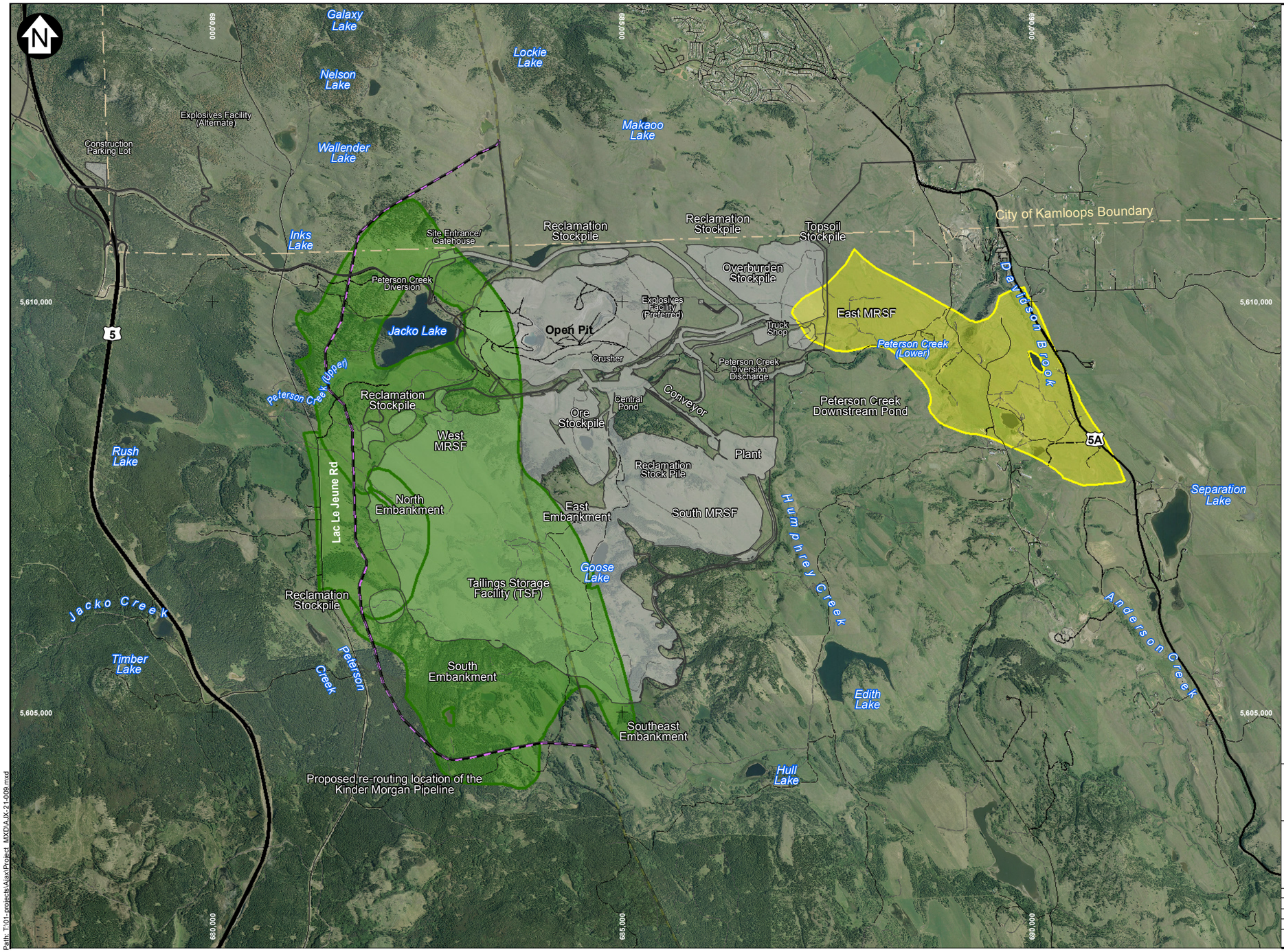
An analysis of total yearly solar insolation showed that typical levels of insolation for flat ground around the Project site varied between 50 Watt hours per square metre (Wh/m^2) in winter to 500 Wh/m^2 in summer. Insolation is highly dependent on surface topography, where south facing slopes receive higher amounts of solar radiation than any other landform. The hilly topography of the Project site therefore has a high spatial variation in solar insolation, where values can reach as high as 4,000 Wh over the duration of the summer. Figure 8.3-4 shows the distribution of the total yearly amount of solar insolation in the vicinity of the Project.

8.3.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for Visual Impact/Aesthetic Features, and encompasses possible direct, indirect, and induced effects of the Project on Visual Impact/Aesthetic Features, as well as the trends in processes that may be relevant.

Figure 8.3-3
Visual Quality Objectives that Interact with the Project

ERM



NOTES:

1. BASE MAP: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
   Content may not reflect National Geographic's current map policy.
   Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC,
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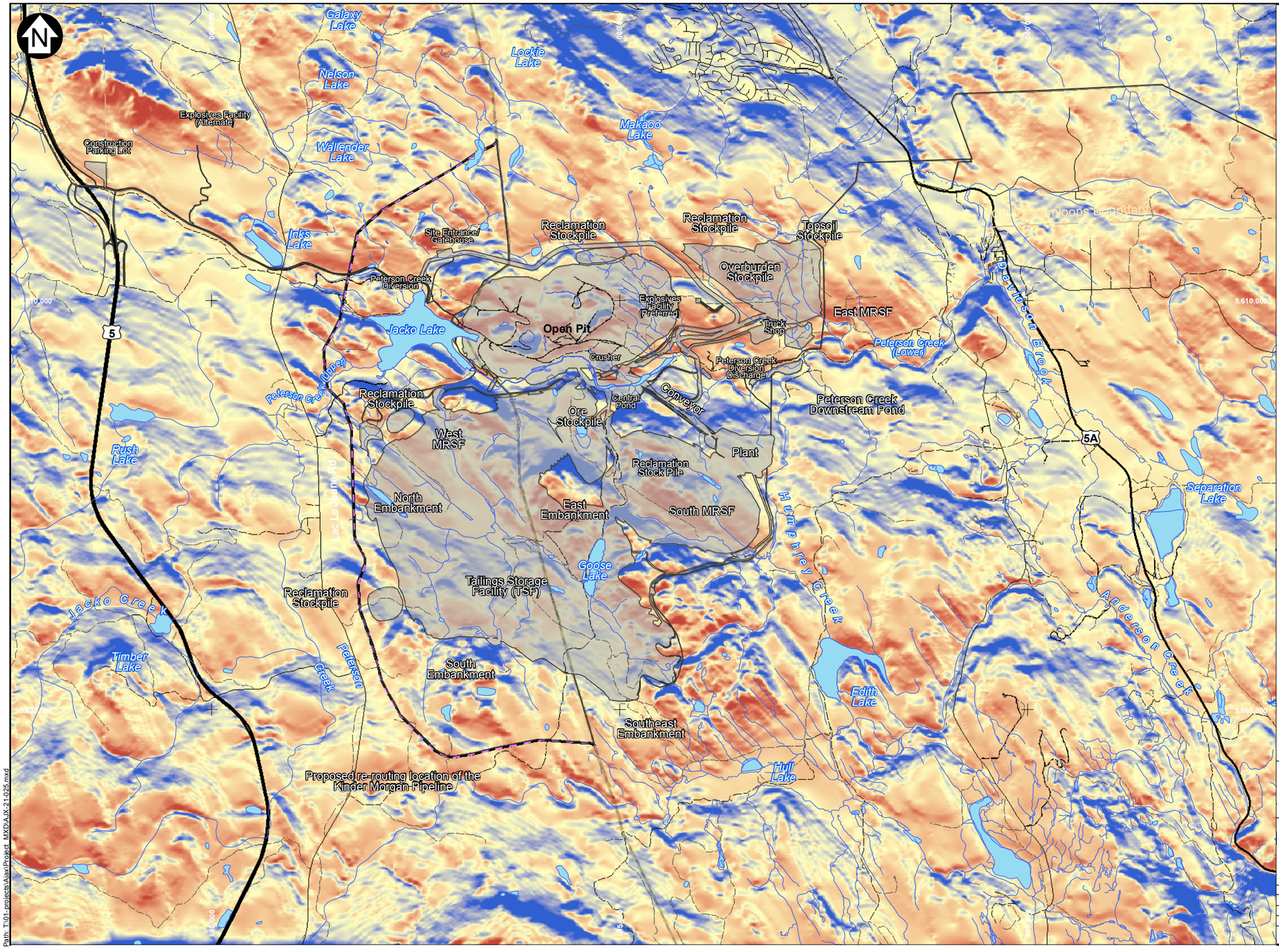
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NOTES:

1. BASE MAP: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC,
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SCALE 0 0.5 1 1.5 Kilometres

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8.3.3.1 Spatial Boundaries

Local Study Area

The Local Study Area (LSA) is a spatial boundary in which most of the potential Project effects are expected to occur. The LSA was determined based on the distance at which a landscape viewer could clearly see large Project components. Within 8 km, the shape and texture of objects will emerge from the general background (BC MOF 1997). Beyond 8 km, the viewer will be able to discern general shapes, but texture and colour becomes indistinct from the background landscape and the overall landscape pattern dominates the viewer's visual perspective. Therefore, the LSA boundary is defined as any location within 8 km that either has a view of the Project or is near an area that has a view of the Project (Figure 8.3-5). For the purposes of defining the LSA, a location is considered near an area that has a view of the Project if the majority of the surrounding square kilometre has a view of the Project.

Regional Study Area

The Regional Study Area (RSA) is a spatial boundary in which some potential effect of the Project could reasonably be expected. The RSA was determined based on the results of the viewshed analysis combined with the potential for use of areas around the Project (Figure 8.3-5). If an area had a view of the Project and could be used or was in close proximity to an area that could be used by potential viewers of the landscape, it was included in the RSA. The RSA extends up to a maximum of 50 km from the Project, as that is the furthest distance at which a viewer is likely to be able to resolve any visible portions of Project components. The RSA extends east approximately 11 km up the South Thompson River valley and includes the Sun Rivers area and a portion of Kamloops Indian Reserve No. 1, north approximately 50 km up the North Thompson River Valley along Highway 5, and west approximately 35 km to the western shore of Kamloops Lake. The area to the south beyond 9 km from the Project is obscured by topography.

8.3.3.2 Temporal Boundaries

Temporal boundaries reflect the periods of time during which Project activities could reasonably be expected to potentially affect a VC. The projected phases of the Project are:

- **Construction**: 2 years;
- **Operation**: 23 years;
- **Decommissioning and Closure**: 5 years (includes decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- **Post Closure**: 5+ years (includes ongoing reclamation activities and post-closure monitoring).

For the purposes of this assessment, the Construction and Decommissioning and Closure Phases were assessed together with the Operations Phase, as the effects during those phases will be neither substantially different nor greater than the effects during the Operations Phase. The Post Closure Phase will be assessed independently.

The effects of the Project on visual quality are not expected to change with the seasons as the visual character of the landscape is largely similar throughout the year with the exception of winter. In winter, snow cover renders the visual landscape more uniform and will cover any Project components, blending them into the landscape to a greater degree than any other time of year. Furthermore, while the surrounding landscape is still used for tourism and recreation, the number of users is much lower than during the rest of the year.

8.3.3.3 Administrative Boundaries

No administrative boundaries apply to the visual impact/aesthetic features assessment.

8.3.3.4 Technical Boundaries

No technical boundaries apply to the visual impact/aesthetic features assessment.

8.3.4 Potential Effects of the Project and Proposed Mitigation for Visual Impact/ Aesthetic Features

8.3.4.1 Identifying Potential Effects on Visual Impact/Aesthetic Features

The assessment of potential effects on Visual Impact/Aesthetic Features considers potential changes to visual quality (including changes to views and the visibility of Project components and activities from various viewpoints) as well as shading (including the amounts and patterns of shade created by the Project).

Reduced Visual Quality

It is expected that visual quality from certain locations will be affected by various Project components and activities over the life of the Project. Table 8.3-3 identifies the potential contribution of each component and activity in relation to visual quality effects.

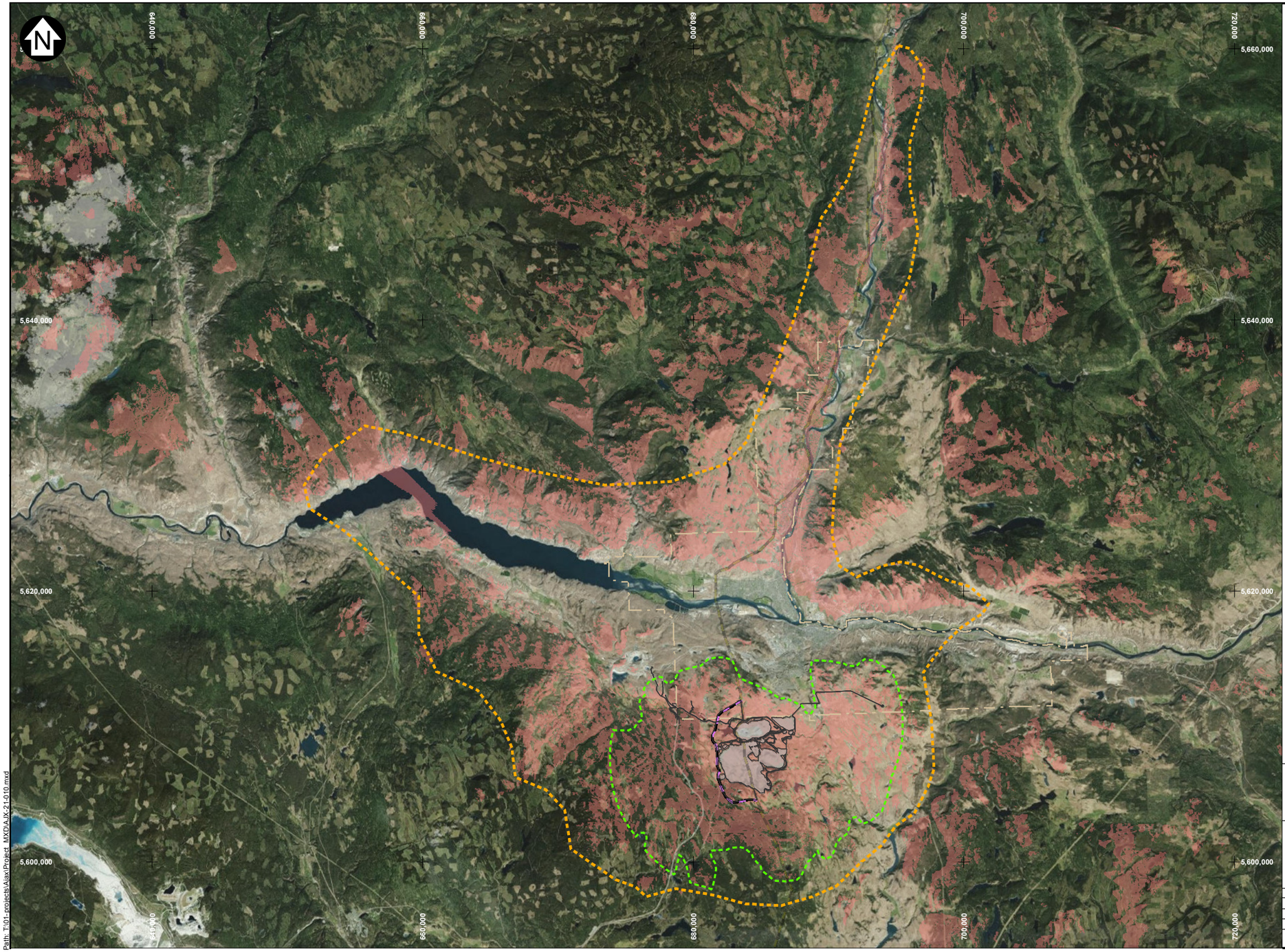
Parts of the Project footprint are subject to VQOs that were established primarily from the Coquihalla Highway and Lac Le Jeune Road (BC ILMB 1995), and a portion of the Project may be visible from those transportation corridors.

Given the current design of the Project and the nature of the surrounding landscape, it is likely that the large Project components will be visible from many points in the surrounding area. However, where the smaller components such as haul roads and power lines are visible within the Project area, their visual impact will be dwarfed by the large components such as the pit and Tailings Storage Facility; these components thus contribute a negligible amount to the overall effect on visual quality by the Project.

Recreation areas around the Project, such as Jacko Lake and Edith Lake, will have a direct view of the South and/or West MRSFs. The 9-km-long 230 kV overhead power line that runs from the Project east to the BC Hydro transmission line 2L265 will also be visible from these areas as well as from locations in Aberdeen and Knutsford.

Figure 8.3-5
Visual Impact/Aesthetic Features Local and Regional Study Areas

ERM



NOTES:

1. BASE MAP: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:303,082 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 3 6 9 Kilometres

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KGHM Ajax Mining Inc.

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Table 8.3-3. Identifying Potential Project Interactions and Effects on Visual Impact/ Aesthetic Features

Project Activities		Potential Effects on Visual Impact/ Aesthetic Features	
		Visual Quality	Shading
Construction	Clearing and Grubbing	M	O
	Earthworks	M	O
	Overburden/Topsoil Stockpile	M	M
	Laydown Areas and Storage Yards	L	O
	Project Lighting	L	O
	Site Security and Fencing	L	O
	Fuel Storage and Filling Area	L	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O
	Construction Wastes Transport, Storage, and Disposal	O	O
	Sewage Infrastructure and Disposal	O	O
	Public Road Realignment, Use, and Maintenance	O	O
	Site Road Construction, Use and Maintenance	L	O
	Peterson Creek Bridge Construction, Use, and Maintenance	O	O
	Site Buildings and Process Plant	L	O
	Explosives Magazine and Storage Facilities	L	O
	Open Pit Development	M	O
	Drilling and Blasting	M	O
	Crushing Mine Rock	O	O
	Loading, Hauling, and Deposition of Mine Rock	O	O
	Temporary Ore Stockpile	M	M
	Tailing Storage Facility Development	H	M
	Power Transmission, Distribution	L	O
	Natural Gas Line	L	O
	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	L	O
	Water Intake from Kamloops Lake	L	O
	Fire Suppression Infrastructure	O	O
	Contact Water	L	O
	Non-contact Water	L	O
	Peterson Creek Diversion	O	O
	Water Management Dams	L	O
	Mine Staffing (Direct Employment)	O	O
	Contracted Employment	O	O
	Taxation	O	O

(continued)

Table 8.3-3. Identifying Potential Project Interactions and Effects on Visual Impact/ Aesthetic Features (continued)

Project Activities		Potential Effects on Visual Impact/ Aesthetic Features	
		Visual Quality	Shading
Operation	Open Pit Development	M	O
	Drilling and Blasting	M	O
	Hauling Mine Rock and Ore from Pit	O	O
	Crushing and Conveying Ore	O	O
	Temporary Ore Stockpile	M	M
	Development of Mine Rock Storage Facilities	H	M
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	L	L
	Re-vegetation through Progressive Reclamation	L	O
	Process Plant Operation	L	O
	Deposition to Tailing Storage Facility	L	O
	Site Road Use and Maintenance (Materials, Personnel, Supplies)	O	O
	Concentrate Transport and Storage	O	O
	Explosives Magazine and Storage Facilities	L	O
	Fire Suppression Infrastructure	O	O
	Fuel Storage and Filling Area	O	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O
	General Wastes Transport, Storage, and Disposal	O	O
	Sewage Infrastructure and Disposal	O	O
	Laydown Areas and Storage Yards	L	O
	Power Transmission, Distribution	L	O
	Project Lighting	L	O
	Site Access, Security and Fencing	L	O
	Water Intake from Kamloops Lake	O	O
	Contact Water	O	O
	Non-contact Water	O	O
	Potable Water Treatment and Use	O	O
	Peterson Creek Diversion	O	O
	Mine Staffing (Direct Employment)	O	O
	Contracted Employment	O	O
	Taxation	O	O

(continued)

Table 8.3-3. Identifying Potential Project Interactions and Effects on Visual Impact/ Aesthetic Features (completed)

Project Activities		Potential Effects on Visual Impact/ Aesthetic Features	
		Visual Quality	Shading
Decommissioning and Closure	Dismantling of Ancillary Buildings	O	O
	Pit Lake Planning	M	O
	Site Road/Bridge Decommissioning	O	O
	Tailing Storage Facility Decommissioning and Reclamation	M	O
	Mine Rock Storage Facilities Reclamation	M	O
	Fuel Storage and Filling Area	O	O
	Hazardous Wastes Transport, Storage, and Disposal	O	O
	General Wastes Transport, Storage, and Disposal	O	O
	Sewage Infrastructure and Disposal	O	O
	Laydown Areas and Storage Yards	L	O
	Power Transmission, Distribution	L	O
	Project Lighting	L	O
	Site Access, Security and Fencing	L	O
	Contact Water	O	O
	Non-contact Water	O	O
	Potable Water Treatment and Use	O	O
	Peterson Creek Diversion	O	O
	Road use to the Project (Materials, Personnel, Supplies)	O	O
	Mine Staffing (Direct Employment)	O	O
	Contracted Employment	O	O
	Taxation	O	O
Post Closure	General Site Inspections and Maintenance	O	O
	Contact Water	O	O
	Non-contact Water	O	O
	Road use to the Project (Materials, Personnel, Supplies)	O	O
	Mine Staffing (Direct Employment)	O	O
	Contracted Employment	O	O

Notes:

O	*No interaction anticipated.*
L	*Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
M	*Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*
H	*Key interaction; warrants further consideration.*

The Project components that extrude from the surface with substantial elevation (i.e. greater than 50 m), such as the ore and overburden stockpiles or the Mine Rock Storage Facilities, will be visible from long

distances. These components may be visible from locations east of the Project including Highway 5A, Goose Lake Road, and Long Lake Road, and from the outer limits of the RSA including parts of northern Kamloops (e.g., Batchelor Heights) and the upper slopes of Sun Rivers resort community.

Other Project components that occupy a large footprint, such as the pit and the Tailings Storage Facility, may be visible from medium distances due to their prominence on the landscape relative to the viewer. The visual effects of these components may apply throughout the LSA.

All large Project components have the potential to affect visual quality throughout all stages of development, though the effects will be most apparent during operations when the size of these components is fully realized.

Increased Shading

The large Project components, particularly those with substantial elevation, will change patterns of shading and solar insolation (i.e., the amount of solar energy per unit area) in the area surrounding the Project. Areas immediately adjacent to large Project components will experience increased shading and reduced solar insolation, particularly in the winter months where the sun's angle is lowest. Areas further away from the Project will also experience very small reductions in solar insolation due to Project components obscuring portions of the horizon, from which a portion of solar insolation originates due to the diffusion of light from the sun in the atmosphere.

8.3.4.2 Effects on Visual Impact/Aesthetic Features

Reduced Visual Quality

To determine how the Project may affect visual quality from each of the 39 viewpoints, the assessment utilised a sequence of tools including viewshed analysis, the Hassell matrix, and visual simulations. The assessment considered both the major components of the Project (i.e., at the mine site) as well as the potential visual effects of the 230 kV power line. Consideration was also given to existing Visual Quality Objectives for Scenic Areas overlapping the Project, though no quantitative analysis was conducted to assess the impacts on VQOs.

The effect of the 230 kV power line on visual quality was assessed separately from the mine site as the power line will exist through all stages of the Project, including post-closure. During all stages of the Project except post-closure, any effect on visual quality contributed by the power line in areas where major Project components are also visible will be negligible given the relative sizes of the power line and the major Project components. Following reclamation of the Project site, the effect of the large Project components on visual quality could decrease, but the power line will remain, and could stand out from reclaimed Project components, producing an effect on its own.

The 230 kV power line running from the Project east to BC Hydro transmission line 2L265 was potentially visible from 14 viewpoints. Section 3.15 notes that the power line will be constructed mostly with single wooden poles, but some larger H-frame structures will be required. Currently there are no specific designs showing where the H-frames will be located; it is therefore assumed that all poles will be H-frames.

Viewshed Analysis

For each viewpoint, a preliminary viewshed analysis was conducted to determine if the viewpoint had any view of any Project component (Figure 8.3-2), as well as a viewshed analysis for the 230 kV power line separately. The viewshed analysis was conducted using the Spatial Analyst extension of ArcGIS 10.2.2, and was based on a LiDAR-derived digital elevation model (DEM) with a spatial resolution of 5 m. Three-dimensional designs of the major Project components[2] were superimposed on the DEM to produce a final DEM surface that represented the area of the Project at the peak of the Operations phase. The analysis considered only topography and did not include possible visual obstructions such as trees or buildings resulting in a conservative analysis. If a viewpoint had no view of the Project, no further assessment specific to the Project components from that viewpoint was conducted (Table 8.3-4). Similarly, if a viewpoint had no view of the 230 kV power line, no further assessment specific to the power line from that viewpoint was conducted (Table 8.3-4). The remaining viewpoints were assessed using a Hassell Matrix to determine the visual impact of the Project (see Tables 8.3-10, 8.3-11, and 8.3-12).

Table 8.3-4. Results of Viewshed Analysis for All Viewpoints

ID	Name	View of Project[1]	View of Power Line[2]
1	Ord Road Dog Park	No	No
2	Batchelor Heights Urban	Yes	No
3	Batchelor ATV Trails	No	No
4	Sun Rivers Golf Course Hole 12	Yes	No
5	Sun Rivers Parking Lot	Yes	No
6	McGowan Elementary	No	Yes
7	Upper Sahali neighbourhood	No	Yes
8	Aberdeen at Abbyglen	No	Yes
9	Pacific Way Elementary	No	Yes
10	Running Horse Rd	No	Yes
11	Knutsford Mailboxes	No	Yes
12	Knutsford Hill Rd	No	Yes
13	Simms Rd	Yes	Yes
14	Upper Rose Hill Rd	Yes	Yes
15	Lower Rose Hill Rd	Yes	Yes
16	Beresford Rd	Yes	No
17	Edith Lake Rd	Yes	Yes

(continued)

[2] The major Project components included in the final DEM surface were the open pit, the East, West, and South Mine Rock Storage Facilities (EMRSF/WMRSF/SMRSF), the overburden stockpile, the topsoil stockpile, the ore stockpile, and the Tailings Storage Facility (TSF). The plant site was not included in the DEM as designs for the site were not available. Most views of the plant site would have the SMRSF in the immediate background, so the omission of the physical building had a minimal effect on the results. Other, smaller Project components (such as diversion channels and small buildings) were excluded as they would either not be visible from most viewpoints or they would have a marginal impact on visual quality relative to the large Project components.

Table 8.3-4. Results of Viewshed Analysis for All Viewpoints (completed)

ID	Name	View of Project[1]	View of Power Line[2]
18	Long Lake Rd	Yes	Yes
19	Goose Lake Rd East	Yes	No
21	Jacko Lake Boat Launch	Yes	No
22	Lac Le Jeune Haul Rd	Yes	No
23	LLJ South of Haul Rd	No	No
24	Coquihalla Hwy 1	Yes	No
25	Coquihalla Hwy 2	Yes	No
26	Coquihalla Hwy 3	Yes	No
27	Coquihalla Hwy 4	No	No
28	Iron Mask Interchange	No	No
29	Pine View	No	No
30	Mt Dufferin Dr	No	No
31	Jacko Lake	Yes	No
32	Valleyview neighbourhood	No	No
33	Coal Hill	Yes	Yes
34	Greenstone Mtn Park	No	No
35	Jacko Lake Boat Launch	Yes	No
36	Kenna Cartwright Park	Yes	No
37	Lac Le Jeune Rd 1	Yes	No
38	Lac Le Jeune Rd 2	Yes	No
39	Rose Hill neighbourhood	Yes	Yes

[1]*Any viewpoint with a view of the Project (not including the 230 kV power line) will be carried forward in the assessment of the Operations and Closure Phases, all other viewpoints will be omitted.*
[2]*Any viewpoint with a view of the 230 kV power line will be carried forward in the assessment of the 230 kV power line.*

A viewshed analysis was also conducted from each viewpoint with respect to the power line. Each viewpoint that was greater than 3 km from the nearest visible portion of the power line was excluded as the power line would have a negligible impact on visual quality from greater distances. The remaining viewpoints were assessed using a Hassell Matrix to determine the visual impact of the power line (see Table 8.3-12).

Hassell Matrix

Based on the viewshed analysis, viewpoints with a potential view of any of the large Project components were assessed using a Hassell Matrix. The Hassell Matrix is a system developed by Hassell Pty Ltd. (Hassell 2005) that describes the visual impacts of developments by assessing the existing landscape and the expected modification due to development. For each viewpoint, there are five aspects that describe the visual characteristics of the landscape and the effect of the development, and each aspect is assigned a rating from one to five:

- character of the existing landscape;

- the expected degree of modification of the landscape;
- the horizontal extent of the visual effect;
- the vertical extent of the visual effect; and
- the distance of the visual effect from the viewpoint.

The rating for the existing landscape visual character is assigned based on landscape views from each viewpoint in the direction of the Project (Table 8.3-5). The rating for the degree of visual modification is assigned based on the expected visual change and the nature of the design of the Project components balanced with the landscape's capacity to absorb or mitigate the effects of that change (Table 8.3-6).

Table 8.3-5. Existing Landscape Visual Character

Description	Value	Typical Character/Modification
Unmodified landscape/natural	5	No or minimal effect from anthropogenic sources (e.g., national parks, coastlines, native forest areas)
Natural transition landscape	4	Changing landscape character associated with the interface between natural areas and modified rural, pastoral, or agricultural zones
Modified rural landscape, agricultural, pastoral areas	3	Rural landscape defined by field patterns, forestry plantations, and agricultural areas, and associated small roads and buildings
Rural transition landscape	2	Landscape associated with the interface between rural, agricultural areas, and more developed suburban or urban zones
Highly modified landscape, urban/industrial	1	Substantially developed landscape with a high level of visual effects associated with buildings, factories, roads, and other related infrastructure

Source: Hassell (2005).

Table 8.3-6. Degree of Visual Modification

Degree of Visual Modification (% of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects: the existing landscape character is completely changed or modified to accommodate the development
60 to 79	4	Increasing visual effects: the landscape is seen as changed permanently with the development dominating the existing landscape
40 to 59	3	Moderate visual effects: medium level of change to the landscape character; the landscape is less able to absorb change because of the scale, frequency, or extent of the development
20 to 39	2	Limited effects: the development is noticeable within the landscape, but the capacity for the landscape to absorb the development through vegetation growth or landforms is high
0 to 19	1	No or minor visual effects within the landscape: the development is considered in keeping with the existing landscape character

Source: Hassell (2005).

The horizontal and vertical extents of the visual effects of development are measured based on the approximate angular widths of human field of vision (Tables 8.3-7 and 8.3-8). Each viewpoint is first aligned to the centre of development. For the horizontal extent, an angle of 100° is defined to either side of the viewpoint alignment for a total of a 200° field of vision. The angular width of the proposed development visible from the viewpoint is measured and then calculated as a percentage of the 200° field of vision that is affected, and a rating is assigned to the percentage. If multiple Project components are visible, their horizontal effects are summed. For the vertical extent, the process is identical to the horizontal extent except that the total field of vision is 150° in the vertical.

Table 8.3-7. Horizontal Visual Effect

Degree of Horizontal Visual Effect (% of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects throughout the whole panorama
60 to 79	4	Increasing visual effects
40 to 59	3	Moderate visual effects
20 to 39	2	Limited visual effects
0 to 19	1	No or minor visual effects

Source: Hassell (2005).

Table 8.3-8. Vertical Visual Effect

Degree of Vertical Visual Effect (% of change)	Value	Description of Visual Modification
80 to 100	5	Substantial visual effects throughout the whole panorama
60 to 79	4	Increasing visual effects
40 to 59	3	Moderate visual effects
20 to 39	2	Limited visual effects
0 to 19	1	No or minor visual effects

Source: Hassell (2005).

The distance of visual effect aspect is a measurement of how the effect is modified by distance. The effect of scale, topography, vegetation, atmospheric conditions including aerosols (i.e. particulate matter suspended in the atmosphere), and weather patterns varies with distance and, in turn, alters the degree of visual effect (Table 8.3-9).

Table 8.3-9. Distance of Visual Effect

Distance to Development (km)	Value	Description
0 to 0.5	5	Adjacent
0.5 to 1	4	Foreground
1 to 3	3	Middle Ground
3 to 5	2	Distant Middle Ground
Greater than 5	1	Background

Source: Hassell (2005).

Once the ratings for all of the above aspects are assigned, they are summed to produce a final visual effect rating, which is a description of the visual impact of the development (Table 8.3-10).

Table 8.3-10. Final Visual Effect Rating

Degree of Visual Effect	Value Range
Severe	21 to 25
Substantial	17 to 20
Moderate	13 to 16
Slight	9 to 12
Negligible	5 to 8

Source: Hassell (2005).

The results of the Hassell Matrix analysis for the major Project components during the Operations Phase are shown in Table 8.3-11. The Hassell Matrix analysis shows one viewpoint with a visual effect rating of Substantial. Viewpoint 17, which is located on Edith Lake Road about 2.5 km west of the junction with Long Lake Road, has an elevated view of the Peterson Creek valley. It therefore has a direct view of the overburden and topsoil stockpiles, the South MRSF, the plant site, and the north wall of the open pit. This viewpoint received a visual effect rating of Substantial. The South MRSF is 700 m from the viewpoint, putting it in the foreground. There is no existing vegetation to provide any screening of the Project components, and it is likely there will be a moderate number of viewers of the landscape due to the proximity of Edith Lake, which is used for fishing and camping.

Table 8.3-11. Results of Hassell Matrix Analysis, Operations Phase

ID	Name	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
2	Batchelor Heights Urban	2	1	1	1	1	6	Negligible
4	Sun Rivers Hole 12	2	1	1	1	1	6	Negligible
5	Sun Rivers Parking Lot	2	1	1	1	1	6	Negligible
13	Simms Rd	4	2	1	1	2	10	Slight
14	Upper Rose Hill Rd	4	1	1	1	1	8	Slight
15	Lower Rose Hill Rd[1]	4	2	1	1	1	9	Slight
16	Beresford Rd[1]	4	2	1	1	2	10	Slight
17	Edith Lake Rd[1]	5	3	4	1	4	17	Substantial
18	Long Lake Rd	5	2	2	1	3	13	Moderate
19	Goose Lake Rd East	5	3	2	1	4	15	Moderate
21	Jacko Lake Boat Launch	4	5	3	1	3	16	Moderate
22	Lac Le Jeune Haul Rd	4	3	2	1	3	13	Moderate
24	Coquihalla Hwy 1[1]	5	2	1	1	3	12	Slight
25	Coquihalla Hwy 2	5	1	1	1	1	9	Slight

(continued)

Table 8.3-11. Results of Hassell Matrix Analysis, Operations Phase (completed)

ID	Name	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
26	Coquihalla Hwy 3	5	1	1	1	1	9	Slight
31	Jacko Lake	4	5	3	1	3	16	Moderate
33	Coal Hill[1]	5	3	3	1	4	16	Moderate
35	Jacko Lake Boat Launch[1]	4	5	3	1	3	16	Moderate
36	Kenna Cartwright	2	1	1	1	1	6	Negligible
37	Lac Le Jeune Rd 1[1]	4	4	2	1	4	15	Moderate
38	Lac Le Jeune Rd 2	5	1	1	1	1	9	Slight
39	Rose Hill	4	1	2	1	3	11	Slight

[1] *Visual simulations of the Operations Phase can be found in Plate (b) of Plates 8.3-1 to 8.3-7.*

Considering the sensitivity of each viewpoint (from Table 8.3-1), only the viewpoints from Jacko Lake (Viewpoints 21, 31, and 35) had a High sensitivity, owing largely to the lake's value as a recreation and tourist destination for angling. Viewpoint 17 (the only Substantial rating in the analysis) had a Moderate sensitivity, due to its use as a transportation corridor and its proximity to the small camp site nearby (2 km to the south).

The results of the Hassell Matrix analysis for the major Project components during the Post Closure Phase are shown in Table 8.3-12. In the Post Closure Phase, given that the Project Components will be re-vegetated to blend with the surrounding landscape, the Degree of Visual Modification rating was lowered to 1 (development is in keeping with the visual landscape character), and the final Degree of Visual Effect rating was recalculated. Three viewpoints showed a rating of Moderate, with the remainder of the Viewpoints receiving a rating of Slight or Negligible. Of the three points with a Moderate rating, Viewpoints 17 (Edith Lake Road) and 33 (Coal Hill) had a sensitivity of Moderate.

Table 8.3-12. Results of Hassell Matrix Analysis, Post Closure Phase

ID	Name	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
2	Batchelor Heights Urban	2	1	1	1	1	6	Negligible
4	Sun Rivers Hole 12	2	1	1	1	1	6	Negligible
5	Sun Rivers Parking Lot	2	1	1	1	1	6	Negligible
13	Simms Rd	4	1	1	1	2	9	Slight
14	Upper Rose Hill Rd	4	1	1	1	1	8	Slight
15	Lower Rose Hill Rd[1]	4	1	1	1	1	8	Slight
16	Beresford Rd[1]	4	1	1	1	2	9	Slight
17	Edith Lake Rd[1]	5	1	4	1	4	15	Moderate
18	Long Lake Rd	5	1	2	1	3	12	Slight

(continued)

Table 8.3-12. Results of Hassell Matrix Analysis, Post Closure Phase (completed)

ID	Name	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
19	Goose Lake Rd East	5	1	2	1	4	13	Moderate
21	Jacko Lake Boat Launch	4	1	2	1	3	11	Slight
22	Lac Le Jeune Haul Rd	4	1	2	1	3	11	Slight
24	Coquihalla Hwy 1[1]	5	1	1	1	3	11	Slight
25	Coquihalla Hwy 2	5	1	1	1	1	9	Slight
26	Coquihalla Hwy 3	5	1	1	1	1	9	Slight
31	Jacko Lake	4	1	3	1	3	12	Slight
33	Coal Hill[1]	5	1	3	1	4	14	Moderate
35	Jacko Lake Boat Launch[1]	4	1	3	1	3	12	Slight
36	Kenna Cartwright	2	1	1	1	1	6	Negligible
37	Lac Le Jeune Rd 1[1]	4	1	2	1	4	12	Slight
38	Lac Le Jeune Rd 2	5	1	1	1	1	9	Slight
39	Rose Hill	4	1	2	1	3	11	Slight

[1] *Visual simulations can be found in Plate (c) of Plates 8.3-1 to 8.3-7.*

The results of the Hassell Matrix analysis for the 230 kV power line are shown in Table 8.3-13. All viewpoints rated the visual impact of the power line as Slight with the exception of Viewpoint 12 (Knutsford Hill Rd), which was rated as Moderate. This is because the viewpoint has a view of undisturbed landscape, but the power line runs within 100 m of the viewpoint. The visual impact of the power line is limited largely due to the characteristics of local topographical relief, which permit only short segments of the power line to be visible from a given viewpoint.

Table 8.3-13. Results of Hassell Matrix Analysis for 230 kV Power Line

ID	Name	Existing Landscape Visual Character	Degree of Visual Modification	Horizontal Visual Effect	Vertical Visual Effect	Distance of Visual Effect	Final Visual Effect Rating	Degree of Visual Effect
6	McGowen Elementary[1]	2	1	2	1	4	10	Slight
7	Upper Sahali	3	1	2	1	4	11	Slight
8	Aberdeen at Abbyglen	4	1	1	1	3	10	Slight
9	Pacific Way Elementary	4	1	1	1	3	10	Slight
10	Running Horse Road	3	1	2	1	4	11	Slight
11	Knutsford Mailboxes	2	1	3	1	5	12	Slight
12	Knutsford Hill Rd	5	1	2	1	5	14	Moderate
13	Simms Rd	4	1	1	1	1	8	Slight
14	Upper Rose Hill Rd	4	1	2	1	4	12	Slight
15	Lower Rose Hill Rd	4	1	1	1	1	8	Slight
17	Edith Lake Rd	5	1	1	1	3	11	Slight
18	Long Lake Rd	4	1	1	1	3	10	Slight
33	Coal Hill	5	1	1	1	4	12	Slight
39	Rose Hill	4	1	2	1	3	11	Slight

[1] *Visual simulation can be found in Plate 8.3-8b.*

Visual simulations from eight viewpoints were created to verify the results of the Hassell Matrix analysis. Simulations were created for Viewpoints 6 (McGowen Elementary), 15 (Lower Rose Hill Rd.), 16 (Beresford Rd.), 17 (Edith Lake Rd.), 24 (Coquihalla Highway 1), 33 (Coal Hill), 35 (Jacko Lake Boat Launch), and 37 (Lac Le Jeune Rd. 1). These sites were chosen as representative of the locations that would be affected by the major Project components and the power line. They were also selected to be representative of landscape use with respect to travel corridors (Viewpoints 16, 17, 24, and 37), recreation areas (Viewpoints 17, 33 and 35), and residential areas (Viewpoints 6, 15, and 16). The existing view and simulations of the effect of major Project components on visual quality for Viewpoints 15, 16, 17, 24, 33, 35, and 37 are shown in Plates 8.3-1 through 8.3-7. Each series of plates represents the baseline condition (Plate [a]), the Operations Phase at Year 15 (Plate [b]), and the Post-Closure Phase (Plate [c]). The existing view and simulation of the effect of the power line from Viewpoint 6 is shown in Plates 8.3-8a, which represents the baseline condition, and 8.3-8b, which represents the Operations Phase through to the Post-Closure Phase.

Visual Simulations

The visual simulations for the Operations Phase represent the expected design of the Project at Year 15, when the MRSFs and all stockpiles will have been constructed to their maximum extents. The simulations of the Post Closure phase represent the final design of the Project when all ancillary structures have been removed and the surfaces have been fully re-vegetated and all other reclamation activities have been completed.

A comparison of the visual simulations and the results of the Hassell Matrix analysis indicate that the visual effect ratings represent an accurate assessment of the impact of the Project on visual quality. Viewpoint 15 has a view of the South and East MRSFs (Plate 8.3-1), but the viewpoint is about 6 km away, putting the Project in the background and limiting the angular size of the Project components. The visual effect rating of Slight is appropriate.

Viewpoint 16 also has a view of the South and East MRSFs (Plate 8.3-2), and is closer than Viewpoint 15, but much of the Project is hidden behind a hill in the foreground, suggesting that the rating of Slight is correct.

Viewpoint 17 was the only viewpoint to rate as Substantial, although the visual simulation (Plate 8.3-3) may be slightly misleading. The viewpoint is elevated slightly, is relatively close to the Project (700 m to the plant site), and has a view of most of the Project components including the South and East MRSFs, the north pit wall, the plant site and several soil stockpiles. However, direction of the original photograph omitted the location of South MRSF (the lower slopes of which can be seen to the extreme left of Plate 8.3-3b). It is the proximity to the South MRSF to the viewpoint that is responsible for the Substantial rating. When compared to other visual simulations with Moderate ratings (e.g. Viewpoint 33), this simulation does not appear much different in terms of the overall visual effect of the Project, so the exclusion of the South MRSF needs to be considered.

Viewpoint 24 had a visual effect rating of Slight largely due to the distance to the Project (3 km), which resulted in a small angular size of Project components (Plate 8.3-4).



Plate 8.3-1a. Existing view of the Project site from Viewpoint 15 (Lower Rose Hill Road).

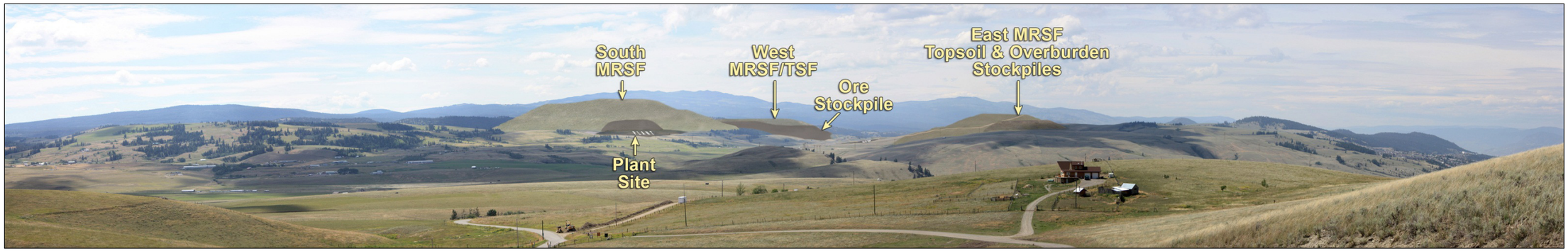


Plate 8.3-1b. View of the Project site from Viewpoint 15 (Lower Rose Hill Road) during the Operations Phase (Year 15).



Plate 8.3-1c. View of the Project site from Viewpoint 15 (Lower Rose Hill Road) during the Post Closure Phase.



Plate 8.3-2a. Existing view of the Project site from Viewpoint 16 (Beresford Road).



Plate 8.3-2b. View of the Project site from Viewpoint 16 (Beresford Road) during the Operations Phase (Year 15).



Plate 8.3-2c. View of the Project site from Viewpoint 16 (Beresford Road) during the Post Closure Phase.



Plate 8.3-3a. Existing view of the Project site from Viewpoint 17 (Edith Lake Road).



Plate 8.3-3b. View of the Project site from Viewpoint 17 (Edith Lake Road) during the Operations Phase (Year 15).



Plate 8.3-3c. View of the Project site from Viewpoint 17 (Edith Lake Road) during the Post Closure Phase.



Plate 8.3-4a. Existing view of the Project site from Viewpoint 24 (Coquihalla Highway 1).



Plate 8.3-4b. View of the Project site from Viewpoint 24 (Coquihalla Highway 1) during the Operations Phase (Year 15).



Plate 8.3-4c. View of the Project site from Viewpoint 24 (Coquihalla Highway 1) during the Post Closure Phase.



Plate 8.3-5a. Existing view of the Project site from Viewpoint 33 (Coal Hill).

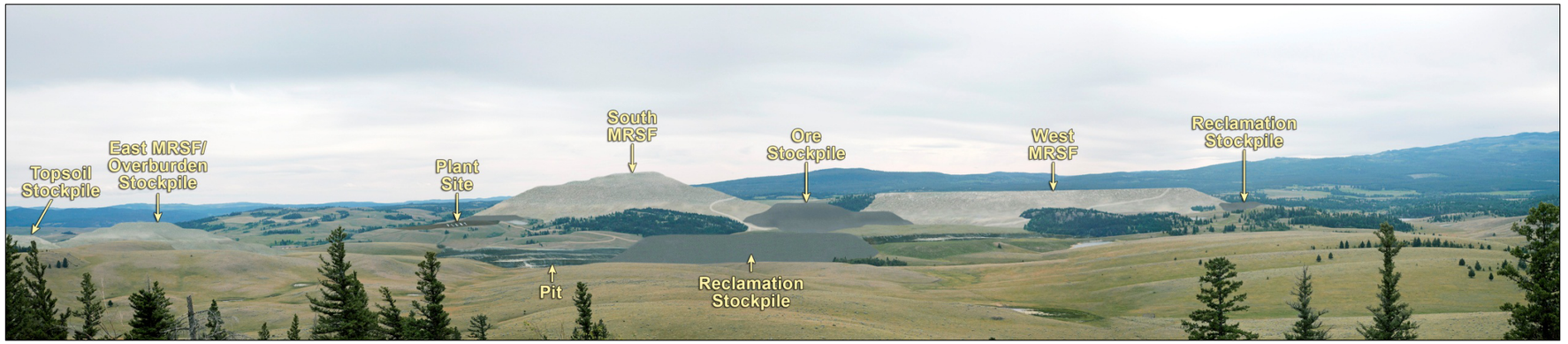


Plate 8.3-5b. View of the Project site from Viewpoint 33 (Coal Hill) during the Operations Phase (Year 15).



Plate 8.3-5c. View of the Project site from Viewpoint 33 (Coal Hill) during the Post Closure Phase.



Plate 8.3-6a. Existing view of the Project site from Viewpoint 35 (Jacko Lake Boat Launch).



Plate 8.3-6b. View of the Project site from Viewpoint 35 (Jacko Lake Boat Launch) during the Operations Phase (Year 15).



Plate 8.3-6c. View of the Project site from Viewpoint 35 (Jacko Lake Boat Launch) during the Post Closure Phase.



Plate 8.3-7a. Existing view of the Project site from Viewpoint 37 (Lac Le Jeune Road 1).



Plate 8.3-7b. View of the Project site from Viewpoint 37 (Lac Le Jeune Road 1) during the Operations Phase (Year 15).



Plate 8.3-7c. View of the Project site from Viewpoint 37 (Lac Le Jeune Road 1) during the Post Closure Phase.



Plate 8.3-8a. Existing view of Project site from Viewpoint 6 (McGowen Elementary).



Plate 8.3-8b. View of Project site from Viewpoint 6 (McGowen Elementary) during the Operations (Year 15) and Post Closure Phases.

With an elevated view of all major project components, the visual effect rating for Viewpoint 33 was Moderate (Plate 8.3-5). The rating was limited by the distance to the Project (2.5 km), which in turn limited the angular size of the components.

Viewpoint 35, within close proximity to the project at 1.6 km, indicated a visual effect rating of Moderate (Plate 8.3-6). The proximity to the Project resulted in large angular sizes for the Project components. However, local topography, particularly a hill to the east of the viewpoint and a forested hill on the opposite side of the lake, hides much of the Project (including the pit, the East MRSF, and portions of the South MRSF) and limits the overall visual impact.

Viewpoint 37 showed a visual effect rating of Moderate as well, entirely due to the proximity to the West MRSF and TSF embankments, which stretch across a large portion of the field of view (Plate 8.3-7). However, the rising topography between the viewpoint and the Project limits the angular height of those components, limiting the overall visual effect rating.

Viewpoint 6 has no view of the Project, but it does have a view of the power line. The Hassell Matrix analysis indicated a visual effect rating of slight, owing mostly to the distance to the power line (2 km) and the short segment of which it has a view (600 m) (Plate 8.3-8). Furthermore, power lines with smaller towers have small impacts on visual quality, as the power line itself is only just visible and the towers do not occupy significant angular widths. The visual effect rating of Slight is thus appropriate.

Effects on Visual Quality Objectives

As indicated in Section 8.3.1, mining operations are not subject to legislation regarding visual quality. However, the AIR/EISG makes reference to VQOs with respect to mitigation measures and descriptions of retention targets, which implies that an analysis of the effects of the Project on the VSUs with established VQOs should be conducted. The methodology for the assessment of effects on VSUs as established by the MFLNRO was designed for forestry-related activities and cannot be directly adapted for a large-scale mining development. Instead, the effects on the VSUs can be estimated by examining Figure 8.3-3 and comparing the approximate extents of the Project footprint within each VSU to the baseline photos and, where possible, the visual simulations from each viewpoint that has a view of the VSU. The anticipated amount of alteration

Two VSUs, both with a VQO of Partially Retained (between 1.5 and 7% view alteration), overlap the TSF, Open Pit, and related infrastructure on the west side of the Project area. There is no development within these VSUs, resulting in an Existing Visual Condition (EVC) of Retained (0% view alteration). It is anticipated that the total amount of alteration of the visual landscape in both VSUs will exceed 40%, which is well past the threshold for Excessively Modified (greater than 30%), thus the VQO of Partially Retained for those VSUs is exceeded.

The VSU overlapping the East MRSF on the east side of the Project Area has a VQO of Modified (between 7 and 20% view alteration). There are a small number of buildings and a sparse road network within the VSU resulting in an Existing Visual Condition of Partially Retained. It is anticipated that the total amount of visual alteration in the VSU will not exceed 10%, thus the VQO of Modified will be met.

Increased Shading

The 5 m resolution DEM employed in the viewshed analysis was also used to calculate the expected shading effects of the Project. Shading effects considered both the size and location of shadows, and the total amount of solar insolation.

Shadow Modelling

Shadows due to Project components were modelled for the winter solstice (December 22, the date when the sun is lowest in the sky) at sunrise and sunset to show the maximum length of shadows. The azimuth and elevation of the sun for those calculations were 130° and 10° respectively for sunrise and 230° and 10° respectively for sunset. No other times were calculated as the results showed that maximum shadows would not extend beyond the Project limits.

Figure 8.3-6 shows the modelled shadows for the Project on December 22. At sunrise, the shadows for most Project components extend into land owned by the Proponent and not accessible to the public. There is a small shading effect at sunset by the West MRSF on the southwestern portion of Jacko Lake; however, that portion of the lake is also shaded by local natural relief, so the actual effect of the West MRSF is negligible. The shadow produced by the West MRSF extends 650 m from its base; most of that area is land owned by the Proponent and not accessible by the public.

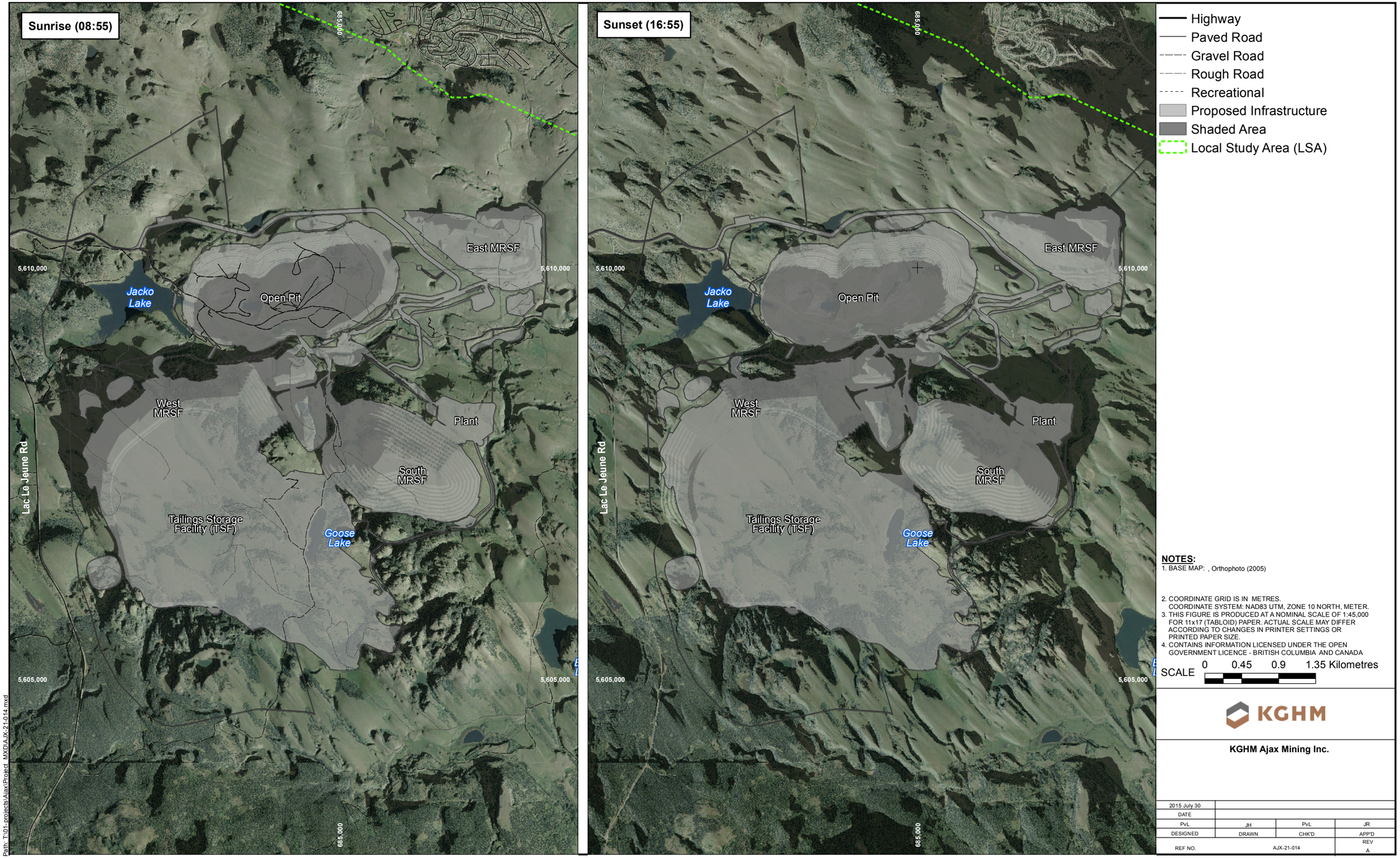
At sunset, the shadows for all Project components extend on to land owned by the Proponent and not accessible to the public. The longest shadow is produced by the South MRSF, which extends 1.2 km from its base, covering the ground between the South MRSF and the Peterson Creek Diversion Discharge Pond.

Solar Insolation

The total amount of solar insolation (in kWh/m^2) on a monthly basis for both the pre-development and full Operations Phase surface was calculated using the Area Solar Radiation tool, part of the Spatial Analyst extension to the ArcGIS 10.2.2 software package. This tool calculates solar insolation in two ways. First, the tool calculates solar insolation from direct sunlight, which is highly dependent on local topography relative to the position of the sun. Landscapes with an aspect nearer to facing the sun and a slope nearer to perpendicular to the angle of incoming radiation will receive higher amounts of insolation. Second, the tool calculates solar insolation from diffuse sunlight from the atmosphere. This parameter is determined by how much of the sky a given landscape can see.

The solar radiation tool calculated the total solar insolation every 30 minutes, and then provided a summed output for each month of the year. The monthly results were summed over the entire year to produce a single measure of yearly solar insolation. The results for the full Operations surface were subtracted from the pre-development surface to determine how Project components affected solar insolation.

Figure 8.3-6
Landscape Shading during Operations Phase on December 22 at Sunrise and Sunset



NOTES:
1. BASE MAP: , Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:45,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 0.45 0.9 1.35 Kilometres

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KGHM Ajax Mining Inc.

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Figure 8.3-7 shows the percentage decrease in total solar insolation on the surrounding landscape over a year once all Project components are fully constructed, considering both shading effects and the obstruction of diffuse solar radiation from the atmosphere. In general, landscapes that are south-facing, with a slope nearer to perpendicular to the angle of incoming sunlight, have the highest levels of solar insolation and therefore have the largest potential for a decline in insolation. The predicted decrease in solar insolation in these types of landscapes that are within 50 m of a Project component can be as high as 4%. For flatter topographies, the decrease is much smaller, around 1%. Further away from Project components, the decrease is even smaller, falling to less than 1% at distances of more than 500 m in areas that are shaded from direct sunlight by Project components at any time during the year.

In areas that are not shaded from direct sunlight, the decrease in total insolation is less than 0.1% due to the obstruction of diffuse solar radiation from the atmosphere. In Figure 8.3-7, this includes most of the blue-shaded areas more than 500 m from the Project components.

8.3.4.3 Mitigation Measures for Visual Impact/Aesthetic Features

Several strategies will be implemented for mitigating the visual effect of the Project on the landscape. The most effective measure is the re-vegetation of Project components and other disturbed areas. Disturbed areas will be re-vegetated on an ongoing basis during the Construction and Operations phases. Larger Project components such as the TSF embankments (completed to its maximum elevation of 1,060 m in Year 8), the MRSFs (completed to maximum elevation in Year 15) and the Overburden and Topsoil Stockpiles (Completed in Year 1) will be visible during much of the Project's life, and will therefore have visual impacts on surrounding viewscapes while they are being built up, but the effects will be mitigated by re-vegetating on an ongoing basis as the components are constructed. The large Project components will be further re-vegetated at closure.

In addition to re-vegetation, good visual design principles will be applied during the design and construction of the Project. The visual design of the Project will consider local and regional landscape patterns and geometry (e.g. slope) in order to meet the needs of the resource values of the surrounding area including economic, recreational and social values. There are several opportunities where the implementation of good visual design principles in the design and construction of the Project will mitigate its visual impact. The types of plants chosen for the re-vegetation of the Project components will either be the same species as the surrounding grassland areas or will at least mimic the overall colour and texture of the landscape. Additionally, slopes on the Project components will be relatively similar to those that could reasonably be expected to exist considering the geomorphic characteristics of the surrounding area. The design will also avoid straight edges where possible. For example, the straight edges of the benches of the MRSFs can be softened by contouring them slightly. "Ridges" or "valleys" built into the design where the surface of the Project component changes horizontal direction will also be curved instead of sharp. Furthermore, the tops of the MRSFs and the TSF embankments will be landscaped (i.e., adding small hills) to avoid creating a flat horizon. Re-vegetation of the large Project components will aid in hiding straight lines, as the visual texture created by a tree stand or dense vegetation can be effective masks.

Infrastructure aesthetics will also be considered. Using non-reflective materials in the construction of buildings and other infrastructure will prevent them from standing out. Infrastructure will also be painted with natural colours that blend into the landscape, or screened with tall shrubs or trees. In the

latter case, complete visual obstruction may not be necessary if the infrastructure being obscured blends in to the landscape.

Following mitigation procedures, it is anticipated that a residual effect from the Project on visual quality will remain at viewpoints that are close to the Project: Jacko Lake (Viewpoints 21, 31, and 35), Lac Le Jeune Road (Viewpoints 22 and 37), and Goose Lake and Edith Lake Roads (Viewpoints 17 and 19). The results of the Hassel Matrix analysis for these locations indicate the project will have a Moderate or Substantial impact on visual quality. The analysis also indicates that no residual effect on visual quality will remain for any viewpoints not listed above, including those that have a view only of the 230 kV power line.

During the Post Closure Phase, monitoring re-vegetation growth on the large Project components to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape will serve as mitigation. In the event that additional re-vegetation efforts need to take place, measures will be taken to allow the Project components to attain the appropriate level of vegetation cover. Following these procedures, it is anticipated that a residual from the Project on visual quality will remain at the viewpoint at Edith Lake Road. This location rated as Substantial in the Hassell Matrix analysis, indicating that even with mitigation efforts in place, the modification to the landscape will remain apparent to viewers.

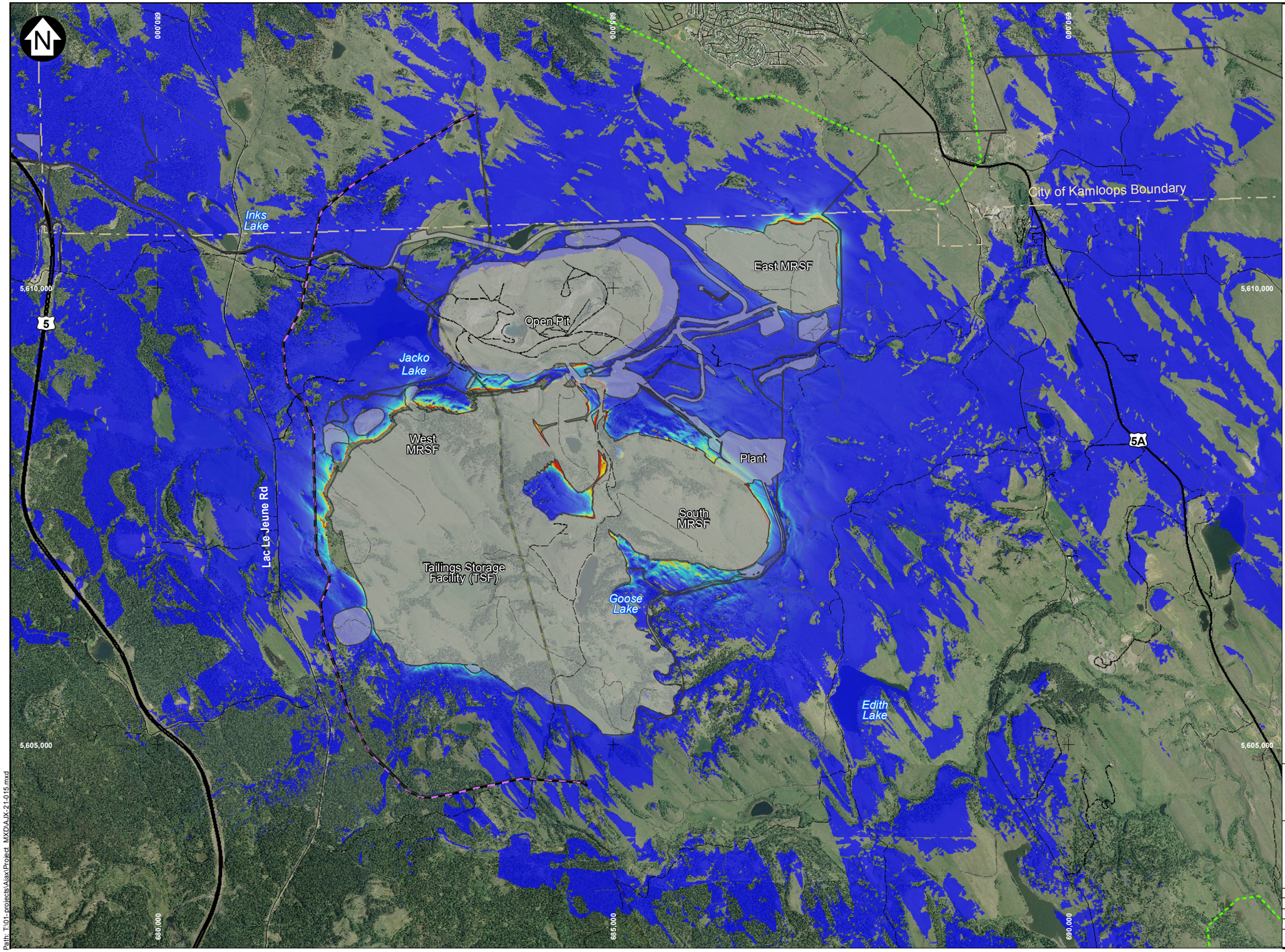
There are no mitigation strategies available for shading; however, no residual effects from shading are anticipated.

8.3.5 Residual Effects and their Significance

8.3.5.1 Summary of Residual Effects

In this assessment, the Construction and Decommissioning and Closure Phases were assessed together with the Operations Phase, as the effects during those phases will not be substantially different nor greater than the effects during the Operations Phase. During these phases, the Project will alter the visual quality of the landscape. Mitigation measures including progressive re-vegetation will be applied, but residual effects on the landscape from some locations in the surrounding landscape will remain (Table 8.3-14), specifically for any viewpoint with a Moderate or Substantial rating from the Hassel Matrix analysis (Table 8.3-11, 8.3-12, and 8.3-13). The construction and use of the MRSFs and overburden and topsoil stockpiles will continue throughout the Operations Phase, and the parts of those Project components that are in use cannot be re-vegetated. Landscape viewing locations closer to the Project will be affected to a larger degree than those further away, as the Project components will occupy a larger portion of the view of the landscape. All Project components will be re-vegetated at closure which will minimize the long-term effect on visual quality during the Post-Closure phase.

Figure 8.3-7
Percentage Decrease in Total Yearly Insolation



Kinder Morgan Pipeline - Current
Kinder Morgan Pipeline - Rerouted
Highway
Paved Road
Gravel Road
Rough Road
Recreational
City of Kamloops
Proposed Infrastructure
Local Study Area (LSA)

Decrease in Yearly Insolation
High : 5
2.5% Decrease
Low : 0

NOTES:
1. BASE MAP: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:45,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 0.45 0.9 1.35 Kilometres

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KGHM Ajax Mining Inc.

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Table 8.3-14. Summary of Residual Effects on Visual Quality

Potential Effect	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect	Description of Mitigation Measure(s)	Description of Residual Effect
Reduction of visual quality	Operations (including Construction and Closure Phases)	Major Project components: all MRSFs, TMF, overburden and topsoil stockpiles	The presence of major Project components will reduce the visual quality of the landscape	Progressively re-vegetate disturbed areas that are no longer in use; employ good visual design principles; screen infrastructure with vegetation where appropriate	Reduced visual quality for Viewpoints at Jacko Lake, Lac Le Jeune Rd, Coal Hill, Goose Lake Rd, and Edith Lake Rd.
Reduction of visual quality	Post-Closure	Major Project components: all MRSFs, TMF, overburden and topsoil stockpiles	The presence of major Project components will reduce the visual quality of the landscape	Monitor vegetation cover on Project components; ensure vegetation growth can attain desired re-vegetation	Reduced visual quality for Viewpoints at Goose Lake Rd and Edith Lake Rd.

8.3.5.2 Criteria for Characterization of Residual Effects

Specific criteria for the characterization of residual effects to Visual Quality are described in Table 8.3-15. These criteria are based on definitions established in Section 5.2.5.2, with the exception of the Geographic Extent criterion. This criterion has been adjusted to conform to the Hassell Matrix definitions of viewing distances, shown in Table 8.3-9, to identify whether the visual effect is in the foreground, middle-ground, distant middle-ground or background.

8.3.5.3 Characterization of Residual Effects

Residual effects on visual quality will largely occur during the Operations Phase of the Project. The Project is adjacent to recreational and residential areas, as well as public roads and highways, and therefore has a higher likelihood of being viewed compared to more remote locations, and landscapes and viewscapes are valued by people who use these areas. Table 8.3-16 shows the ratings for each of the characterizations criteria as they apply to visual quality.

Of the 16 viewpoints with a view of the Project during the Operation Phase, seven were given a final Visual Effect Rating from the Hassell Matrix analysis of Moderate (Viewpoints 19, 21, 22, 31, 33, 35, and 37) and one was given a final Visual Effect Rating of Substantial (Viewpoint 17). The remainder were given ratings of either Slight or Negligible. The criterion for the determination of magnitude of the residual effect is based on the highest Visual Effect Ratings among the viewpoints included in the Hassell Matrix analysis (Table 8.3-15). With one Substantial and seven Moderate Visual Effect Ratings, these results indicate that the residual effect during the Operations Phase has a magnitude of Medium. The duration of the effect is expected to be for the life of the Project up to the end of the Closure Phase, indicating that the effect will be Long-term. Given that the Distance to Visual Effect ratings in the HASSEL Matrix analysis for all points that received a final Visual Effect Rating of Moderate or Substantial were all within 3 km of the Project, the geographic extent of the effect is in the Middle Ground. The effect can be reversed in the short-term with an aggressive re-vegetation program. The landscape has a neutral level of resiliency and a neutral context.

Following the Hassell Matrix analysis for the 16 viewpoints with a view of the Project during the Post-Closure Phase, three were given a Visual Effect Rating of Moderate (Viewpoints 17, 19, and 33), with the remainder of the viewpoints receiving a rating of either Slight or Negligible. Following the criterion for Magnitude in Table 8.3-15 in which the highest Visual Effect Rating was Moderate, these results indicate that the residual effect during the Post Closure Phase has a Magnitude of Minor. The duration of the effect is expected to extend into the Far Future. Given that the Distance to Visual Effect ratings in the Hassell Matrix analysis for all points that received a final Visual Effect Rating of Moderate or Substantial were all within 3 km of the Project, the geographic extent of the effect is in the Middle Ground. The effect is irreversible since the re-vegetated Project components will be permanent fixtures in the landscape.

8.3.5.4 Significance of Residual Effects

Broadly, the viewpoints selected for this assessment are moderately sensitive to changes to the visual landscape. Twenty-four of the 39 viewpoints had no view of any Project components (Table 8.3-4), including those in neighbourhoods of south Kamloops such as Aberdeen and Sahali. The remaining 15 locations with a view of the Project were carried forward into the Hassell Matrix analysis, which showed that only one viewpoint would experience a substantial effect on the visual landscape. Additionally, the only viewpoints with high sensitivity to landscape view alteration (Jacko Lake) would experience a moderate effect on the visual landscape.

Following the above analysis in which a significant majority of the Kamloops area will have no view of the Project and that those areas that have a view of the Project will largely be only moderately affected, it is anticipated that the effect of the Project on visual quality during the Operations Phase will be Not Significant (Moderate). Given that a number of the Project components will be removed (e.g. the topsoil and overburden stockpiles) and the remaining components will be fully re-vegetated in keeping with the general visual characteristics of the surrounding landscape, it is anticipated that the effect of the Project on visual quality during the Post Closure Phase will be Not Significant (Minor).

8.3.5.5 Characterization of Likelihood and Confidence

The likelihood of the effect occurring is considered High. The amount of the Project that will be seen from numerous points in the landscape is known, and none of the criteria used in the characterization of the residual effect will be subject to significant change in the future, with the exception of the sensitivity, which may fluctuate with ongoing urban development and changing use of the area by residents and tourists.

The confidence of the prediction of significance is Moderate. Although the viewpoints selected in this assessment were chosen to be as representative as possible of potential viewpoints, there may be additional areas that were not included that may have value for some viewers. There may also be future developments and new uses of the landscape that could result in effects to visual quality that were not anticipated.

Table 8.3-15. Definitions of Characterization Criteria for Residual Effects on Visual Impact/Aesthetic Features

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Ecological Context	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*From what distance is the Project visible?*	*To what degree is the effect reversible?*	*How resilient is the landscape to changes to visual quality?*	*What is the current condition of the ecosystem and how commonly is it represented in the LSA?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change from baseline conditions (Hassell Matrix Visual Effect Rating: Negligible to Slight).	**Short-term:** Effect lasts 1 to 5 years.	**Once:** Effect is confined to one discrete period in time during the life of the Project.	**Foreground:** Project components visible from less than 1 km.	**Reversible Short-term:** Effect can be reversed relatively quickly.	**Low:** The landscape has a low resilience to changes to visual quality, and will not easily absorb the change.	**Low:** The landscape has little value to any potential viewers.	**High:** It is highly likely that this effect will occur.	**High:** < 80% confidence. There is a good understanding of the cause-effect relationship and all necessary data are available for the Project area. There is a low degree of uncertainty and variation from the predicted effect is expected to be low.
Minor: Differs from the average value for baseline conditions to a small degree. (Hassell Matrix Visual Effect Rating: Slight to Moderate).	**Medium-term:** Effect lasts 6 to 25 years.	**Sporadic:** Effect an effect that occurs at sporadic or intermittent intervals during any phase of the Project.	**Middle Ground:** Project components visible from 1 to 3 km.	**Reversible Long-term:** Effect can be reversed within 20 years of Post Closure.	**Neutral:** The landscape has a neutral resilience to imposed stresses and may be able to absorb or mitigate the change.	**Neutral:** The landscape has some value to select potential viewers of the landscape.	**Medium:** This effect is likely, but may not occur.	**Medium:** 50 to 80% confidence. The cause-effect relationships are not fully understood, there are a number of unknown external variables, or data for the Project area are incomplete. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident.
Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation. (Hassell Matrix Visual Effect Rating: Moderate to Substantial).	**Long-term:** Effect lasts between 26 and 50 years.	**Regular:** Effect occurs on a regular basis during the life span of the Project.	**Distant Middle Ground:** Project components visible from 3 to 5 km.	**Irreversible:** Effect cannot be reversed (i.e., is permanent).	**High:** The landscape has a high natural resilience to changes to visual quality, and can easily absorb the change.	**High:** The landscape has significant value to all potential viewers of the landscape.	**Low:** This effect is unlikely but could occur.	**Low:** < 50% confidence. The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project area are incomplete. High degree of uncertainty and final results may vary considerably.
Major: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation. (Hassell Matrix Visual Effect Rating: Substantial to Severe).	**Far Future:** Effect lasts more than 50 years.	**Continuous:** Effect occurs constantly during the life of the Project.	**Background:** Project components visible from greater than 5 km.					

Table 8.3-16. Characterization of Residual Effects, Significance, Likelihood and Confidence on Visual Impact/Aesthetic Features

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Reduction of Visual Quality - Operations Phase	Medium	Medium-term	Continuous	Foreground/ Middle Ground	Reversible Short-term	Neutral	Neutral	Not Significant (Moderate)	High	Medium
Reduction of Visual Quality - Post Closure Phase	Minor	Far Future	Continuous	Foreground/ Middle Ground	Irreversible	Neutral	Neutral	Not Significant (Minor)	High	Medium

8.3.5.6 Summary of Residual Effects Assessment and Significance

During the Operations Phase and the Post Closure Phase, the Project will alter the visual quality of the landscape. It is expected that there will be a residual effect after appropriate mitigation measures have been applied (Table 8.3-17). Based on the results of this assessment, the effect of the Project on visual quality is expected to be Not Significant (Moderate) during the Operations Phase and Not Significant (Minor) during the Post Closure Phase.

This residual effect will be carried forward into the cumulative effects assessment section, and discussed in relation to other projects.

Table 8.3-17. Summary of Residual Effects, Mitigation, and Significance on Visual Impact/ Aesthetic Features

Residual Effects	Project Phase	Mitigation Measures	Significance
Alteration of the landscape associated with Project components	Operations	Re-vegetate that are ready to be decommissioned; employ good visual design principles	Not Significant (moderate)

8.3.6 Cumulative Effects Assessment

8.3.6.1 Introduction

The cumulative effects assessment (CEA) considers the effects on visual quality of the Project in conjunction with the effects of other projects and activities (past, present, or future) in the RSA. There are many past, present, and future projects that have shaped, and will continue to shape, the visual character of the landscape. The effects of these projects on visual quality will be considered along with the residual effects of the Project identified in this assessment to determine if any interactions are evident, and if any cumulative residual effect could occur.

In order to be included, a project or activity must fall within the RSA and must have the potential to act cumulatively with the residual effect of the Project described in section 8.3.5. The latter criterion can be defined in two ways:

- the project or activity must be visible in the landscape to a viewer at the same time as the Project, which is defined as being within the viewer's field of view (i.e., in a 200° arc as noted in the discussion of the Hassell Matrix methodology in Section 8.3.4.2), and must not be obscured by landscape relief; or
- the project or activity acts cumulatively to affect the overall visual character of the area within the RSA.

8.3.6.2 Identification of Other Actions that May Affect Visual Impact/Aesthetic Features

Table 8.3-17 notes the activities that may have a cumulative effect on visual quality in conjunction with the Project. Activities with no spatial or temporal overlap fall outside of the RSA and thus will not be considered further. Activities with spatial or temporal overlap but no interaction are activities that either are not considered to affect visual quality (e.g. Recreational trails, Ranching), or exist in

the urban landscape of the City of Kamloops (e.g. Kamloops Airport, Water Treatment Centre), rendering their impact on visual quality inconsequential to this assessment. These activities will not be considered further. Activities anticipated to interact with the Project to a negligible or minor degree are those that cumulatively affect the overall visual character of the RSA. These activities do not overlap with the Project such that an activity is visible from the same location, but by small amounts they reduce the regional landscape's natural scenic qualities. However, relative to the size of the RSA, the area affected by these activities is minimal, and they will not be considered further. Activities anticipated to interact with the Project to a moderate degree are those that will overlap with the Project such that they can be seen along with the Project from the same viewpoint. These will be assessed in the following sections.

8.3.6.3 Interactions between Residual Project Effects and Other Project or Activity Effects

It is expected that the residual effects on visual quality due to the Project will interact with the effects of other projects and activities in the area (Table 8.3-18). The Trans Mountain pipeline activities, both the present and future expansion aspects, will run adjacent to the Project along the western side and will therefore be visible from some nearby viewpoints in conjunction with the Project. Furthermore, any future expansion of the City of Kamloops along the Highway 5A corridor or to the north of the Project may affect visual quality from viewpoints that have a view of the Project to east and north.

8.3.6.4 Proposed Mitigation Measures

Visual Quality

There were two primary mitigation strategies for the impacts of the Project on visual quality. The first involved the re-vegetating of areas not directly affected by Project components during operations and subsequently re-vegetating areas during the Operations phase that were ready to be decommissioned, including portions of active components that are no longer in use (e.g. lower slopes of MRSFs). The second was employing good visual design principles in order to shape the large Project components such that they could be absorbed better into the visual character of the landscape.

For the Trans Mountain pipeline system and its expansion, given the nature of the project, the visual impact is expected to be limited to a small right-of-way (ROW) occupied by a road for maintenance access. The road will be maintained throughout the life of the pipeline, so re-vegetation is not appropriate. There may be limited re-vegetation opportunities for the portions of the ROW that are not occupied by a road; however, the ROW must be clear of large obstacles such as trees in order to be able to access the underground pipeline for maintenance or repair. In the small segments where the ROW runs through a stand of trees, re-vegetation will likely be limited to grasses and small shrubs. Good visual design principles can be employed by making the ROW appear irregular in shape and by ensuring that any above ground features such as roads avoid straight edges where possible.

Table 8.3-18. Ranking Potential for Residual Effects to Interact Cumulatively with Effects of Other Human Actions for Visual Impact/Aesthetic Features

	Industrial Projects/Activities													Natural Resources and Land Use			Tourism and Commercial Recreation Activities					Community Infrastructure			Transportation					
Residual Effect	Vidette Lake Mine	Afton Mine (Historical)	Iron Mask Mine	Bonaparte Mine	New Afton Mine (New Gold)	Highland Valley Copper Mine (Teck)	Domtar Kamloops Pulp Mill	Tolko-Hefley Creek Plywood and Veneer	LaFarge Cement Plant	Trans Mountain Pipeline System (Kinder Morgan)	Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Harper Creek	Highland Valley Copper - Bethlehem Expansion	Kamloops Forest District	Agriculture	Ranching	Tranquille on the Lake	Lac Le Jeune Resort	Tobiano Golf Course	Recreational Hunting, Fishing, Foraging	Recreational Trails	City of Kamloops Wastewater Management	Water Treatment Centre	City Expansion and Growth	Lac le Jeune Road	Highway 1	Highway 5A	Highway 5 (Coquihalla Highway)	Kamloops Airport	Rail Yards and Lines (CP and CN)
Reduction of Visual Quality (Operations Phase)	-	-	-	-	L	-	L	L	L	L	M	-	-	O	O	O	O	O	L	O	O	O	O	M	L	L	L	L	O	O
Reduction of Visual Quality (Post Closure Phase)	-	-	-	-	L	-	L	L	L	L	M	-	-	O	O	O	O	O	L	O	O	O	O	M	L	L	L	L	O	O

Notes:

(-) *No spatial or temporal overlap.*

O *Spatial or temporal overlap, but no interaction anticipated OR No change from current condition anticipated, and already captured as part of baseline characterization. No further consideration warranted.*

L *Negligible to minor interaction expected; impact limited to overall visual character of the RSA; no monitoring required, no further consideration warranted.*

M *Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*

H *Key interaction; warrants further consideration.*

The expansion of the City of Kamloops is likely to occur over the next several decades. The Kamloops Official Community Plan (KAMPLAN; City of Kamloops 2014) projects that 36% of the city's population growth to 2021 and 48% of the population growth to 2036 will occur in the Southwest Sector of the city (comprised of the neighbourhoods of Aberdeen, Mt. Dufferin, Sahali, and Knutsford). The Aberdeen Community Plan (Aberdeen Area Plan 2008) indicates that some of the necessary expansion may take place up to 800 m south of the limits of existing development (i.e. south of Aberdeen Drive), which will have effects on visual quality. Mitigation strategies are limited to basic design principles such as the avoidance of straight lines where possible (e.g. road construction) and avoiding the use of highly reflective materials or colours that contrast sharply with the surrounding environment in home construction.

8.3.6.5 Evaluation of Significance of Residual Cumulative Effects

Following the implementation of the mitigation strategies described above, it is expected that a cumulative residual effect will remain. Effects of activities within the immediate area of the Project will likely result in some degradation of the visual quality of the landscape; however, those effects are anticipated to be minor (Table 8.3-19). Table 8.3-20 assesses the significance, probability, and confidence of occurrence of the residual effect.

Table 8.3-19. Summary of Cumulative Effects Mitigation Measures and Residual Effects on Visual Impact/Aesthetic Features

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Large Project Component Construction /Operation	Construction/ Operation of other project infrastructure; agriculture; ranching	Degradation in the visual quality of the landscape	Re-vegetation of components that are ready to be decommissioned as well as progressive re-vegetation of active components; good design principles	Overall reduction of visual quality of the landscape

8.3.7 Conclusion

Visual Quality and Aesthetic Features were considered as a VC as part of the assessment of the effects of Project activities. Two potential effects on the surrounding landscape arising from the Project, visual quality and shading, were identified and evaluated using on-site photographs, quantitative analyses and visual simulations. After considering mitigation strategies, it was determined that the Project would result in a residual effect, wherein the visual quality of the landscape would be reduced. The effect is predicted to be Not Significant (Moderate) for the Operations Phase and Not Significant (Minor) for the Post Closure Phase. No residual effects for the 230 kV overhead power line or shading effects from Project components are expected.

The residual effect was carried forward into the CEA, wherein the effect of the Project on visual quality was examined in the context of activities in the surrounding area. The residual cumulative effect is predicted to be Not Significant (Moderate). Table 8.3-21 summarizes the Project and cumulative residual effects.

Table 8.3-20. Characterization of Cumulative Residual Effects, Significance, Likelihood and Confidence on Visual Impact/Aesthetic Features

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Reduction of Visual Quality - Operations Phase	Medium	Medium-term	Continuous	Foreground/ Middle Ground	Reversible Short-term	Neutral	Neutral	Not Significant (Moderate)	High	Medium
Reduction of Visual Quality - Post Closure Phase	Minor	Far Future	Continuous	Foreground/ Middle Ground	Irreversible	Neutral	Neutral	Not Significant (Minor)	High	Medium

Table 8.3-21. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Visual Impact/Aesthetic Features

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Reduction of Visual Quality	Operations (including Construction and Closure)	Progressively re-vegetate disturbed areas that are no longer in use; employ good visual design principles	Not Significant (Moderate)	Not Significant (Moderate)
Reduction of Visual Quality	Post Closure	Monitor vegetation cover on Project components; ensure vegetation growth can attain desired re-vegetation	Not Significant (Minor)	Not Significant (Minor)

8.4 LAND AND RESOURCE USE

The Land and Resource Use section of the Application for an Environmental Assessment Certificate/Environmental Impact Statement for a Comprehensive Study (Application/EIS) for a Comprehensive Study (Application/EIS), considers the activities and uses of the areas in proximity to the Project. The Project is located in an area that has a broad range of historic and current land uses, including agriculture (mostly ranching) and resource extraction (including mining and forestry). The Project is included within the Thompson-Nicola Regional District's (TNRD) boundaries and portions of the Project fall within the City of Kamloops (Kamloops), where the Project may affect the land use activities of local residents and the community's land use objectives.

8.4.1 Rationale

This section includes a description of the scoping process used to identify Land and Resource Use for inclusion in the assessment. Scoping is fundamental to focusing the Application/EIS on those issues where there is the greatest potential to cause significant adverse effects. Valued components (VCs) are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (CEAA 2006; EAO 2013). To be included in the EA, there must be a perceived likelihood that the VC will be affected by the proposed Project. Valued components are scoped into the environmental assessment based on issues raised during consultation with Aboriginal Groups, government agencies, the public and stakeholders. Consideration of certain VCs may be a legislated requirement, while other VCs may be a known concern through previous project experience. The Construction, Operations, and Decommissioning and Closure phases of the Project will result in changes to land and resource use in proximity to the mine site.

With respect to Land and Resource Use, the focus of public/stakeholder concern was largely on issues related to community land use, land use planning and ranching (Table 8.4-1). Indirect effects associated with the biophysical environment have been considered in the assessment for Land and resource use (Sections 6.1 – 6.17). Aboriginal concerns identified during the consultation process relating to land and resource use are covered in Section 8.5 (Current Use of Land and Resources for Traditional Purposes [CULRTP]). Outdoor Recreation interests are identified in the vicinity of the Project and Project activities, and have also been raised during public engagement; potential effects of the Project on outdoor recreation are considered in Section 8.6 (Outdoor Recreation). Healthy Living is considered in Section 10.6 (Healthy Living and Health Education). Property Value is considered in Section 7.5 (Property Values). Based on feedback received to date from government, the public and other stakeholders, the following components are included in the discussion of Land and Resource Use in the vicinity of the Project:

- Community land use and planning (including consideration of various municipal and regional plans and processes, like the Sustainable Kamloops Plan);
- Ranching and other agriculture;
- Mining; and
- Other land and resource use (e.g., forestry, parks and protected areas).

Key concerns raised during consultation, and therefore considered in this section, include potential effects related to:

- **Community land use plans:** Direct effects may involve overlap of Project footprint with existing land use designations. Indirect adverse effects may include concerns around how the presence of the Project could affect development within Kamloops through environmental or other effects and whether or not the Project infringes upon the goals and objectives of existing plans.
- **Ranching:** Much of the land within the Project footprint and immediate vicinity is currently used for agricultural purposes (primarily ranching). Concerns raised relate to the direct loss of grazing land as a result of the Project, and to loss of access to these lands resulting from Project-related access restrictions (e.g., closure of Goose Lake Road).

Table 8.4-1. Summary of Rationale and Justification for Land and Resource Use as a VC

Valued Components	Identified by*				Rationale for Inclusion
	AG	G	P/S	SK	
Land and Resource Use	X	X	X	X	Concerns related to potential adverse effects of the Project on existing land use plans, as well as the potential effects on ranch livelihoods in the vicinity of the Mine Site.

**AG = Aboriginal Group; G = Guideline Requirement; P/S = Public/Stakeholder; SK = Scientific/Professional Knowledge.*

Comments from Aboriginal Groups on the Application Information Requirements influenced the assessment of land and resource use. Discussion specific to discussion on Aboriginal Land and Resources Use is included in Section 8.5 (CULRTP).

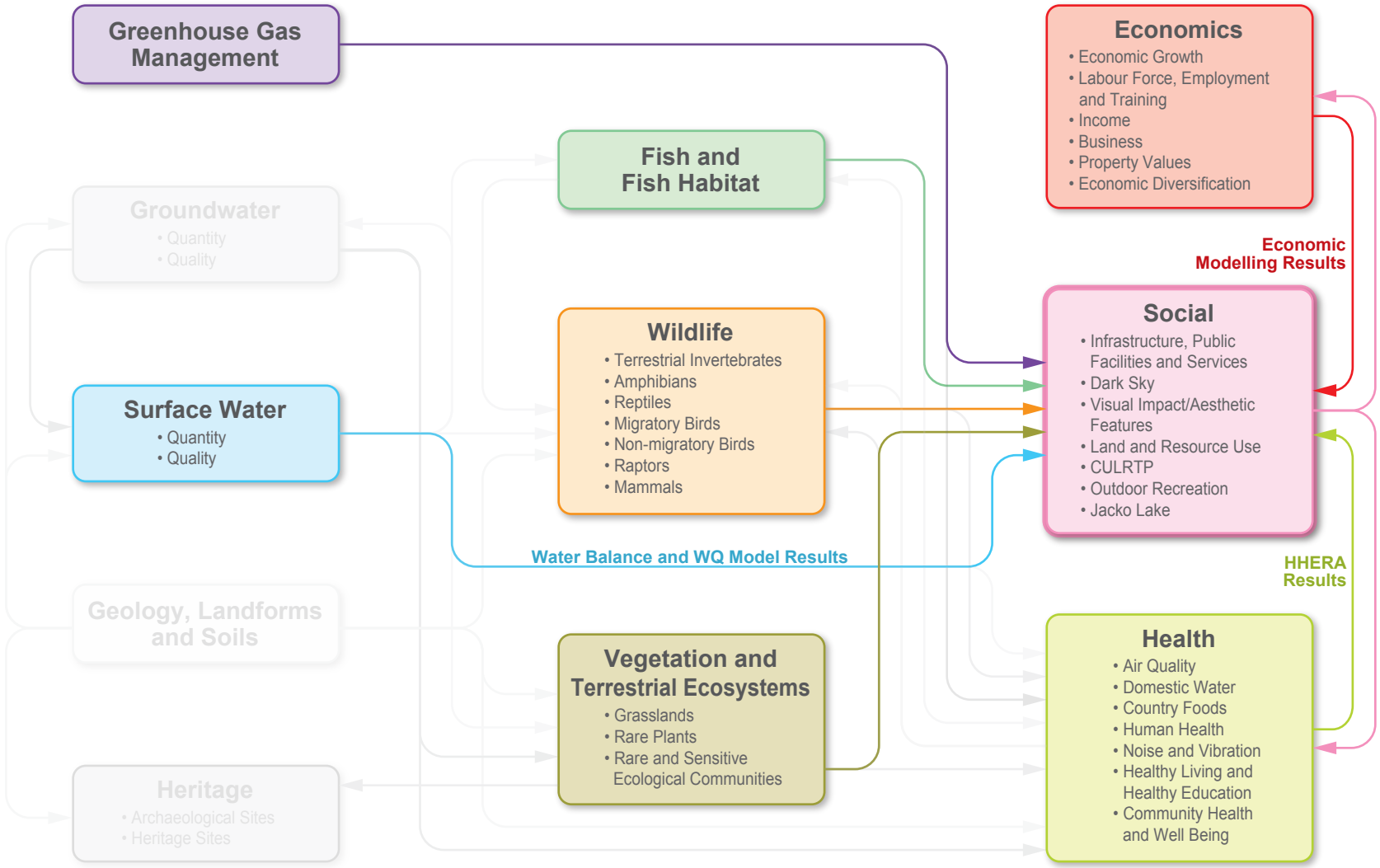
The assessment of effects to land and resource use is related primarily to potential effects on City of Kamloops and TNRD planning, and the operations of ranchers in the vicinity of the Project. The information developed from other VCs is used to support the analysis of this VC as summarized in Figure 8.4-1. For example, research and findings from water quality and quantity help to inform potential effects on ranching operations.

8.4.2 Background

8.4.2.1 Regional Overview

The Project is located within the TNRD, an area within the British Columbia (BC) interior that includes both urban and rural landscapes. The TNRD describes itself in saying the area "offers the best of both worlds. Urban life within vibrant communities, and outlying rural regions that showcase the region's beauty – pristine but rugged mountains, rolling grasslands, lush evergreen forests and both historic and modern areas all within approximately 45,000 square kilometers" (TNRD 2013). This combination of characteristics results in a diversity of land and resource uses to consider with respect to the Project.

Figure 8.4-1
Inputs to Social Valued Components



Community land use (including consideration of future plans) occurs primarily to the north (City of Kamloops) and east (rural community of Knutsford) of the Project. Both the City of Kamloops and the TNRD have undertaken land use planning processes related to these areas.

The proposed Mine Site is the location of historic mining activities, as described in Section 8.4.2.2. In addition to mining, the immediate vicinity of the Project is also currently used for agriculture and ranching, with much of the area designated as part of the Agricultural Land Reserve (ALR).

The Project is in the traditional territories of several Aboriginal Groups, including the Tk'emlúps te Secwépemc and Skeetchestn Indian Bands (represented by the Stk'emlupsemc te Secwépemc Nation), the Lower Nicola Indian Band and the Ashcroft Indian Band (from the Nlaka'pamux Nation), the Whispering Pines/Clinton Indian Band (from the Secwépemc Nation) and the Métis Nation of British Columbia. Section 8.5 (Current Use of Lands and Resources for Traditional Purposes) and Chapter 12 (Background and Aboriginal Group Settings) provide a description of historical and current land uses by Aboriginal people.

8.4.2.2 Historical Activities

The areas in proximity to the Project have been subject to a variety of Land and Resource Use over the years. Kamloops derives its name from the Secwépemc word "Tk'emlúps", which refers to the meeting of the North and South Thompson rivers. The area was first inhabited by approximately 3,000 members of the Shuswap tribe, part of the Interior Salish Nation. As noted in Section 12, archaeology indicates that the area was used by Aboriginal people for hunting ungulates such as elk, moose and deer. Until the mid-1800s, the area supported large elk herds that Stk'emlupsemc te Secwépemc Nation (SSN) harvested for meat, hides, antlers, bones, and teeth (used for tools).

Prior to the arrival of Europeans in the twentieth century, Aboriginal Groups report that rainbow trout were fished from Jacko Lake. Since the lake was typically ice-free by mid-April, Aboriginal Groups identify it as an early source of fish for people. Other fishing locations were common on the North, South and Main Thompson River where salmon fishing was practiced. Jacko Lake was also a preferred area for harvesting traditional medicinal plants, in addition to root plants and soapberries (Ignace 2014).

Fur trading began in the area in the early 1800s, and fur trading posts were located in various locations in what is now Kamloops. By the mid-1800s, elk forage ranges in this area were subject to grazing by large herds of horses (and subsequently cattle). Cattle herding in the Kamloops area may have begun shortly after 1846, when Chief Factor of the Hudson's Bay Company moved cattle and horses from Fort Vancouver at the mouth of the Columbia River to Vancouver Island, Fort Kamloops and Fort Alexandria. Early cattle drives brought cattle to the Thompson River, Fort Kamloops, and Savona, and formed the foundation of ranching in the area. The Kamloops area was settled in the 1860s, and the early ranchers included well-educated, middle class British immigrants (McLean 1982). Cattle ranching continues to be a primary Land and Resource Use in the Project area. In 2012, KAM purchased the Sugarloaf Ranch and associable lands, see Figure 8.4-3.

British Columbia officially became part of Canada in 1871. Construction of the transcontinental railroad was completed in 1885, encouraging the growth of a small village on the shore of the Thompson River. The village grew rapidly and became incorporated as a city with public works by 1893. At that point the

population had grown to approximately 500. In the following years, there were a number of infrastructure developments, including bridges that connected villages on either side of the rivers.

Mining also has a long history in the Project area, with mining exploration occurring as early as the 1880s. G. J. Rogers was the first recorded owner of the Ajax claims (1906), which were acquired by the Consolidated Mining and Smelting Company of Canada in 1928. Diamond drilling exploration by Cominco and later Afton Mines Ltd. continued on and off from 1929 to the 1970s, during which time there were several changes in ownership of specific claims. Exploration efforts by Afton Mines Ltd. between 1973 and 1980 identified a reserve consisting of copper, gold, and silver and recoverable reserves were defined as of 1988 (BC Ministry of Energy 2008). The Afton Operating Corporation began mining operations in the east and west pits of the Ajax deposit in 1989 after the economic open pit reserves at the Afton site (approximately 9 km northwest of the Project) had been depleted early that year (BC Ministry of Energy 2008). Due to market conditions, mining of the deposits was sporadic through the 1990s. Abacus Mining and Exploration acquired the Ajax claims in 2002, and continued the exploration of the Ajax properties by drilling from 2005 to 2010 (Abacus Mining and Exploration Corp. 2012). KGHM Ajax Mining Inc. (KAM) acquired 80% of the project and has continued to conduct exploration drilling and environmental baseline sampling between 2012 and the present date.

The Project is located within the Kamloops Forest District, which is part of the Kamloops Timber Supply Area (TSA). Tree-killing bark beetles (including mountain pine beetle, spruce beetle, and Douglas fir beetle) continue to pose a threat to the forests. The Project is located in the Greenstone Beetle Management Unit, where more than 30% of the area is identified as susceptible to the mountain pine beetle. In 2008, in response to the pine beetle, the Annual Allowable Cut for the TSA was determined to be 4 million cubic metres. This harvest level (and priority for beetle management) will remain in place until 2018 unless otherwise altered. The Domtar Pulp Mill is located immediately west of Kamloops on the Thompson River and the Heffley Creek Saw Mill is located immediately to the North of Kamloops on the North Thompson River.

8.4.2.3 Baseline Studies

Baseline studies occurred between 2011 and 2015, and included consideration of both primary and secondary data sources. The baseline studies sought to understand the overall character of Land and Resource Use in the TNRD, with a particular focus on those areas closest to the Project. This included characterization of current and historic Land and Resource Use. The intent of these studies was to provide a baseline from which potential changes from the Project could be measured.

Data Sources

The main sources of this portion of the baseline included literature and key person interviews with individuals that have relevant experience and interests. Key contributors to the discussion on Land and Resource Use included representation from:

- KAM;
- Key person interviews with individuals with expertise in land or resource use in the Local and Regional study areas (see Figure 8.4-4 (Local Study Area) and Figure 8.4-5 (Regional Study Area)), including representatives from the City of Kamloops and the TNRD;

- Key person interviews, informal discussions and organized workshops held with key resource users (e.g., ranchers);
- City of Kamloops and TNRD planning documentation;
- BC Ministry of Agriculture;
- BC Ministry of Environment;
- Statistics Canada data; and
- Other secondary data sources as appropriate.

Consultation activities undertaken with the Aboriginal Groups during the Pre-Application period included capacity building and funding, TK/TLU (Traditional Knowledge/Traditional Land Use) studies, community meetings, site tours, and meetings with Aboriginal Group representatives (see Section 4.3). Multiple attempts have been made to engage each Aboriginal Group to seek the baseline data required for the Application/EIS including the circulation of baseline documentation for review and comment. The information gathered through this engagement has been incorporated in the Application and considered in the assessments. For example, the Cultural Heritage Study Report prepared by SSN for the Project informed the historic activities description in Section 8.5.2.2. In some cases, the requested information was not available from Aboriginal Groups at the time of writing or from secondary sources. Where appropriate, additional information made available by Aboriginal Groups will be considered in Project development plans.

Methods

The approach to understanding baseline conditions was to use a combination of literature sources, complemented by relevant knowledge, insights and experience of those in the study areas. Where data were available, maps were produced to describe baseline conditions.

Characterization of Land and Resources Use Baseline Condition

The following baseline summary focuses on land and resource use activities most relevant to the Project and the Mine Site, including land management and planning, ranching activities, and the history of mining in the area.

Other land and resource uses were considered in the baseline study and the scoping of the assessment including forestry, parks and protected areas, and outdoor recreation (including hunting and fishing). Residential land use is discussed and reflected in part within the assessment of property values in Section 7.5 (Property Values). Outdoor recreation land uses are assessed in Section 8.6 (Outdoor Recreation). No provincial parks or protected areas were identified in the vicinity of the Project. Further baseline information on these subjects can be found in Appendix 7.1-A (Socio-economic Baseline).

The Jacko Lake Supporting Topic, Section 8.7, serves to aggregate summaries for all VCs that have potential Project effects related to Jacko Lake; the intent of this section is to provide a snapshot of residual effects, mitigations and the determination of significance for each of the relevant VCs.

Community Land Management and Planning

The City of Kamloops and the TNRD have undertaken extensive planning processes over the past several decades. In general, City of Kamloops planning documents have focused on municipal growth within the city boundary, including infrastructure upgrades required for various population thresholds, and the TNRD plans have focused on overall land and resource use in the region as well as outside the municipal boundary. Numerous plans, including official community plans (OCPs) and land and resource management plans (LRMPs), were reviewed to determine whether there was any potential overlap between each plan and Project activities (Figure 8.4-2; Table 8.4-2).

Table 8.4-2. City of Kamloops, TNRD and Provincial Plans and Designations

City of Kamloops	TNRD	Provincial
• Kamplan • Aberdeen Area Plan • Kamloops Agricultural Area Plan • Travel Smart Plan • Airshed Management Plan • Industrial Land Review • Sustainable Kamloops Plan • Bicycle Master Plan • Kamloops Pedestrian Master Plan • Agriculture Area Plan, the Kamloops Transit Business Plan and the Kamloops Parks Plan (Draft). • Intersection Safety Master Plan • McGill Corridor Southgate Project • Mount Dufferin Land Use Plan	• Fringe Area Policy Paper • Regional Growth Strategy • South Thompson Settlement Strategy • Kamloops South Official Community Plan (OCP) • Cherry Creek-Savona OCP • Zoning Bylaw • Lakeshore Development Guidelines • Coquihalla Highway Corridor Special Planning Study • FireSmart Manual • Building Regulations Bylaw	• Kamloops Land and Resource Management Plan (LRMP) • Agricultural Land Reserve

Table 8.4-3 summarizes the planning documents that were considered most relevant to the Project and were considered in the discussion of effects.

Table 8.4-3. Description of Land Use Plans and Designations

Plan	Description
Kamloops LRMP	The Kamloops LRMP was developed in the 1990s as part of BC's Land Use Strategy to direct the management of all Crown land over the next 10 years (BC Ministry of Natural Resource Operations 1995). Although the plan was not updated within the 10-year time frame indicated, it continues to guide land and resource use management decisions today (Ajax KPI Program 2011-2012). The Kamloops LRMP applies to 22,000 hectares of south-central BC within the TNRD and provides direction on land use management practices and monitoring systems. Within the LRMP, the Project falls within an area designated as a General Management Zone (GMZ). Mineral and mine development is allowable in all general management zones outside of protection resource management zones, and those places in which mine development is prohibited by law. The Ajax Project does not overlap with any protection resource management zones or other prohibited areas. The goals and objectives of the LRMP with respect to specific activities (e.g., agriculture) are described in the relevant description of those activities within this Application/EIS.

Plan	Description
Agricultural Land Reserve	The Project is located within the ALR, a provincial zone designated by the Agricultural Land Commission Act in which agriculture is recognized as the priority use. Non-agriculture uses and subdivisions within the ALR are restricted unless permitted via regulation or approved by the Agricultural Land Commission. Other resource uses within the ALR, including activities such as oil and gas, forestry, and aggregate extraction uses (both short- and long-term) are considered temporary, and lands can be reclaimed for agricultural use (Provincial Agricultural Land Commission 2014).
KAMPLAN (Kamloops OCP)	The purpose of the Kamloops Official Community Plan (the KAMPLAN) is to provide objectives and policies that guide decisions on planning and land use management within the municipality (see Figure 8.4-2 for plan boundaries). Key goals of the KAMPLAN, which are also referenced in other associated planning documents (e.g., Aberdeen Development Plan) include building strong neighbourhoods, providing a variety of housing types, encouraging healthy and active lifestyles, supporting cultural and athletic pursuits, diversifying economic and education opportunities and maintaining sustainable environmental stewardship. One of the key focuses of the KAMPLAN is growth management, which notes that a population of 100,000 could be supported within the current land available, while growth to 120,000 would require major infrastructure investment. Overall, growth is anticipated to be greatest in the southwest section of the city, which includes the Aberdeen neighbourhood. The Project does not overlap with areas designated to accommodate population growth (e.g., residential area expansion). Future growth projections and residential demand identify special development areas in Highlands West and the Taylor Property. Both areas are located south of Aberdeen approximately 1.1 km from the Project East Mine Rock Storage Facility. The City of Kamloops urban growth boundary (on the northern border of the Project) is approximately 800 m at its closest point to the Project. The location of the Project also overlaps with areas currently designated as having value for agricultural purposes and value as grasslands, as well as areas that are categorized as important for watershed protection.
Sustainable Kamloops Plan	This plan was developed through extensive consultation with stakeholders. Components of the plan relate to the airshed, environmentally-sensitive areas, production and consumption of local foods, reduced energy consumption, reduced solid waste generation, efficient and sustainable development of land, reduced greenhouse gas emissions, optimal health outcomes, reduced water demands and a host of other topics.
Kamloops Agricultural Area Plan	The purpose of the Kamloops Agriculture Area Plan (AAP) is to establish updated and more defined policies that will protect and promote local agriculture and encourage sustainable agricultural practices. For the purpose of this AAP, "local" is defined as product grown/raised within Kamloops political boundaries. The plan focuses on community farm areas and identifies opportunities and practical solutions to strengthen agriculture and ultimately contribute to Kamloop's long-term sustainability. While the AAP does not overlap with the Project, it identifies agricultural areas within Kamloops that border the Project area.
Aberdeen Area Plan	The purpose of the Aberdeen Area Plan is to plan the growth of the Aberdeen neighbourhood such that it is capable of accommodating the population growth projected by the KAMPLAN. It is anticipated that there will be a demand for approximately 3,900 new residential units in Aberdeen. The Aberdeen Area Plan supports maintaining the status quo in existing areas and focuses on providing policy direction for the remaining undeveloped lands, which are mostly either designated as Special Development Areas (Highlands West, Taylor Property) or within the Agricultural Land Reserve (True Consulting Group 2008).

Plan	Description
TravelSmart Plan	The TravelSmart Plan is a program that integrates land use and transportation system planning management. TravelSmart considered land use growth strategies (as identified in the KAMPLAN), neighbourhood design considerations, road network improvements, and other transportation network improvements (e.g., public transit).
Kamloops South OCP	The Kamloops South OCP serves as a basis for decisions and actions related to the use and development of all lands within the Kamloops South OCP Area (See Figure 8.4-2). The Plan is bounded by the southern border of the City of Kamloops boundary and extends south past all Project facilities. The southeastern boundary is located close to Scuito Lake and Campbell Lake; southern boundary aligns with top of Shumway lake; western boundary just west of Dam Lake; northern boundary is city of Kamloops. This area includes Beresford, Campbell Creek, and all Project related facilities. The Kamloops South OCP provides a framework of objectives and policies for a number of topics. Its overall objective is to designate and direct the pattern of existing and future land use to promote orderly growth, provide opportunity for multiple land uses, sustain the existing resource base, and preserve the natural characteristics of the area (TNRD 2011c).
Kamloops South OCP *(cont'd)*	The Project overlaps with areas identified for agricultural uses within the plan. The Project footprint also overlaps with parcels identified as "rural resources" (i.e., uses that may include activities such as grazing, forestry, agriculture, resource extraction, and public use). It is also close to areas designated as "country residential" and "mobile home park" (Knutsford). There are also recreational designations, including a commercial recreation zone (near Knutsford), a large area to the west on either side of the Coquihalla, area approximately 2 km south of Knutsford, Jacko Lake and Edith Lake. Notwithstanding these land use designations, the plan also recognizes that "the Regional District does not have direct jurisdiction over the extraction of Sand/Gravel Resources or Mineral Resources, the Board of Directors encourage that the extraction and on-site processing of Sand/Gravel Resources or Mineral Resources be located on lands designated for forestry-grazing, agricultural or rural resource use within the Plan Area provided suitable noise and dust controls are employed" (TNRD 2011c).

Ranching and Agriculture

Agricultural production in the TNRD varies widely in accordance with geographic and climatic variation in the region. The southeastern portions of the TNRD are close to the Okanagan Valley, which is one of the most productive agricultural areas in the province. However, most of the TNRD is higher in elevation and drier in climate and therefore less suitable for crop production. Cattle ranching and horse keeping accounted for most of the agricultural activity in the region. Of 58 farms, 28 were classified as cattle ranching and farming and 16 were classified as other animal production (14 of these were horse or other equine ranches). In total, the farms in the area had 8,309 cattle and calves and 280 horses and ponies, as well as a variety of other livestock (Statistics Canada 2006).

Cattle ranching is the primary agricultural activity in proximity to the Project. Cattle ranching typically involves the production of hay (which is normally baled for winter feed), movement of cattle between grazing areas (on private and crown land), reproduction operations, and the sale of steers, heifers, and herd culls. Grazing cattle on pasture is recommended by the Cattlemen's Association as a best management practice, which has the potential to benefit farmers and society at large by making use of land that has low crop value (British Columbia Cattlemen's Association 2012b).

Ranching activities in proximity to the Project are managed through grazing leases. Grazing leases are an historic type of land tenure issued by the Provincial government, and current tenures have typically been grandfathered in as part of the Land Act. A grazing lease gives the holder exclusive use of the forage on Crown Land for grazing purposes. The Province retains timber and mineral rights on the leases that have been granted, while things such as public roads are often exempt from the lease itself. Public access to lands within grazing leases is legally restricted, with access requiring permission from the lease holder (BC Ministry of Forests 2000).

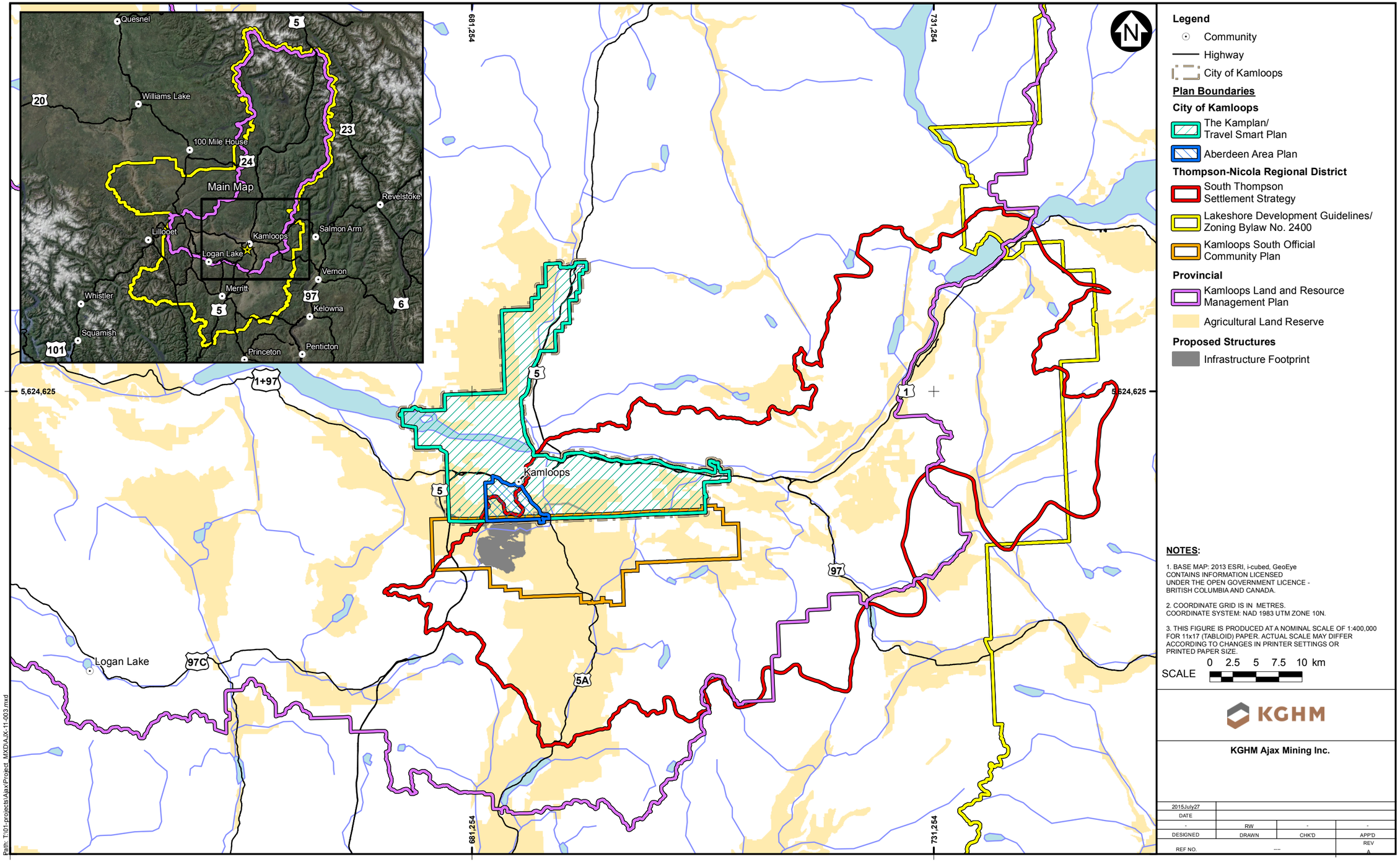
Grazing leases share common terms with the land to be used for either grazing livestock or for harvesting purposes. Provisions for lawful access to grazing lease land parcels to gather traditional sustenance resources, medicines and other cultural heritage resource activities exits though must be established in accordance with applicable grazing lease agreements; KAM is unaware of any such agreements. These provisions could include access for activities such as hunting and fishing and maintaining traditional practices and spiritual relationship to the land, in a manner that respects the grazing lease activities and does not interfere with grazing or forage use. Grazing lease access is managed by the lease holder.

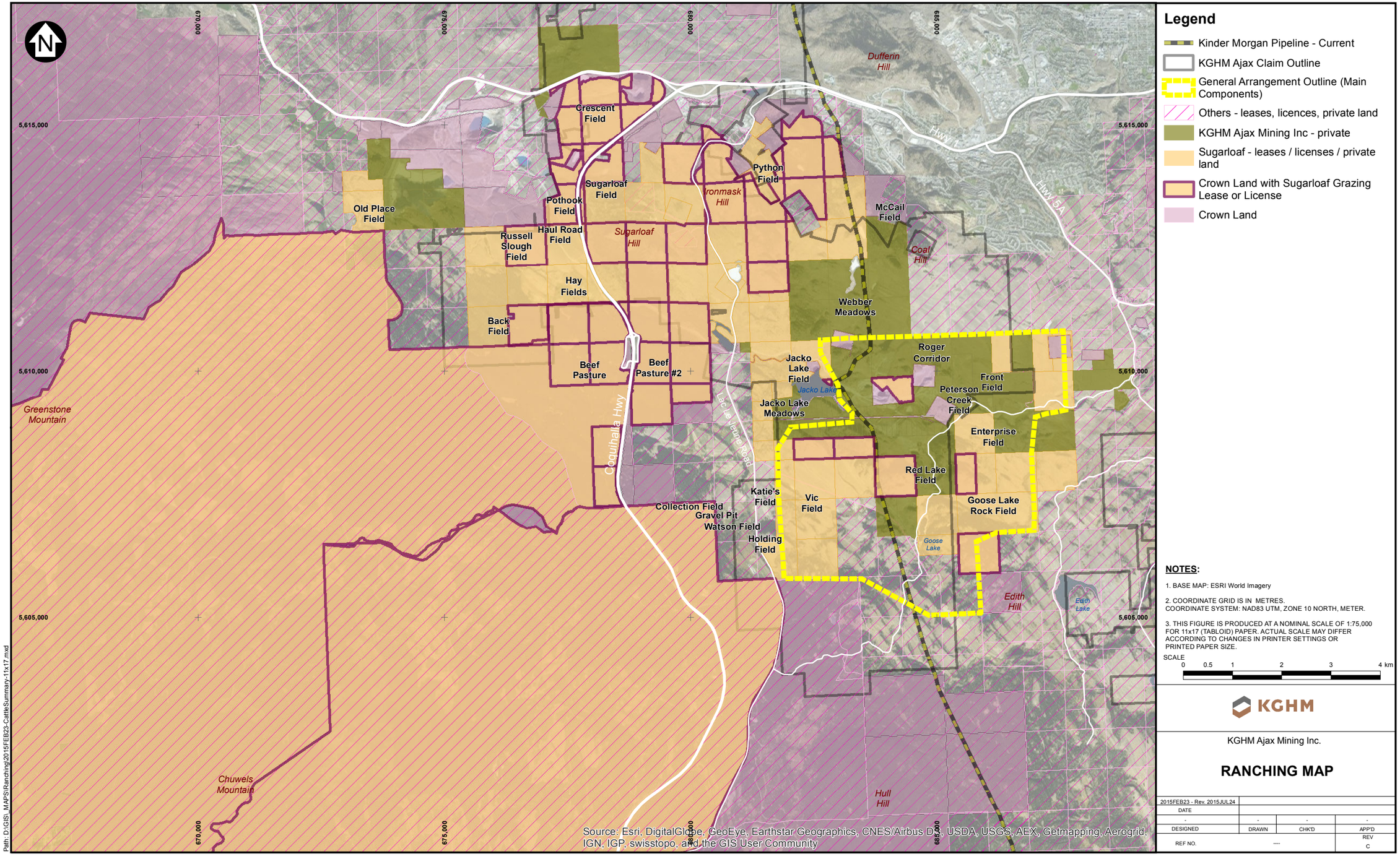
The Project overlaps with a grazing tenure held by Sugarloaf Ranch, portions of which include access and use agreements with other area ranchers. As for other grazing tenures, mineral exploration and development is allowed while also allowing for continued ranching activities. Figure 8.4-3 presents an overview of the fields used for grazing in proximity to the Project, including existing grazing leases, grazing licenses, privately held lands, and Crown lands, including those pertaining to Sugarloaf Ranch and to other ranchers in the area. While use of the fields depicted in Figure 8.4-3 is guided by the requirements of the various grazing leases and licences, there are also a series of both legal and informal agreements that enable use of the area. While confidentiality prohibits the disclosure of the details of these agreements, KAM is working closely with Sugarloaf Ranch and others to understand the use of the area and ensure access is managed for ranching purposes.

The Socio-economic Baseline (Appendix 7-1A) provides a summary of the current use of the fields depicted in Figure 8.4-3, including Sugarloaf Ranch's activities, other ranchers use, and the approximate annual timing of each. These fields and their use are included in the discussion of effects later in the chapter (see Table 8.4-6: Predicted Effects on Field Use for Ranching).

Figure 8.4-2
Plan Boundaries Associated with the City of Kamloops, the Thompson-Nicola Regional District, and the Province of BC

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Legend

- Kinder Morgan Pipeline - Current
- KGHM Ajax Claim Outline
- General Arrangement Outline (Main Components)
- Others - leases, licences, private land
- KGHM Ajax Mining Inc - private
- Sugarloaf - leases / licenses / private land
- Crown Land with Sugarloaf Grazing Lease or License
- Crown Land

NOTES:

1. BASE MAP: ESRI World Imagery

2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD83 UTM, ZONE 10 NORTH, METER.

3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:75,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

SCALE
0 0.5 1 2 3 4 km

KGHM

KGHM Ajax Mining Inc.

RANCHING MAP

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Agricultural Water Use

Ranching activities currently have a major influence on Peterson Creek streamflows, as there are a number of existing surface water licences on Peterson Creek and its tributaries. These licences are predominantly used for the irrigation of hay crops. Existing water licences for ranching and agricultural activities in Peterson Creek are accounted for in the baseline conditions water balance model. Annual surface water licenses for irrigation include:

- 530,000 m^3 on Peterson Creek above Jacko Lake;
- 431,000 m^3 on Jacko Lake;
- 55,000 m^3 on Keynes Creek;
- 99,000 m^3 on Humphrey Creek;
- 50,000 m^3 on Davidson Brook; and
- 230,000 m^3 in the Separation Lake sub-watershed. (See Section 6.3, Surface Water Quantity).

Mining

Kamloops' experience with mining dates back over 100 years, and mining in general has been a strong part of the regional economy for decades (Venture Kamloops 2013). There are two operating metal mines within the vicinity of the Project: the New Afton Mine (a gold mine operated by New Gold Inc., approximately 10 km west of the Project) and Highland Valley Copper (Canada's largest open pit copper mine owned by Teck [97.5%], located 31 km south-west of the Project). Mineral claims in the immediate vicinity to the Project include Gold Mask (located approximately 2 km west of the Project), Discovery (located approximately 2 km north of the Project) and Cicada (located immediately to the east of the Project). Additional information on economic trends in the mining sector is presented in Section 7.4.Under the Kamloops LRMP, the Project is located in a general management zone. Mineral and mine development is allowable in all general management zones outside of protection resource management zones, and those places in which mine development is prohibited by law. The Ajax Project does not overlap with any protection resource management zones or other prohibited areas. The objectives of the LRMP with regard to mining are: 1) to encourage new mining development; 2) to strive for diversified mineral industries, and; 3) to maintain or enhance access to lands for mineral development (BC Ministry of Natural Resource Operations 1995).

8.4.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for Land and Resources Use and encompasses possible direct, indirect, and induced effects of the Project on Land and Resource Use, as well as the trends in processes that may be relevant.

8.4.3.1 Spatial Boundaries

Baseline studies considered current and historical land and resources uses for those areas in closest proximity to the Project, with consideration of the land and resources uses in the TNRD as context. For the purposes of the effects assessment, the spatial boundaries consider the extent to which Project effects may accrue from other related VCs (i.e., terrestrial effects study areas, aquatic effects study areas, air quality effects study areas, noise and vibration effects study areas, and human and health and ecological risks assessment boundaries), in addition to where Project components or activities are likely to overlap with existing Land and Resource Use.

Local Study Area

As illustrated in Figure 8.4-4, the Local Study Area (LSA) for the Land and Resource Use VC is the area that may be disturbed by Project components or activities. Due to the Project's proximity to the Kamloops, the LSA extends to include the following areas:

- The southern neighbourhoods of the Kamloops Official Community Plan (KAMPLAN) immediately north of the Project site boundaries to Hwy 1, specifically Upper Sahali, Aberdeen, Pineview Valley and Lac Le Jeune; and
- Those areas identified within the Kamloops South OCP.

Regional Study Area

As illustrated in Figure 8.4-5, the Regional Study Area (RSA) for Land and Resource Use encompasses the study areas for other related VCs (i.e., terrestrial VCs, aquatic VCs, air quality, noise and vibrations and human health), and recognizes that some resource users may travel from a distance to access the area. The RSA includes areas considered part of the KAMPLAN south of Kamloops Lake and the Thompson River, as well as those areas identified within the Kamloops South OCP.

8.4.3.2 Temporal Boundaries

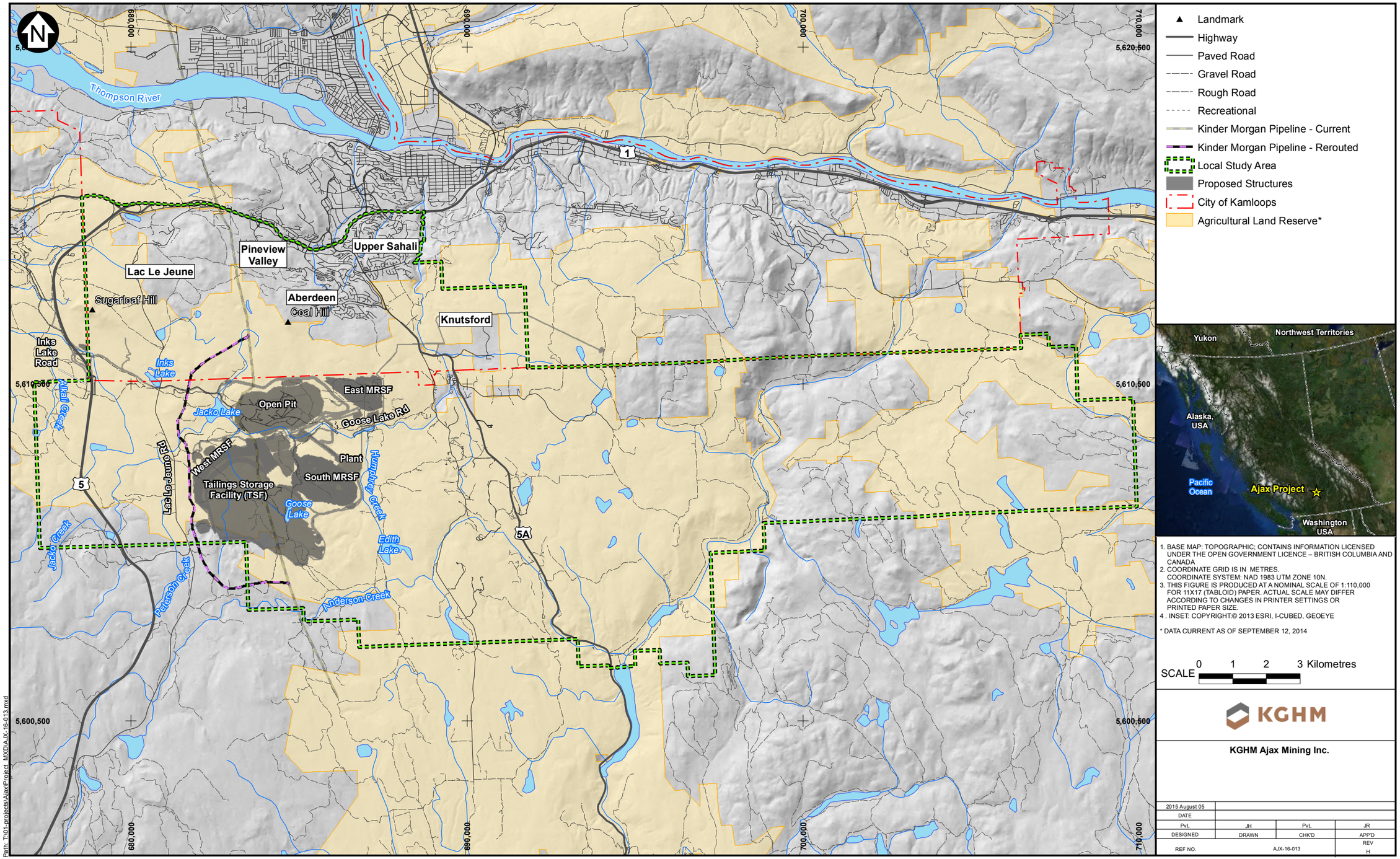
The effects assessment for Land and Resources Use considers all phases of the project as follows:

- **Construction**: 2 years;
- **Operation**: 23 years;
- **Decommissioning and Closure**: 5 years (includes decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- **Post Closure**: 5+ years (includes ongoing reclamation activities and post-closure monitoring).

The focus of the assessment will be on the Construction and Operation phases as this is when the Project will be most active and when the Project impacts the current Land and Resource Use. Potential effects during the Decommissioning and Closure Phase, and the Post Closure Phase, will be described in relation to associated VCs, and to the extent that describing future Land and Resources Use is possible.

Figure 8.4-4
Land and Resource Use Local Study Area

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1. BASE MAP: TOPOGRAPHIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:110,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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* DATA CURRENT AS OF SEPTEMBER 12, 2014

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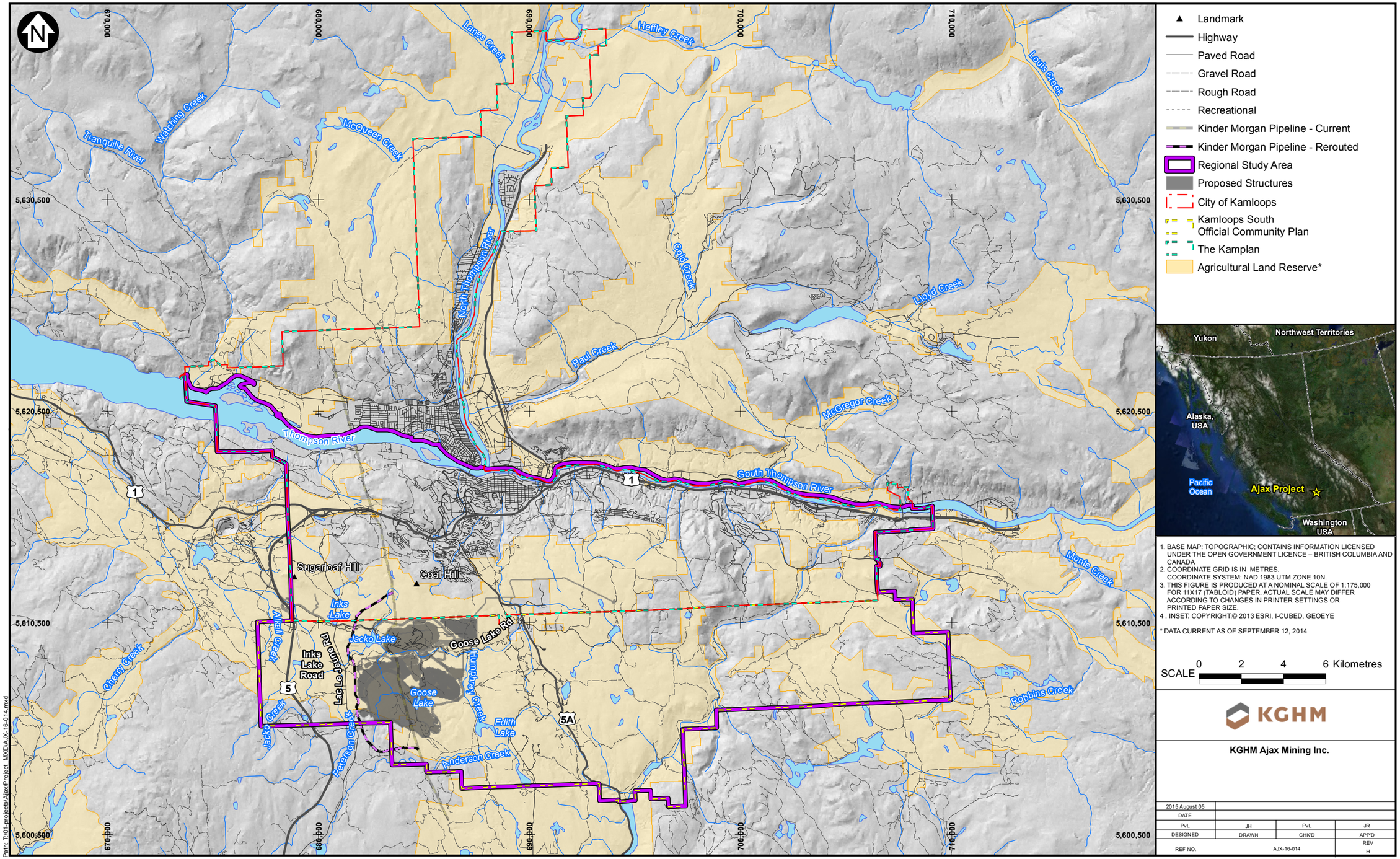
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Figure 8.4-5
Land and Resource Use Regional Study Area

InterGroup CONSULTANTS



1. BASE MAP: TOPOGRAPHIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
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* DATA CURRENT AS OF SEPTEMBER 12, 2014

SCALE 0 2 4 6 Kilometres

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KGHM Ajax Mining Inc.

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8.4.3.3 Administrative Boundaries

Given the Project's proximity to the City boundary, there are numerous administrative considerations with respect to the City's and the TNRD's land use planning processes, in addition to provincial considerations. Table 8.4-2 provides an overview of the plans considered in the characterization of Land and Resources Use, while further information on these plans is provided in Appendix 7.1-A (Socio-economic Baseline). The planning documents identified in Table 8.4-2 are interconnected, e.g., the Aberdeen Area Plan and Travel Smart Plan both reflect the contents and intent of the KAMPLAN.

The land use planning processes were considered in determining the spatial scope of the effects assessment for Land and Resource Use; specifically, the KAMPLAN and Kamloops South OCP, and South Thompson Settlement Strategy were considered in defining the LSA, and the Kamloops LRMP was considered in defining the RSA.

8.4.3.4 Technical Boundaries

Technical boundaries do not influence the assessment.

8.4.4 Potential Effects of the Project and Proposed Mitigation for Land and Resources Use

8.4.4.1 Identifying Potential Effects on Land and Resources Use

Land and Resources Use may be affected through several pathways including:

- The Project or Project activities (e.g., blasting, traffic) may cause physical or environmental changes to the surrounding area, may affect resource use and resource users in proximity to the Project, including changes to the perceived quality of the resource or experience;
- The Project footprint and infrastructure may limit or restrict access to (and use of) some areas; and
- The Project may affect the ability of planning authorities to meet the objectives of community and land/resource management plans in proximity to the Project.

Multiple forms of Land and Resource Use are considered within the assessment, and the extent to which the above pathways will affect those uses will be considered. Table 8.4-4 provides an interaction matrix that describes the likely overlaps between the Project and various Land and Resources Use. Note that for most Land and Resource Use activities, it is not a single Project component or activity that affects the VC, but rather an aggregate of multiple components/activities that are likely to affect Land and Resource Use. Each type of Land and Resource Use, or individual resource users within the same grouping (e.g., ranchers), will not be affected identically. As such, the description of potential effects to Land and Resource Use is organized first by type, followed by a description of individuals/groups who are most likely to be affected by Project components or activities, and then a discussion of other potential broader effects.

Additional detail regarding potential interactions is provided in Section 6.3.4.1 (Surface Water Quality), Section 6.4.4.1 (Surface Water Quantity), Section 6.5.4.1 (Groundwater Quality), Section 6.6.4.1 (Groundwater Quantity), Section 10.1.4.1 (Identifying Potential Effects on Air Quality), Section 10.5.4.1 (Identifying Potential Effects on Noise and Vibration). Other sections of the Application/EIS will be referenced where appropriate.

As shown in Table 8.4-3, potential effects on Land and Resource Use are identified in relation to land use planning (and the objectives set by land and resource management plans and designations in the vicinity of the Project), and ranching (as the primary land use in the vicinity of the Project).

Potential effects on Land and Resource Use such as forestry and mining were also considered. There are no overlaps with the Project or Project activities identified as there are currently no forestry or mining activities or tenures overlapping the Project. As described in the Socio-economic Baseline (Appendix 7.1-A), there are existing mining claims in the vicinity of the Project. With regards to forestry, there are harvestable timber resources between Inks Lake and Highway 5, although the LSA has low potential for forestry activity. Overall forestry in the RSA is declining due to a combination of economic factors and the mountain pine beetle infestation (see Appendix 7.1-A, Socio-economic Baseline).

With respect to parks and protected areas, there is no spatial overlap with the Project identified in the Kamloops South OCP and no provincial parks or protected areas in the LSA (Table 8.4-4); no potential effects on these features are identified.

8.4.4.2 Effects on Land and Resource Use

There are several ways in which the Project could potentially affect Land and Resource Use. Each of the potential effects, including those related to other VCs, is described below.

Table 8.4-4. Identifying Potential Project Interactions and Effects on Land and Resource Use

Project Components/Physical Activities		Potential Effects on Land and Resource Use		
		Limited Ability to Meet Land Use Planning Objectives	Change to Current Ranching Practices	Changes to Other Land Use Designations (e.g., forestry and mining)
Construction	Clearing and Grubbing	M	M	L
	Earthworks	M	M	L
	Overburden/Topsoil Stockpile	M	M	L
	Laydown Areas and Storage Yards	M	M	L
	Project Lighting	M	M	L
	Site Security and Fencing	M	M	L
	Fuel Storage and Filling Area	M	M	L
	Hazardous Wastes Transport, Storage, and Disposal	M	M	L
	Construction Wastes Transport, Storage, and	M	M	L

Project Components/Physical Activities		Potential Effects on Land and Resource Use		
		Limited Ability to Meet Land Use Planning Objectives	Change to Current Ranching Practices	Changes to Other Land Use Designations (e.g., forestry and mining)
	Disposal			
	Sewage Infrastructure and Disposal	M	M	L
	Public Road Realignment, Use, and Maintenance	M	M	L
	Site Road Construction, Use and Maintenance	M	M	L
	Haul Truck Road Construction, Use, and Maintenance	M	M	L
	Site Buildings and Process Plant	M	M	L
	Explosives Magazine and Storage Facilities	M	M	L
	Open Pit Development	M	M	L
	Drilling and Blasting	M	M	L
	Crushing Mine Rock	M	M	L
	Loading, Hauling, and Deposition of Mine Rock	M	M	L
	Temporary Ore Stockpile	M	M	L
	Tailing Storage Facility Development	M	M	L
	Power Transmission, Distribution	M	M	L
	Natural Gas Line	M	M	L
	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	M	M	L
	Water Intake from Kamloops Lake	M	M	L
	Fire Suppression Infrastructure	M	M	L
	Contact Water	M	M	L
	Non-contact Water	M	M	L
	Haul Truck Road	M	M	L
	Water Management Dams	M	M	L
	Mine Staffing (Direct Employment)	M	M	L
	Contracted Employment	M	M	L
	Taxation	O	O	O
Operation	Open Pit Development	M	M	L
	Drilling and Blasting	M	M	L
	Hauling Mine Rock and Ore from Pit	M	M	L
	Crushing and Conveying Ore	M	M	L
	Temporary Ore Stockpile	M	M	L
	Development of Mine Rock Management Facilities	M	M	L
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	M	M	L
	Revegetation through Progressive Reclamation	M	M	L
	Process Plant Operation	M	M	L

Project Components/Physical Activities		Potential Effects on Land and Resource Use		
		Limited Ability to Meet Land Use Planning Objectives	Change to Current Ranching Practices	Changes to Other Land Use Designations (e.g., forestry and mining)
	Deposition to Tailing Storage Facility	M	M	L
	Site Road Use and Maintenance (Materials, Personnel, Supplies)	M	M	L
	Concentrate Transport and Storage	M	M	L
	Explosives Magazine and Storage Facilities	M	M	L
	Fire Suppression Infrastructure	M	M	L
	Fuel Storage and Filling Area	M	M	L
	Hazardous Wastes Transport, Storage, and Disposal	M	M	L
	General Wastes Transport, Storage, and Disposal	M	M	L
	Sewage Infrastructure and Disposal	M	M	L
	Laydown Areas and Storage Yards	M	M	L
	Power Transmission, Distribution	M	M	L
	Project Lighting	M	M	L
	Site Access, Security and Fencing	M	M	L
	Water Intake from Kamloops Lake	M	M	L
	Contact Water	M	M	L
	Non-contact Water	M	M	L
	Potable Water Treatment and Use	M	M	L
	Haul Truck Road	M	M	L
	Mine Staffing (Direct Employment)	M	M	L
	Contracted Employment	M	M	L
	Taxation	O	O	O
Decommissioning and Closure	Dismantling of Ancillary Buildings	M	M	O
	Pit Lake Planning	M	M	O
	Site Road/Bridge Decommissioning	M	M	O
	Tailing Storage Facility Decommissioning and Reclamation	M	M	O
	Mine Rock Management Facilities Reclamation	M	M	O
	Fuel Storage and Filling Area	M	M	O
	Hazardous Wastes Transport, Storage, and Disposal	M	M	O
	General Wastes Transport, Storage, and Disposal	M	M	O
	Sewage Infrastructure and Disposal	M	M	O
	Laydown Areas and Storage Yards	M	M	O
	Power Transmission, Distribution	M	M	O

Project Components/Physical Activities		Potential Effects on Land and Resource Use		
		Limited Ability to Meet Land Use Planning Objectives	Change to Current Ranching Practices	Changes to Other Land Use Designations (e.g., forestry and mining)
	Project Lighting	M	M	O
	Site Access, Security and Fencing	M	M	O
	Contact Water	M	M	O
	Non-contact Water	M	M	O
	Potable Water Treatment and Use	M	M	O
	Haul Truck Road	M	M	O
	Road use to the Project (Materials, Personnel, Supplies)	M	M	O
	Mine Staffing (Direct Employment)	M	M	O
	Contracted Employment	M	M	O
	Taxation	O	O	O
Post Closure	General Site Inspections and Maintenance	L	L	O
	Contact Water	L	L	O
	Non-contact Water	L	L	O
	Road use to the Project (Materials, Personnel, Supplies)	L	L	O
	Mine Staffing (Direct Employment)	L	L	O
	Contracted Employment	L	L	O

Notes:

O	*No interaction anticipated.*
L	*Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
M	*Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*
H	*Key interaction; warrants further consideration.*

Limited Ability to meet Land Use Planning Objectives

The City of Kamloops, TNRD, and the Province have undertaken land use planning processes, including those identified in Table 8.4-1. Each of these plans was reviewed with respect to potential overlap of the plan areas or objectives with the Project or Project activities. This exercise identified the ways in which various Project components or activities could overlap with the spirit or intent of each of the various plans. In addition, review of the documents and discussion with stakeholders from Kamloops and TNRD also identified several key themes where the Project could present challenges to achieving the objectives of those plans.

The key themes that emerged from the review of planning documents/processes are discussed in further detail in the sections that follow:

- Projected population growth and need for associated infrastructure/housing;
- Overlap with specific land use designations (including the ALR Rural Resources; Agricultural Land Reserve); and
- Changes (real or perceived) to the quality of land uses.

Population Growth Strategy

The Project will contribute to population growth in Kamloops and the TNRD as new employment opportunities attract temporary skilled workers during the Construction Phase and permanent workers and service suppliers during the Operations Phase. This economic activity and the expected increase in population will advance the time when infrastructure investment will be required to support the increased population. When the Project completes the Operations, Decommissioning and Closure Phases, the decrease in economic activity may impact municipal and regional planning and expenditures as the population growth rate slows.

The City and the TNRD have collaborated on a regional growth strategy that provides a framework for coordinating efficient land use, facilities, services, finances and resources. This provides both organizations opportunity to coordinate on human settlement, transportation, economic development, energy, economic development, environmental protection, open space, and cultural heritage issues (City of Kamloops 2008). Within this collaborative process, the KAMPLAN and other local/regional plans, including TravelSmart, have projected growth in the municipality and surrounding areas over the coming decades. The KAMPLAN (2004) assumed a growth rate of 1.25% annually, meaning that by 2021 there could be approximately 100,000 residents, and 120,000 residents by 2036. All planning-related activities have proceeded under the assumption that such growth is likely.

The KAMPLAN predicts that population growth to 100,000 residents can be accommodated within existing infrastructure as there is sufficient land zoned within the current footprint of the City and the necessary infrastructure is available. An increase in population to 120,000 residents will require additional investment and planning for new infrastructure and this would likely include expansion to the south and encroachment on the southern growth boundary for Kamloops. Growth strategies for a population of 120,000 considered the need for investment in the road networks, as a factor of both the financial requirements and overall traffic congestion throughout the City (City of Kamloops 2008); these were also considered in the TravelSmart Plan (City of Kamloops 1999). These concerns resulted in a recommendation that growth in the southwest sector of Kamloops best balanced the needs of a growing Kamloops with the additional infrastructure requirements.

Aligned with the KAMPLAN (and also developed by the City of Kamloops), the Aberdeen Area Plan specifically covers the southwest sector of the City, bounded by the TransCanada Highway in the north, Highway 5A in the east, the Versatile Industrial Park in the west, and the municipal boundary to the south (True Consulting Group 2008; see Figure 8.4-2 for plan boundaries). There are currently no plans for development of land up to the municipal boundary, and areas currently zoned for residential development (including future developments) are approximately 1.1 km from the Project. South of the municipal boundary, land use planning is addressed in the Kamloops South OCP, which includes the proposed Project (TNRD 2011c).

The City of Kamloops has focused considerable effort and resources on planning for the southwest sector, and has expressed concern that an inability to pursue this growth strategy as envisioned would present challenges to its ability to accommodate growth beyond 2036 when, based on KAMPLAN growth estimates, the population reaches 120,000. Alternative options for the development of the necessary infrastructure and services to accommodate residential, commercial, and industrial development have not been fully explored, as the southwest sector has consistently been identified in studies and planning processes as the preferred location. The uncertainties associated with the likely rate and timing of population growth, contribution of the Project to population growth, and overall uncertainties associated with the Project and Project activities with respect to the desirability of the southwest sector for residential use, have contributed to the City's concerns about Project development. The Aberdeen neighbourhood is currently considered an "executive" neighbourhood, and concerns about noise and vibration, viewshed, property values, and air quality during both the Construction and Operations phases were identified as concerns during Project consultation. The City of Kamloops also raised concerns around the Coal Hill reservoir located on the south side of Coal Hill, and concerns about structure stability due to vibration during both Project Construction and Operations phases.

The effects assessment for these VCs (see discussion in Section 10.5 [Noise and Vibration], Section 7.5 [Property Values], and Section 10.1 [Air Quality]) conclude that there are no significant adverse effects outside of the Project area; however, perceptions related to a neighbourhood's (such as Aberdeen) proximity to the Project may still influence development in the future. More detailed discussion of the relationship of residential, commercial, and agricultural property value with the Project is considered in Section 7.5 (Property Values). A broad range of variables contribute to a changes in property values, including developer decisions, marketability of new neighbourhoods (in the southwest or in other parts of the city), and the potential for mine-related nuisance factors (e.g., dust, noise). Regardless of whether actual environmental changes arise (e.g., effects on air quality, noise), perception is also an important factor and the extent of the role that perceptions will play in future development is uncertain, particularly as the overall Construction, Operations, and Decommissioning and Closure phases of the Project occur over a 30-year period.

There are limited examples of similarly sized mining operations in proximity to residential developments to draw upon for comparison. The Project site was previously an operating mine (Ajax) in similar proximity to Kamloops, although at a different scale. The Kennecott Mine in Utah provides one example where substantial growth in the surrounding areas resulted in opportunities for residential development. The resulting community of Daybreak, located on remediated mining lands, provides an example of where industrial sites and communities can co-exist in close proximity. The Kennecott mine example also reinforces the notion that interactions between local stakeholders and project proponents work towards allowing "communities [to] develop in ways that are consistent with their own vision" (MMSD 2002).

The City is currently updating the KAMPLAN, in addition to a Master Traffic Plan. The updated KAMPLAN will consider two scenarios: one in which the Project is approved and moves ahead, and another without the Project. With the Project and the potential for in-migrating workers with relatively good salaries, the City still expects that growth will occur in the southwest sector of the Kamloops. City of Kamloops officials are considering how development in the southwest sector of

the City might proceed in the future, noting that development may not occur in a way consistent with the previous KAMPLAN assumptions. The Kamloops South OCP also has designated residential designations (e.g., country residential and mobile home park) in the vicinity of Knutsford that may need to be reconsidered if growth pressure exceeds planning objectives. KAM is committed to ongoing dialogue with the City of Kamloops and the TNRD throughout the life of the Project.

Specific Land Use Designations

The Project overlaps with areas that have specific land use designations. Initial consultation with the City of Kamloops and the TNRD identified potential concerns regarding municipal land uses, and resulted in a revised General Arrangement (GA) so that a majority of the Project footprint features would not be within the City of Kamloops boundaries. As a result of this change to the design of the Project, potential adverse effects specific to municipal land use designations are not expected (and potential effects on the City's growth strategy and related goals/plans are described separately, above). As such, only provincial and TNRD land use designations are considered within this discussion.

As described in Section 8.4.2.3, several provincial and TRND plans are relevant to the Project. Plans and policies with specific land use designations overlapping Project infrastructure or activities, along with the responsible jurisdiction (i.e., the TNRD or the Province), are summarized in Table 8.4-5.

The *Mineral Tenure Act* (specifically, Sections 11, 14, and 15) takes precedence over other land use designations (with the exception of lands designated as parks and protected areas under provincial legislation). The identified plans in Table 8.4-5 acknowledge this while also stressing the need to work with mining interests to acknowledge and accomplish the goals of the individual plans. Although the above plans may not prevent the development of the Project, the Project may affect the integrity or achievement of plan objectives and designated land uses, and these effects will be assessed.

During the Construction Phase, a demand for facilities to accommodate non-local workers may place pressure on the TNRD to consider zoning additional areas for residential development. As stated in Section 8.1, prior to the start of construction, KAM will discuss potential accommodation requirements with relevant construction contractors and develop a Construction Phase Workforce Accommodation Plan. During the Operations Phase, increased permanent employment may increase pressure on the municipal and regional district staff to revisit existing development plans and designations.

Quality of Land Use Activities

Land use planning documentation often recognizes the qualitative factors that are inherent in different land use activities, including considerations for visual quality (i.e., views), environmental integrity, and peace and quiet. The plans encompass numerous types of land uses, including residential, agricultural, and recreational, each of which may have different qualitative needs. The planning exercises undertaken by the Province, TNRD, and the City of Kamloops mirror the overarching desire to balance development while maintaining and encouraging different land uses that are reflective of the region's history and plans for moving into the future.

Table 8.4-5. Land Use Designations Overlapping the Project

Plan/Policy	Jurisdiction	Land Use Designation or Zone
Agricultural Land Reserve	Provincial (BC)	The Project falls within the ALR. The ALR is a provincially designated zone in which agriculture is recognized as the priority use. Non-agricultural land use is subject to permit application and approval.
Kamloops LRMP	Provincial (BC)	The Project falls within an area designated as a general resource management zone. This designation allows for mining and mineral development, and new mining industry opportunities are encouraged. The Project's location within the ALR is also acknowledged.
Lakeshore Development Guidelines	Regional (TNRD)	The Project overlaps with lakes identified in the guidelines. Jacko Lake is classified as a "critical" and "special use" lake. Goose Lake is classified as a "special use" lake. Edith Lake is classified a "natural environment" lake. Classifications are based on the physical features of the lake. The guidelines are intended to manage residential development and do not address mining.
Kamloops South OCP	Regional (TNRD)	The Project overlaps with areas zoned for agricultural and rural resources use and is close to areas zoned for country residential, mobile home, and recreational.
South Thompson Settlement Strategy (STSS)	Regional (TNRD)	The STSS is focused on the long term planning policy to balance anticipated settlement pressures in the South Thompson valley, accommodate growth, services, and environmental stewardship. The Project is located at the western edge of the STSS.
Zoning Bylaw 2400	Regional (TNRD)	The Project falls in an area zoned as Agriculture/Forest 1(AF-1). The purpose of this zone is to permit activities associated with a broad range of agricultural, forestry, recreational, and resource uses.

Real or perceived changes to the quality of land use in proximity to the Project stems from the concept that mining or industrial development is incompatible with other types of land use, as these activities can disrupt views, generate noise and dust, and affect other environmental qualities. This is consistent with land use planning processes such as the KAMPLAN, which zones areas for heavy industrial use close to transportation corridors and away from urban and suburban development, and limits medium and light industrial uses to specific areas. While not overlapping with the Project, the Kamloops AAP identifies agricultural areas within Kamloops that border the Project area and includes in its objectives an agricultural edge strategy to encourage complementary development of the urban-rural edge.

The regional growth strategy and other planning documents and processes (e.g., Sustainable Kamloops Plan) have been developed by the City and TNRD to acknowledge and address the need to coordinate efficient land uses and encourage a variety of land use choices and quality of life attributes, while ensuring the environment and natural amenities. The Project may affect the quality of land use activities, including designated residential areas, through the generation of noise, dust, and other disturbances, and therefore may affect the integrity of plan objectives and community/land use planning processes (e.g., Sustainable Kamloops Plan objective of reduced greenhouse gas emissions). It is expected that Construction Phase activities will generate the most disturbances, particularly with the intensity of activity in a comparatively brief period of time. Effects are also expected to be present during the Operations Phase as activity levels, while reduced,

will generate noise, dust, and other disturbances. The Decommissioning and Closure Phase is expected to generate fewer disturbances that may adversely affect the integrity of plan objectives and planning processes.

The assessment of the potential effects of the Project concluded that effects for noise and vibration (Section 10.5) and air quality (Section 10.1) are not anticipated to be not significant following mitigation. There is some potential for local perceptions of Project effects to be influenced in neighbourhoods near to the Project (such as Aberdeen). KAM is committed continued dialogue with the City of Kamloops and TNRD to address local concerns and interests.

Changes to Ranching Practices

Effects to ranching are expected to primarily affect activities at Sugarloaf Ranch, which is owned by KAM. However, other ranchers who use parts of certain fields for short periods throughout the annual cycle of ranching activities, or cross potentially affected areas to access other grazing locations may also be affected by the Project. Discussions with Sugarloaf Ranch have indicated that sufficient lands are available, outside of the Project Footprint, to sustain cattle operations going forward.

Ranching activities, including cattle grazing on Crown and private land, currently occur in the location of the proposed Mine Site and are expected to be affected by the physical presence of the Project and through various Project activities. Ranching activities may be affected through changes in dust, noise and vibration, physical access to grazing fields, and access to sufficient water quantities to support ranching operations. KAM will implement mitigation measures to reduce and manage these environmental effects (Section 8.4.4.3). The nature and extent of these effects is anticipated to change as the Project moves from Construction through to Operations and the Decommissioning and Closure phases. To the extent practical and safe to do so, KAM intends to encourage continued ranching activities in the vicinity of the Project, subject to safety and access restrictions, and is committed to working with affected ranchers to understand their annual use of the area.

There are no regulatory requirements for the movement of livestock on private land or between privately-owned lands. Movement of livestock from one location to another is typically accommodated through informal agreements between ranchers and landowners. Access to Fields for Grazing, Travel, and Other Activities

Access to and use of fields will be affected throughout the life of the Project. In general, access will be restricted to eight fields during the Construction and Operations phases. Once the Project activity affecting access to a field have been completed, access will be restored and where feasible, the use of fields for grazing and other purposes will also be restored following progressive reclamation activities. All fields within the Project Footprint will be unavailable until after final reclamation. Some areas associated with specific Project features (open pit) will not be returned to agricultural use while other features (Mine Rock Storage Facility (MRSF), Tailing Storage Facility (TSF)) will be reclaimed for agricultural use. Fields located outside of the Project area will remain in active use throughout the Project phases. Access to certain fields may also change during the Construction and Operations phases as Project activities require changes to access. Table 8.4-6 describes the changes to field use over the phases of the Project and, for reference, Figure 8.4-3 illustrates the identified fields in relation to the LSA.

Table 8.4-6. Predicted Effects on Field Use for Ranching

Field Name	Project Phase				Description of Use and Effect
	C	O	DC	PC	
Hay Fields	x				Used for grazing between March and May. Construction of the new interchange at Inks Lake Road and Hwy 5 and the water line from Kamloops Lake could affect ranching activities in the first year of construction, if construction occurs between March and May. After construction of the interchange is complete, use of the Hay Fields will return to baseline and no further impact is expected.
Crescent Field	x				Crescent Field is approximately 6 km northwest of the Project, on the western side of Highway 5. Small portion of the field is expected to be impacted during construction and closure associated with water line construction and decommissioning.
Pothook Field	x				Used for grazing between March and May. Construction of the new interchange at Inks Lake Road and Hwy 5 and the water line from Kamloops Lake could affect ranching activities in the first year of construction, if construction occurs between March and May. After construction of the interchange is complete, use of the Pothook Field will return to baseline and no further impact is expected.
Haul Road Field	x				Used for grazing between March and May. Construction of the new interchange at Inks Lake Road and Hwy 5 and the water line from Kamloops Lake could affect ranching activities in the first year of construction, if construction occurs between March and May. After construction of the interchange is complete, use of the Haul Road Field will return to baseline and no further impact is expected.
Sugarloaf Field					Sugarloaf Field is approximately 5 km north west of the Project. No impact is expected.
Russell Slough Field					Russell Slough Field is approximately 6 km northwest of the Project, on the western side of Highway 5. No impact is expected.
Beef Pasture					Beef Pasture is approximately 4 km west of the Project, on the western side of Highway 5. No impact is expected.

Field Name	Project Phase				Description of Use and Effect
	C	O	DC	PC	
Jacko Lake Field	x	x	x		Parts of Jacko Lake Field will be affected by Mine Site construction activities and will be unsuitable for grazing. During the Operations Phase, the presence of Project infrastructure and activities will continue to render parts of the field unsuitable for grazing. These areas will remain unsuitable for grazing during the Decommissioning and Closure Phase, which includes progressive reclamation activities. During the Post Closure Phase, the affected parts of the field will have been reclaimed and re-vegetated, resulting in the renewed ability to use the field for grazing purposes
Katie's Field*					Katie's Field is located less than 1 km immediately west of the Project. No impact is expected.
Vic Field	x	x	x	x	Vic Field will become part of the tailings storage facility and will no longer be available or accessible. This change will be permanent through the Construction, Operations, Decommissioning and Closure, and Post Closure phases. This field is currently used for branding in the spring and summer. Once the area is reclaimed it will be available for grazing.
Holding Fields	x	x	x		A small portion of the Holding Fields will become a permanent part of the tailings storage facility throughout the Construction, Operations, and Decommissioning and Closure phases. However, use of the remainder of the field by cattle moving to summer range areas will continue. In the Post Closure Phase, it is expected that the majority of the field will again be available for use, and no impact is expected.
Collection Field/Gravel pit/Watson Field					Collection Field, Gravel Pit, and Watson Field are all located approximately 1 to 2 km immediately west of the Project and east of Hwy 5. No impact is expected.
Jacko Lake Meadows	x	x	x		A small part of the east end of Jacko Lake Meadows will be affected by activities during the Construction, Operations, and Decommissioning and Closure phases. This area will not be available for grazing, which currently occurs between spring and early winter. The area will be reclaimed and it is expected that the entire meadow will be available for use in the Post Closure Phase.
Old Place Field*					Old Place Field is located approximately 9 km northwest of the Project and west of Highway 5. No impact is expected.
Peterson Creek Field	x	x	x	x	Peterson Creek Field is currently used for water access and summer breeding. Peterson Creek Field will become part of the open pit and other infrastructure and will no longer be available or accessible. This change will be permanent through the Construction, Operations, Decommissioning and Closure, and Post Closure phases.

Field Name	Project Phase				Description of Use and Effect
	C	O	DC	PC	
Red Lake Field	x	x	x	x	Red Lake Field will become part of the South MRSF and will no longer be available or accessible. This change will be permanent through the Construction, Operations, Decommissioning and Closure, and Post Closure phases. This field is currently used for calf/cow pairing in the spring.
Roger's Corridor	x	x	x	x	The Roger's Corridor field will become part of the open pit and will no longer be available or accessible. This change will be permanent through the Construction, Operations, Decommissioning and Closure, and Post Closure phases. This field is currently used for summer breeding.
Webber Meadows*					Webber Meadows is located approximately 1 km north of the Project. No impact is expected.
Back Field*					Back Field is located approximately 6 km west of the Project. No impact is expected.
Enterprise Field*	x	x	x		A small portion of Enterprise Field will be used for the Plant facility during the Construction, Operations, and Decommissioning and Closure phases. This field is occasionally used for replacement heifers. During the Decommissioning and Closure Phase, the affected area will be reclaimed and will be available for ranching use in the Post Closure Phase.
Front Field	x	x	x	x	Front Field will be used for the Haul Road and East MRSF during the Construction, Operations, and Decommissioning and Closure phases. This field is occasionally used for yearlings and replacement stock. During the Decommissioning and Closure Phase, parts of this area will be reclaimed and may be available for ranching use in the Post Closure Phase.

Notes:
Project Phases are Construction (C), Operations (O), Decommissioning and Closure (DC), and Post Closure (PC).
"No impact" indicates that the Project is not anticipated to have any effects on current ranching activities.
** Indicates fields where impacts are likely to extend to ranchers other than the Sugarloaf Ranch.*

In addition to access to and from fields within the Project Footprint, seasonal movement of cattle includes use of the local road network to either drive or truck cattle. The closure of the Goose Lake Road will affect how at least one rancher in the area who regularly moves cattle between grazing properties via Goose Lake Road.

The areas that will be most affected are those that will be temporarily or permanently converted to accommodate Project facilities and infrastructure. This includes Vic Field, Peterson Creek Field, Red Lake Field, Roger's Corridor, and Front Field, all of which are used by Sugarloaf Ranch at various points during the year. These areas will not be available for continued or future land use, depending upon the Project facility/infrastructure in place; although, parts of some fields may be decommissioned and reclaimed to a state where future ranching activities could take place. For example, fields that overlap with the TSF and/or MRSF are unlikely to be used in the same way for ranching Post-closure; however, flat surfaces such as the tops of MRSFs will be reclaimed and may be suitable for future grazing.

KAM owns the Sugarloaf Ranch and intends to work with those running the ranch to support continued operation through the reduction or elimination of Project effects and best management measures (e.g., reducing dust, noise). In some cases, where a previously used area is no longer available for use by the ranch, a comparable area suited to the use will be identified within the Sugarloaf property. Overall, the ranch operation and activities are expected to continue as usual, although perhaps at a different location in some instances within the current ranch property.

Fields that overlap with Project roads and infrastructure (such as the Plant Facility and other buildings that will be removed) may be reclaimed and restored for future use. Given that most of these fields are only used for part of the annual ranching cycle, it is most likely that ranching activities will be displaced (or in the case of cattle drives re-routed) as opposed to being discontinued entirely. Sugarloaf Ranch expects that there will be sufficient lands elsewhere within the vicinity to accommodate the current volume of cattle.

Similarly, some fields will be temporarily affected and portions permanently lost due to the development of Project facilities and infrastructure. In these cases, part of the field area will be temporarily or permanently lost, while the remainder of the area will be available for continued use; this includes Jacko Lake Field, Jacko Lake Meadows, Holding Fields, and Enterprise Field, all of which are used primarily by Sugarloaf Ranch, although other ranchers use parts of Enterprise Field for some of the annual cycle of ranching activities. Ranching activities will need to avoid the Project Footprint; however, sufficient land is available elsewhere within the vicinity to accommodate this displacement. Both Jacko Lake and Peterson Creek are used as water sources for cattle (by Sugarloaf Ranch and other ranchers) and access to these water bodies may be impeded by Project activities.

During the Construction Phase only, construction of the new interchange at Inks Lake Road and Highway 5 could affect ranching activities, particularly if construction overlaps with spring activities in the Hay Field, Pothook Field, and Haul Road Field. However, this would be limited to the first year of construction only (see Appendix 8.1-A, Traffic Impact Assessment). The closure of a portion of the Goose Lake Road could also affect access of some current cattle drives and transportation that uses this road.

Twenty-one fields were reviewed to determine the potential effects of the Project on the use of fields for grazing and other agricultural activities. Of the 21, eight fields will experience no effect. An additional four fields are expected to experience some disturbance as a result of Project activities during the Construction Phase only. Another four fields are expected to experience some disturbance during Construction, Operation, and Decommissioning and Closure phases. The remaining four fields may experience some disturbance during all phases of the Project (including Post Closure); however, one of these is used occasionally and the remaining three support agricultural land use that will continue at a different location (Table 8.4-6). KAM has consulted the landowners of all fields that will be affected by the Project.

Health of Cattle

Ranchers have raised concerns that reduction in air quality and increased dust as a result of Project activities could adversely affect cattle and their feed. An Ecological Risk Assessment (ERA) of both Jacko Lake and Peterson Creek areas examined the baseline and forecast concentration of various contaminants on various receptor species including mammals (including mule deer, black bear, moose, and domestic cattle), birds (including Mallard, Canada goose, and heron), and communities of plants and invertebrates representing a range of feeding guilds and trophic levels. Chemicals of potential concern (COPC) included in the assessment were aluminum, antimony, arsenic, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, thallium, and uranium.

Ecological risk was quantified for each receptor species based on the total exposure to COPCs from the environment relative to benchmark toxicological reference values. The change in potential risk to the domestic cattle, American robin, bald eagle, black bears, Canada goose, mallard duck, meadow vole, moose, mule deer, muskrat, red fox, ruffed grouse and snowshoe hare were below the risk threshold. The change in potential health risk to these ecological receptors is negligible. Results of the ERA suggest that the Project related activity is unlikely to result in risk to ecological receptors above applicable threshold levels. See Appendix 10.4-A, Human Health and Ecological Risk Assessment Technical Data Report.

Ranchers have also raised concerns that noise and vibration produced during the Construction and Operations phases could affect the well-being of cattle. Project components that will have noise emissions include stationary equipment within plant facilities, haul road and access road traffic, mobile equipment activities, and construction works. Modelling of noise and vibration has focused on the potential effects on humans using 28 receptor locations, which include residences and schools within Kamloops, as well as specific locations in proximity to the Project (e.g., Jacko Lake, Inks Lake, Upper Peterson Creek).

The vibration assessment looks at blast-induced ground and air vibrations' effects on aquatic life, human habitats, and structures (including the Jacko Lake boat launch). Modelling results indicate that both noise and vibration effects will be most noticeable during the Construction Phase and will occur generally within the Project Footprint and mine access road, between the mine site and Inks Lake Interchange. The noise and vibration effects are expected to be below identified threshold limits for humans (see Section 10.5.4.1, Noise and Vibration). Project effects assessment on noise and vibration concluded that any residual adverse effect would be Not Significant (Minor) following

implementation of mitigation measures. As a result, it is unlikely that noise and vibration produced during the Construction and Operations phases of the Project will have an adverse effect on cattle.

Agricultural Water Use

Changes to water quantity in Peterson Creek could affect ranching activities differently throughout the various Project phases. Under average precipitation conditions, the Project may result in reduced annual streamflow volumes in Lower Peterson Creek (below outlet from Jacko Lake) because of reduced surface runoff and reduced base flows. During the Construction and Operations phases, various surface water management ponds, the MRSFs, TSF, and open pit excavation may reduce surface runoff and streamflows in Lower Peterson Creek. Outflows from Jacko Lake will be managed by pumping around the Open Pit and Central Pond but will not be able to simulate existing lake spillway flows given constraints with capacity. The water table in the Open Pit will be lowered due to dewatering throughout the Operations Phase, and the footprint of the Project will reduce the watershed area of Peterson Creek (Lower). As a result, the Project is expected to reduce peak flows in (Lower) Peterson Creek.

During the Decommissioning and Closure, and Post Closure phases, the MSRFs and other facilities will be reclaimed. Peterson Creek (Lower) surface runoff from the reclaimed MRSFs will be captured in evaporation ponds, potentially reducing streamflows in (Lower) Peterson Creek available for agricultural use.

8.4.4.3 Mitigation Measures for Land and Resource Use

Mitigation measures related to the Land and Resource Use VC are a combination of measures proposed by other disciplines to minimize those effects and mitigations directly related to the Land and Resource Use activities and areas discussed in Section 8.4.4.2. Measures implemented by other disciplines to mitigate potential adverse effects will similarly reduce associated effects on Land and Resource Use activities.

- **Air Quality:** Mitigation measures include Project design components (conveyor from crusher to plant will be covered with an arch cover to reduce dust generation, construct a cover over the coarse ore and fine ore stockpiles, install dust collectors (baghouses) for the coarse ore reclaim area) and Project Operation components (watering haul roads surfaces). A detailed discussion of mitigation measures for air quality can be found in Section 10.1 (Air Quality) and the Air Quality and Dust Control Plan can be found in Section 11.6.
- **Noise and Vibration**: Mitigation measures include project design components (conveyor from crusher to plant will be covered with an arch cover to reduce noise emissions, enclose heavy equipment inside buildings away from Kamloops, adapt blast designs to minimize vibration) and project operation components (conduct piling activities only during daytime period, develop a noise and vibration management plan, optimize blasting activities). A detailed discussion of mitigation measures for noise and vibration can be found in Section 10.4 (Human Health) and the Noise and Vibration Management Plan can be found in Section 11.22.
- **Water Quantity:** Mitigation measures focus on the development of a Water Management Plan (WMP) which describes a range of mitigation measures to reduce or eliminate the

potential effects of the Project on surface water quantity, including collecting and reusing contact water in the Process Plant. A detailed discussion of mitigation measures for water quantity can be found in Section 10.6 (Healthy Living and Health Education) and the Water Management Plan can be found in Section 11.6.

- **Traffic:** The Traffic Impact Assessment relates to construction of infrastructure only and does not address issues with ranching or field access through the Project property. The Traffic Impact Assessment is included in Appendix 8.1-A (Traffic Impact Assessment) and additional mitigation for traffic is included in the Access Management Plan found in Section 11.21 and the Transportation Management Plan in Section 11.20.

Mitigation for Land Use Planning

Potential effects on land use planning are: 1) potential changes to the City of Kamloops and TNRD growth strategy; 2) changes to land use designations; and 3) changes to the quality of land use activities. KAM revised the Project configuration such that the majority of the Project Footprint now lies south of the municipal city boundary and farther away from the proposed City growth boundary neighbourhoods targeted for expansion (e.g., Aberdeen, Pineview Valley). The design of the stack TSF has also been changed from a 'dry' facility to a conventional 'wet' TSF. This will reduce effects on residences and mitigate concerns regarding dust and other nuisance factors associated with a dry stack facility.

In the context of the proposed GA and the Project's use of land to accommodate Project components and activities, land uses designated by regional and provincial planning processes will be adjusted to accommodate the mine's activities. These amendments will be made in accordance with formal processes and in consultation with the relevant agencies.

Although changes to the Project location and design will mitigate potential implications for the City's growth strategy, as well as reduce nuisance factors that can alter the quality of land use activities, potential effects may still occur. KAM is committed continued dialogue between KAM and the City of Kamloops and TNRD throughout the Construction and Operations phases to address the interests and concerns of those affected by the Project.

KAM further intends to facilitate the development of a Community Liaison Group made up of Project stakeholders to provide input into monitoring plans, help monitor activities and results and identify and address community concerns, where feasible, as the Project shifts from licensing to construction and operations. KAM expects that this will also provide opportunities for municipal and regional input into planning for reclamation and closure of the Project. As part of this dialogue, KAM will continue to work directly with the City and TNRD to understand community growth, the linkages between Project phases and activities and the City's prospective expansion. If issues and concerns arise throughout the course of Construction and Operations, KAM is open to discussing adaptive management strategies.

Mitigation for Ranching

KAM is committed to working with Sugarloaf Ranch and other potentially affected ranchers to encourage continued ranching activities in proximity to the Project, so long that the safety of mining

activities and/or the safety of ranching activities are not compromised. To this end, KAM has entered into a series of agreements with various potentially affected ranchers to address aspects such as acquisition of private lands, profit-à-prendre[1] arrangements, and access arrangements.

In addition to these agreements, KAM has developed a site Access Management Plan (AMP), which will address overall access to the site for resource users, including ranchers, during the Construction, Operations, and Decommissioning and Closure phases of the Project. The AMP's primary objective will be to maintain public safety and worker safety, while allowing for continued use and enjoyment of areas in proximity to the Project. The AMP can be found in Section 11.21 and will:

- Identify specific areas and activities likely to be affected by the Project;
- Identify what continued land use will be permitted and where those activities can occur;
- Identify what control measures might be necessary to ensure continued public and worker safety; and
- Commit KAM to timely and on-going communication with affected land and resource users to enable continued use of the area where safe and appropriate to do so.

As a part of the AMP, KAM has committed to engaging with ranchers regularly (at least annually) to understand their plans for ranching activities in proximity to the site, including the timing and nature of those activities. These interactions will include KAM providing updates on the Project's construction and operation, and any changes to the availability of lands for ranching purposes. Upon request, KAM will also provide results of other monitoring programs in order to address any concerns ranchers have regarding things such as air quality, water quantity, noise and vibration.

The sharing of information, by both KAM and the ranchers, will allow for adaptive management if there is variation from the predicted Project effects. This may include developing enhancement measures within KAM's private lands (e.g., clearing areas to permit improved access, developing new water access points) to support ongoing ranching activities. KAM has indicated in meetings to date with potentially affected local ranchers and water licence holders that KAM will work with ranchers to ensure sufficient mitigation measures are present where Project-related adverse effects impact the ability to sustain cattle operations.

8.4.5 Residual Effects and Their Significance

8.4.5.1 Summary of Residual Effects

In regard to potential effects on land planning processes and objectives, residual effects are anticipated following implementation of mitigation measures. Local and regional planning bodies including the City of Kamloops and the TNRD could experience a limited ability to meet land use planning objectives as a result of the Project (as summarized in Table 8.4-7).

[1] Profit-à-prendre refers to a non-possessory interest in land similar to an easement, which gives the holder the right to take natural resources such as petroleum, minerals, timber, and wild game from the land of another.

Table 8.4-7. Summary of Residual Effects on Land and Resource Use Planning

Project Effect	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Limited ability to meet land use planning objectives	All Phases	Presence of Project	The presence of the Project and Project activities may limit the ability of City of Kamloops and TNRD to achieve land use planning goals and objectives, as currently envisioned.	Design changes to project location, environmental mitigations, use of formal processes to amend land designations, Ongoing engagement between KAM, City of Kamloops, and TNRD to discuss potential areas of interaction between Project and planning	Presence of Project may limit the ability of City of Kamloops or the TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development

[1] *"Cause-effect" refers to the relationship between the Project component/physical activity that is causing the change or effect in the condition of the VC.*

The population growth strategy developed by the City and TNRD focuses on planning the expansion of residential development of the southwest sector of the City, including the neighbourhoods closest to the Project such as Aberdeen (City of Kamloops 2004; TNRD 2011b). Although environmental and aesthetic effects on these neighbourhoods (including noise, dust, visual impact) are expected to be minimal, concerns and perceptions about the proximity of the Project may affect the desirability of these neighbourhoods, a key foundation upon which City and TNRD planning objectives are based. In turn, this could affect the ability of the City and TNRD to achieve development planning objectives, as currently envisioned. While the nature of community land use planning is that it can be revisited and adjusted to meet the changing circumstances in the area, the need to alter future plans to expand the Aberdeen neighbourhood, as per the Aberdeen Development Plan, as well as other plans developed by the City and Kamloops and the TNRD suggests the Project could affect the ability of planners to meet established objectives. This could result in a residual effect.

Specific land use designations (e.g., ALR, zoning by-law 2400) can be amended through the defined permitting agency and related processes if required. As such, no residual effects on designations are identified.

Considering the continued availability of land, the development of the AMP, and a strong commitment to ongoing engagement, information sharing, and adaptive management in collaboration with Sugarloaf Ranch and other ranchers, potential effects of the Project on ranching activities are expected to be effectively mitigated. No residual effects on ranching are identified.

8.4.5.2 Criteria for Characterization of Residual Effects

Residual effects are characterized using the following standard criteria: magnitude, duration, frequency, geographic extent, reversibility, resiliency, and ecological/social context. Definitions of these terms for the assessment of Project effects on Land and Resource Use are outlined in Table 8.4-8.

8.4.5.3 Characterization of Residual Effects

Residual effects are expected during Construction and Operations Phases of the Project. These are characterized in Table 8.4-9. There are no established thresholds for characterizing the significance of residual effects on Land and Resource Use related to community land use planning related to population growth and residential development.

Characterization of residual effects is based primarily on review of secondary sources as well as professional judgement. For the potential effect on the City of Kamloops and the TNRD to meet the objectives of various land use planning initiatives, the following ratings were assigned:

- **Magnitude:** The magnitude of effect of these potential changes to Kamloops and the TNRD planning is ranked as medium. This rating is considered conservative as circumstances could differ substantially from the existing planning conditions with the Project. Current planning processes and documents describe a wide range of objectives. While existing processes are expected to resolve potential planning conflicts, the implications of this on municipal and regional planning cannot be effectively defined and a conservative rating is warranted.

Table 8.4-8. Definitions of Characterization Criteria for Residual Effects on Land and Resource Use

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Social Value	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*How far will the effect reach?*	*To what degree is the effect reversible?*	*How resilient is the receiving environment or population?*	*How influential is the effect on the broader socio-economic environment?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change from baseline conditions.	**Short-term:** Effect lasts 1 to 5 years.	**Once:** Effect is confined to one discrete period in time during the life of the Project.	**Local:** Effect extends less than 500 m from infrastructure or activity.	**Reversible Short-term:** Effect can be reversed relatively quickly.	**Low:** The receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.	**Low:** The effect has limited ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**High:** It is highly likely that this effect will occur.	**High:** > 80% confidence. There is a good understanding of the cause-effect relationship and all necessary data are available for the Project area. There is a low degree of uncertainty and variation from the predicted effect is expected to be low.
Minor: Differs from the average value for baseline conditions to a small degree.	**Medium-term:** Effect lasts 6 to 25 years.	**Sporadic:** Effect an effect that occurs at sporadic or intermittent intervals during any phase of the Project.	**Landscape:** Effect is limited to the LSA.	**Reversible Long-term:** Effect can be reversed within 20 years of Post Closure.	**Neutral:** The receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.	**Medium:** The effect has some ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Medium:** This effect is likely, but may not occur.	**Medium:** 50 to 80% confidence. The cause-effect relationships are not fully understood, there are a number of unknown external variables, or data for the Project area are incomplete. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident.
Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation.	**Long-term:** Effect lasts between 26 and 50 years.	**Regular:** Effect occurs on a regular basis during the life span of the Project.	**Regional:** Effect extends across the broader region (RSA)	**Irreversible:** Effect cannot be reversed (i.e., is permanent).	**High:** The receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.	**High:** The effect has moderate ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Low:** This effect is unlikely but could occur.	**Low:** < 50% confidence. The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project area are incomplete. High degree of uncertainty and final results may vary considerably.
Major: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation.	**Far Future:** Effect lasts more than 50 years.	**Continuous:** Effect occurs constantly during the life of the Project.	**Beyond Regional:** Effect extends beyond the regional scale, and may extend across or beyond the province.					

Table 8.4-9. Characterization of Residual Effects, Significance, Likelihood and Confidence on Land and Resource Use

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Social Value		Probability	Confidence
Presence of Project may limit the ability of City of Kamloops and TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development	Medium	Short-term	Regular	Regional	Reversible Short-term	High	High	Not Significant (moderate)	Medium	Medium

- **Duration:** The duration of the effect, the ability to achieve planning objectives and need to revise plans, is expected to be short term, from 1 to 5 years. While the changes to plans and designations may last a longer period, the effects that it may have on both City of Kamloops and the TNRD planning processes is expected to much shorter as both planning agencies have ability to efficiently revisit and amend plans and objectives.
- **Frequency:** The effects on planning are expected to occur regularly but not continuously during the life of the Project, particularly as Project phases change triggering the potential requirement for municipal and regional planning agencies to revisit and amend plan objectives.
- **Geographic Extent:** The geographic extent of this effect is regional as the major drivers of land and resource use are expected to continue to be RSA and LSA-based. Project activities can be expected to influence planning differently within City of Kamloops and the TNRD, but the effects are likely to be felt across the RSA.
- **Reversibility:** The effects are expected to be reversible in the short term. As the Project moves from Construction to Operations, then to Decommissioning and Closure, its presence and activities will change and may require revisions to municipal and regional plans. It is anticipated that both the City of Kamloops and the TNRD, with experienced and proven planning processes and resources, will be able to consider and revise planning objectives efficiently. KAM expects and commits to working with these agencies directly to support these processes if required.
- **Resiliency:** Resiliency associated with the effect is rated as high. Mining has historically been an important economic driver in the LSA and RSA. As such, local and regional governments are adept in considering the role of mining in the region and those mining interests are reflected already in most of the community planning. The KAMPLAN, for example, identifies mining as one of seven key industrial sectors that contributes to the City's economic development strategy.
- **Social Value:** Social value associated with the effect is rated as high. The City of Kamloops and the TNRD are both active and meticulous with respect to community land use planning. The various plans that are assembled are done so with the central KAMPLAN serving as the starting reference point and can be adjusted as required if the Project affects the current plan objectives.

8.4.5.4 Significance of Residual Effects

The residual effect of the Project on the City of Kamloops and TNRD's ability to meet the objectives of various land use planning initiatives is expected to be **Not Significant (Moderate)**. This prediction is considered conservative as existing plans and designations acknowledge the importance and prominence of resource development in the region. KAM will undertake regular engagement with the City of Kamloops and TNRD in order to minimize potential adverse interactions between the Project and City of Kamloops and TNRD community land use planning.

The residual effect is carried forward into the Cumulative Effects Assessment (CEA) and summarized in Table 8.4-10.

Table 8.4-10. Summary of Residual Effects, Mitigation, and Significance on Land and Resource Use

Residual Effects	Project Phase	Mitigation Measures	Significance
Presence of Project may limit the ability of City of Kamloops and TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development	All Phases	Design changes to project location, environmental mitigations, use of formal processes to amend land designations, ongoing engagement between KAM and City of Kamloops and TNRD to discuss potential areas of interaction between Project and planning.	Not Significant (Moderate)

8.4.5.5 Characterization of Likelihood and Confidence

The likelihood of potential adverse effects related to City of Kamloops and the TNRD community land use planning is medium because there are several factors that affect the overall planning documents. With respect to the effect of the Project on land use planning, for example, there is some uncertainty defining the scope of development in the southwest sector. This uncertainty makes it difficult to characterize the potential effect. The confidence in this characterization is rated as medium. No thresholds or standards for measuring these types of effect exist. The priorities of local residents and governments could evolve as well, making it difficult to accurately characterize potential effects until the Project has been operating for some time.

8.4.5.6 Summary of Residual Effects Assessment and Significance

Potential effects on City of Kamloops and TNRD land use planning are expected to be **Not Significant (Moderate)**. KAM will work with the City and the TNRD to minimize potential adverse interactions between the Project and current versions of community land use plans.

8.4.6 Cumulative Effects Assessment

8.4.6.1 Introduction

This section describes the potential incremental effects likely to result from the Project on the environment when the effects are combined with effects from other past, present, or future projects and activities. The intent is to determine whether residual effects of the Project could interact with residual effects of other projects or activities, thereby creating a greater effect on the Land and Resource Use VC.

The residual effects on Land and Resource Use relate to potential adverse effects on Kamloops and the TNRD's ability to meet objectives of various land use planning initiatives. The City of Kamloops and the TNRD acknowledge, within current planning documentation, the role of mining in the local economy. There may be instances during the Project life when land use planning goals and objectives may require reconsideration and revision. KAM will engage the City and TNRD on an ongoing basis to facilitate these processes, where required, with the intent of minimizing potential adverse Project interactions.

In order for another Project or activity to be considered within the CEA, there must be reasonable potential for the Project or activity to result in a residual effect similar to the Project. The Project is anticipated to have one residual effect on the land and resource use VC:

- Presence of Project may limit the ability of City of Kamloops and TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development.

8.4.6.2 Identification of Other Actions that May Affect Land and Resource Use

Chapter 5 (Assessment Methodology) describes the past, present, and reasonably foreseeable projects and activities that could interact with the effects of the Project. These projects are screened against the residual effects of the Project. For the Land and Resource Use VC, the key concern from a cumulative effects perspective is whether these projects or activities may also affect land use planning initiatives and objectives.

8.4.6.3 Interactions between Residual Project Effects and Other Project or Activity Effects

Table 8.4-11 screens the other projects and activities that could interact with the Project's effects on land and resource use. Only potential interactions ranked "M" or "H" are subject to further assessment as potential cumulative effect.

As illustrated in Table 8.4-11, there is some potential for other Projects and activities to also result in a limited ability to meet land use planning objectives, causing an interaction with the residual effects of the Project. The project identified as having a potential interaction with the Project is the Trans Mountain Pipeline (TMPL) Expansion project. Should the TMPL Expansion project be developed, the City of Kamloops and the TNRD may have additional difficulties meeting their land use planning objectives.

Potential interactions with the TMPL Expansion project are ranked as low. The pipeline will be rerouted as it currently runs adjacent to the proposed open pit. The proposed route alignment will run east of Lac Le Jeune Road and west of the General Arrangement (see Figure 8.4-4, Local Study Area). According to the Technical Update No. 2 filed with the National Energy Board by TMPL (2014), the reroute will affect 13 new parcels of land, 11 of which are owned by KAM, one of which is owned by the Crown, and one of which is privately held. At the time of the filing, the private landowner had not raised any concerns about the proposed reroute. KAM will continue to manage land use and activities around the construction of the TMPL if it is approved and constructed.

The construction of the pipeline may result in similar effects to air quality and other environmental changes as for construction of the Ajax Project. However, the short-term nature of the construction period and minimal aesthetic effects following construction mean that this project is unlikely to influence the desirability of neighbourhoods in southwest Kamloops, or affect the ability of the City and TNRD to meet their land use planning objectives.

Finally, the nature of community land use planning is that it can be revisited and adjusted to meet the changing circumstances in the area. Further, both Projects also provide substantial local and regional benefits (see Chapters 7.1, 7.3, and 7.4). As a result, the addition of the Project is not expected to result in a residual cumulative effect and no further consideration warranted.

8.4.6.1 Proposed Mitigation Measures

No mitigation is proposed as cumulative effects are not anticipated.

8.4.6.2 Evaluation of Significance of Residual Cumulative Effects

No residual cumulative effects are anticipated.

8.4.7 Conclusion

The presence of the Project and Project activities could limit the ability of the City of Kamloops and the TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development. Specifically, real or perceived aesthetic changes could influence the desirability of certain neighbourhoods in southwest Kamloops (e.g. Aberdeen) which are targeted for residential development. This could affect the ability of municipal and regional planning department to achieve land use planning objectives as currently defined.

Design changes to project location have reduced the overlap of various plans and designations (specifically within the City of Kamloops). Environmental mitigation of contributing Project-specific activities is expected to remove, reduce or minimize potential overlaps. The Project is not expected to lead to significant environment, aesthetic, or health effects in Aberdeen or other neighbourhoods. KAM has committed to use of formal processes to amend land designations where required and has committed to ongoing engagement between KAM and the City of Kamloops and the TNRD to discuss potential areas of interaction between Project and planning.

Potential effects to ranching activities were considered including effects related to changes in dust, noise and vibration, physical access to grazing fields, and access to sufficient water quantities to support ranching operations. KAM is committed to working with Sugarloaf Ranch and other potentially affected ranchers to encourage continued ranching activities in proximity to the Project, so long as the safety of mining activities and/or the safety of ranching activities are not compromised. No residual effects on ranching are identified.

The Project, in conjunction with other project and activities being developed within the region, is not expected to result in any cumulative effects. Both the City of Kamloops and the TNRD have planning frameworks and processes that reflect the role of resource development in the region. As well, the nature of community land use planning is that it can be adjusted to suit the changing circumstances in the area.

Table 8.4-12 provides a summary of Project residual effects, mitigation and significance for land and resource use. With respect to land use planning, the residual effect is **Not Significant (moderate),** for all Project phases. Key mitigation measures include implementation of Project design and best management practices, complimented by ongoing engagement with the City of Kamloops and the TNRD.

Table 8.4-11. Ranking Potential for Residual Effects to Interact Cumulatively with Effects of Other Human Actions on Land and Resource Use

Residual Effect	Industrial Projects/Activities														Natural Resources and Land Use			Tourism and Commercial Recreation Activities					Community Infrastructure			Transportation						
	Vidette Lake Mine	Afton Mine (Historical)	Iron Mask Mine	Bonaparte Mine	New Afton Mine (New Gold)	Highland Valley Copper Mine (Teck)	Domtar Kamloops Pulp Mill	Tolko-Hefley Creek Plywood and Veneer	LaFarge Cement Plant	Trans Mountain Pipeline System (Kinder Morgan)	Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Harper Creek	Highland Valley Copper – Bethlehem Expansion		Kamloops Forest District	Agriculture	Ranching	Tranquille on the Lake	Lac Le Jeune Resort	Tobiano Golf Course	Recreational Hunting, Fishing, Foraging	Recreational Trails	City of Kamloops Wastewater Management	Water Treatment Centre	City Expansion and Growth	Lac le Jeune Road	Highway 1	Highway 5A	Highway 5 (Coquihalla Highway)	Kamloops Airport	Rail Yards and Lines (CP and CN)
Presence of Project may limit the ability of City of Kamloops and TNRD to meet the objectives of various land use planning initiatives	O	O	O	O	O	O	O	O	O	O	O	O	O		O	O	L	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Notes:

(-)	*No spatial or temporal overlap.*
O	*Spatial or temporal overlap, but no interaction anticipated OR No change from current condition anticipated, and already captured as part of baseline characterization. No further consideration warranted.*
L	*Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
M	*Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*
H	*Key interaction; warrants further consideration.*

Table 8.4-12. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Land and Resource Use

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Presence of Project may limit the ability of City of Kamloops and TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development	All	Design changes to project location, environmental mitigations, use of formal processes to amend land designations, ongoing engagement between KAM and City of Kamloops and TNRD to discuss potential areas of interaction between Project and planning.	Not Significant (Moderate)	No residual cumulative effect

8.5 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

This section assesses the potential effects of the Ajax Project (Project) on the Current Use of Lands and Resources for Traditional Purposes (CULRTP) by Aboriginal Groups during the Construction, Operation, Decommissioning and Closure, and Post-Closure phases. For the purposes of the assessment, "current use" refers to how the lands and resources are being used at the time of the assessment in relation to the proposed project's lifecycle (pre-construction, Construction, Operation, Decommissioning and Closure). This includes uses by Aboriginal peoples that are currently being carried out and future uses that are certain or reasonably foreseeable (e.g., that may not be actively carried out at the time of the assessment but they have a known cyclical pattern). Furthermore, uses that may have ceased due to external factors will also be considered if they can reasonably be expected to resume once conditions change (pers. communication with CEA Agency, 2015). In applying this definition, a conservative approach was utilized and evidence of some past uses within one generation (25 years) was considered as current use.

The assessment draws on conclusions from several other Valued Components (VCs) in the Application/EIS related to potential Project interactions with CULRTP. These include:

- surface water quality and quantity (Sections 6.3 and 6.4);
- fish populations and fish habitat (Section 6.7);
- vegetation VCs including rare and sensitive ecological communities (Section 6.9) and grasslands (Section 6.10);
- wildlife VCs including, but not limited to, non-migratory gamebirds (Section 6.16) and mammals (Section 6.17);
- social VCs including, but not limited to, land and resource use (Section 8.4) and the supporting topic – Jacko Lake (Section 8.7);
- archaeological resources and heritage sites (Sections 9.1 and 9.2); and
- health VCs, including, but not limited to, country foods (Section 10.3), human health (Section 10.4), noise and vibration (Section 10.5), and community health and well-being (Section 10.7).

Additional information with respect to Aboriginal Groups can be found in the following Application/EIS sections:

- Chapter 12, Background and Aboriginal Groups Settings;
- Chapter 13, Aboriginal Interests (Rights and Title);
- Chapter 14, Other Potential Effects on Aboriginal Interests;
- Chapter 15, Procedural Aspects of Aboriginal Consultation; and
- Chapter 16, Summary.

The BC EAO section 11 Order (issued on January 11, 2012) and the section 13 Order (issued July 23, 2015) for the Project identified the following Aboriginal Groups with asserted interests that could potentially be affected by the Project:

- Tk'emlúps te Secwépemc (TteS) and Skeetchestn Indian Band (SIB), jointly known as the Stk'emlupsemc te Secwépemc Nation (SSN);
- Lower Nicola Indian Band (LNIB) located in nearby Merritt and a part of the Nlaka'pamux Nation;
- Ashcroft Indian Band (AIB) located close to the Town of Ashcroft and part of the Nlaka'pamux Nation; and
- The Whispering Pines/Clinton Indian Band (WP/CIB), part of the Secwépemc Nation.

In addition to the Aboriginal Groups identified above, the Canadian Environmental Assessment Agency (CEA Agency) directed KAM to engage with and collect information from the Metis Nation British Columbia (MNBC) which may also be affected by the Project.

8.5.1 Rationale for Selection of VC

CULRTP was selected as a VC in recognition of asserted Aboriginal rights to hunt, trap, fish, gather resources and other uses of the lands for traditional purposes, also affirmed in section 35(1) of the Constitution.

In addition, the VC was selected to fulfill regulatory requirements. One of the purposes of the former *Canadian Environmental Assessment Act* (former Act), per section 4(1)(b.3), is to promote cooperation and communication between responsible authorities and Aboriginal peoples with respect to the environment. Under section 2 of the former Act an environmental effect includes effects of any change the Project may cause in the environment on the current use of lands and resources for traditional purposes by Aboriginal persons. Section 16.1 of the former Act requires that every comprehensive study include a consideration of the environmental effects of a project, including effects of changes to the environment on current use of lands and resources for traditional purposes by Aboriginal persons. Further to s. 16.1 of the former Act, community knowledge and aboriginal traditional knowledge may be considered in conducting an environmental assessment.

Moreover, input from Aboriginal Groups also influenced the selection of the VC. For example, the SSN emphasized the importance of having a VC on Aboriginal land use assessed in Part B of the Application/EIS. The SSN also emphasized the importance of assessing effects to Aboriginal land use and in keystone sites at Jacko Lake and the surrounding area (Jacko Creek, Goose Lake, Peterson Creek, and the Hunting Blind Complex). According to SSN's comments, without such data it would be impossible, under Part C, to assess the potential Project effects on Aboriginal Interests and the feasibility of potential mitigation measures.

As a result of SSN comments, the AIR/EIS Guidelines were revised to include the CULRTP VC, which evaluates key assessment outcomes from the other VCs to assess potential Project effects on current use of lands and resources for traditional purposes.

8.5.1.1 Influence of Consultation on the Assessment

Consultation with Aboriginal Groups played a key role in understanding how the Project may interact with various types of Aboriginal land uses. KAM undertook a number of consultation activities to generate information on Aboriginal land uses in the areas surrounding the Project. These activities are described in detail in Chapter 15 (Procedural Aspects of Aboriginal Consultation) and include hosting community meetings, meeting with Aboriginal leadership, information sharing, and providing Aboriginal Groups with capacity funding to participate in the EA process. In addition, the SSN were provided with funding to complete a Project-specific study: the Cultural Heritage Study (CHS). The SSN were also provided funding to develop a Preliminary Mitigation Report. The information generated from the consultation activities, the CHS and the Preliminary Mitigation Report informed the description of the baseline conditions for this assessment and influenced the assessment of effects on the VC as well as the development and refinement of mitigation measures.

During consultation, Aboriginal Groups raised several key concerns about potential effects to Aboriginal land uses:

- Effects to fishing. Aboriginal Groups have raised concerns about potential effects to trout fishing in Jacko Lake and Peterson Creek, salmon and trout fishing in the Thompson River, and effects to fishing in Kamloops Lake. Trout was confirmed to be harvested by Aboriginal Groups within the waterbodies surrounding the Project.
- Effects to hunting. Aboriginal Groups raised concerns about potential effects to moose and deer in areas such as Goose Lake, Jacko Lake and Peterson Creek. Other species raised as a concern include bear, grouse and badger.
- Effects to plant gathering. A variety of medicinal and food plants were identified as important to Aboriginal Groups including Saskatoon berries, soapberries, and kinnikinnick.
- Areas of value for other ceremonial uses of the land. For example, SSN identified the Jacko Lake area as having cultural significance and its use for prayer ceremoniesand other spiritual practices. Jacko Lake also features prominently in SSN stories, including a story about the Trout Children and Aboriginal law discussed further in Section 8.5.2.3.

8.5.1.2 Selection of Indicators

Aboriginal Groups' CULRTP includes a number of distinct (although related) practices. The following were selected as indicators for the assessment of this VC:

- fishing activities;
- hunting and trapping activities;
- plant gathering activities; and
- ceremonial and other cultural uses of the land.

Table 8.5-1 presents the rationale for the selection of CULRTP indicators.

Table 8.5-1. Indicators included in the Application/EIS for CULRTP

Indicator	Rationale for Inclusion
Fishing	Fishing has been identified as a current use of the lands and resources for traditional purposes in the area where the Project is located. This activity could be affected by potential losses of fish habitat (e.g. availability), access restrictions to fishing areas, sensorial disturbances such as noise and potential changes to the quality of the fish that is harvested for human consumption.
Hunting/Trapping	Hunting has been identified as a current use for traditional purposes in the area where the Project is located. This activity could be affected by potential losses of habitat used by animals (e.g. availability), access restrictions to hunting areas, sensorial disturbances such as noise and potential changes to the quality of the animals that are harvested for human consumption. To date, trapping by Aboriginal Groups has not been identified in the LSA.
Plant Gathering	Plant harvesting has been identified as a current use for traditional purposes in the area where the Project is located. This activity could be affected by potential losses to habitat for plants harvested, access restrictions to harvesting areas, sensorial disturbances such as noise and potential changes to the quality of the plants harvested for human consumption.
Ceremonial and Other Cultural Uses	Ceremonial or other cultural uses have been identified in the area where the Project is located. These activities could be affected by potential losses to sites of ceremonial or cultural importance (e.g. trails, navigation, habituation sites, prayer locations), access restrictions, sensorial disturbances such as noise or visual effects from Project activities.

8.5.2 Background

This section of the Application/EIS describes the background information for CULRTP.

8.5.2.1 Regional Overview

The Project is located in the Thompson-Nicola Region, an area that contains a mix of rural agricultural lands, small acreage holdings and Crown forest lands. The Kamloops Land and Resource Management Plan (KLRMP) administered by the BC Ministry of Forests, Lands and Natural Resource Operations provides broad direction for sustainable use of Crown land and resources in the region.

The Project is located within the traditional territory of the Secwépemc Nation which includes the SSN and the WP/CIB. The SSN reserve lands are located near Kamloops and Savona BC. Although the WP/CIB are members of the Secwépemc Nation (Shuswap Nation Tribal Council, 2014b), WP/CIB reserve lands are located near Clinton, BC on Highway 97 and north of Kamloops, BC on the west shore of the Thompson River, outside of the LSA.

The Project also overlaps with the Nlaka'pamux Nation traditional territory. LNIB and the AIB are part of the Nlaka'pamux Nation. LNIB's reserve lands are located near Merritt and AIB's reserve lands are located close to the Town of Ashcroft.

Background information on Aboriginal Groups is presented in detail in Chapter 12 and KAM's engagement with Aboriginal Groups is described in Chapter 15.

Hunting, trapping, fishing, plant gathering, and other traditional activities are central to the traditional economies of Aboriginal Groups within this region. A more detailed discussion of land use activities, and communities potentially affected by the Project, including the traditional territories of each of the Aboriginal Groups can be found in Chapter 12 (Background and Aboriginal Groups Setting).

8.5.2.2 Historical Context

Kamloops derives its name from the Secwépemc word "Tk'emlúps", which refers to the meeting of the North and South Thompson rivers. The area was inhabited by members of the Secwépemc peoples, part of the Interior Salish branch of the Salishan landguage family. The Secwépemc language is known as Secwépemctsín and it has some similarities to neighbouring tribes such as the Nlaka'pamux, the Stl'atl'imx, and the Okanagan. There are two major dialects of Secwépemctsín: the Western dialect is used by Aboriginal Groups in Kamloops, North Thompson, Canim Lake, and Williams Lake areas (Secwépemc, 2014) and the eastern dialect is spoken by the people pf the Shuswap Lakes, Spallumcheen and Windermere communities (First Peoples' Heritage, Language and Culture Council, 2010). The Secwépemc believe that the Secwépemctsín language was provided by the Creator to allow them to communicate with each other as well as with nature (Tk'emlups te Secwépemc, 2013).

Early Secwépemc lived off the land and would move from food source to food source, to fish, hunt, and gather. The Secwépemc territory provides plants for food, technological uses, and ceremonial uses, including root plants, berries, stems or shoots, seeds, nuts, mushrooms, and tree lichens. Lakes and rivers also provide food and waterways for travel (Siska, 1988). In correspondence, the SSN noted that the Secwépemc Nation historically lived in, used, and supported their way of life in the areas surrounding the Project and Jacko Lake (SSN, pers. comm., 2014; Ignace, Cultural Heritage Study- Final Report, 2014). However, the arrival of Europeans had a substantive effect on the ability of Secwépemc people to continue peaceful control over their lands.

Various ethnographers estimate the pre-contact (i.e., before the arrival of settlers and Europeans) Secwépemc population to be over 8,000 while others estimate the population at close to 40,000 (Ignace, 1995). The first recorded Europeans in the area were representatives of the fur trade, and met with the Secwépemc to establish the Thompson's River Post, which would eventually become a Hudson's Bay Company post. Between the 1820s and the 1860s, the Secwépemc and the traders established a relationship based on trade for hides, fish, roots, nuts, and berries. The fur trading posts were located in various locations in what is now Kamloops.

It has been suggested that during the beginning of the fur trade the Secwépemc people exercised more autonomy over the types of items they traded and ultimately their level of involvement. The fur traders were reliant on Secwépemc people to supply subsistence food sources such as salmon and wild game, all of which was necessary to maintain the Thompsons's River Post (LeBourdais, 2009). However, after the establishment of fur trade posts it became evident that the fur trade was having a negative impact on the Secwépemc people. Areas of the territory became "trapped out"

and the Secwépemc people became more and more reliant on trade goods. The greater demand for salmon and wild game (from the traders) resulted in food shortages.

In the late 1850s (during the Gold Rush), a number of Europeans passed through the area bringing the small pox disease. The Secwépemc people, whose population had no immunity to the disease, were reduced by an estimated two-thirds during the 1862 epidemic. The Secwépemc also suffered from measles and influenza outbreaks, which greatly reduced the population (Ignace, 1995).

After the small pox epidemic, the smaller surviving bands amalgamated from 32 to 17 (National Energy Board: Oral Presentation from Chief Ignace, 2014). Under the Joint Reserve Commission, these bands were identified as "Indian Bands," as per the *Indian Act* (Ignace, 1995). Although the bands were separated at the time, they were connected by a common language (Secwépemctsín) and belief system and together regulated the use of land and resources (First Nations Land Rights and Environmentalism in British Columbia, 2007). In 2014, during Chief Ronald Ignace's testimony for the Trans Mountain Pipeline National Energy Board hearing, he noted the Secwépemc traditional territory covers between 150,000 and 180,000 km^2. Within the traditional territory, developments such as road infrastructure, pipelines, and forestry have severely impacted the land and resources (SSN Affidavits, 2011).

In 1871, BC officially became part of Canada. In 1885, construction of the transcontinental railroad was completed, encouraging the growth of a small village on the shore of the Thompson River. The village grew rapidly and by 1893 the population had grown to approximately 500 at which point Kamloops became incorporated as a city with public works. In the following years, there were a number of infrastructural developments, including bridges that connected villages on either side of the rivers. During this time, the timber industry was growing; the vegetable and orchard farming industry grew, with most of the land used for this purpose located in the valley.

The Canadian Northern Railway was completed in 1915, while the Kamloops airport was operational in 1939 and the Trans-Canada Highway to the west of the Project area was completed in 1962. The population of the Kamloops area grew after the First World War until development slowed during the Depression and the Second World War. After this period, the city began to grow again, and much of the land that had formerly been used for farming in the valley was used for residential development. Ranching (including cattle grazing) also developed, and is currently ongoing: immediately within and adjacent to the Project. Forestry and mining activities have also been ongoing in the area for over 100 years, with more sustained activities occurring since the 1970s.

At the Mine Site, the proposed Project infrastructure will occupy 1,705 ha of land. Approximately 225 ha or 13% of this land has been disturbed or modified by previous activities including open pit mining conducted by Teck Cominco during the 1990s, agricultural activities and road developments. A breakdown of current disturbances is presented in Table 8.5-2. Further analysis is provided in Section 3.18 (Closure and Reclamation).

The spatial boundaries used for CULRTP is described in Section 8.5.3.1. It is important to note that the vast majority of land within the Local Study Area (LSA) totaling 7,166 ha is privately owned. A survey of surface rights covering approximately 85% of the LSA indicates that 90% of the land is privately owned and only 10% is Crown land as illustrated in Figure 8.5-1.

Figure 8.5-1
Land Tenure

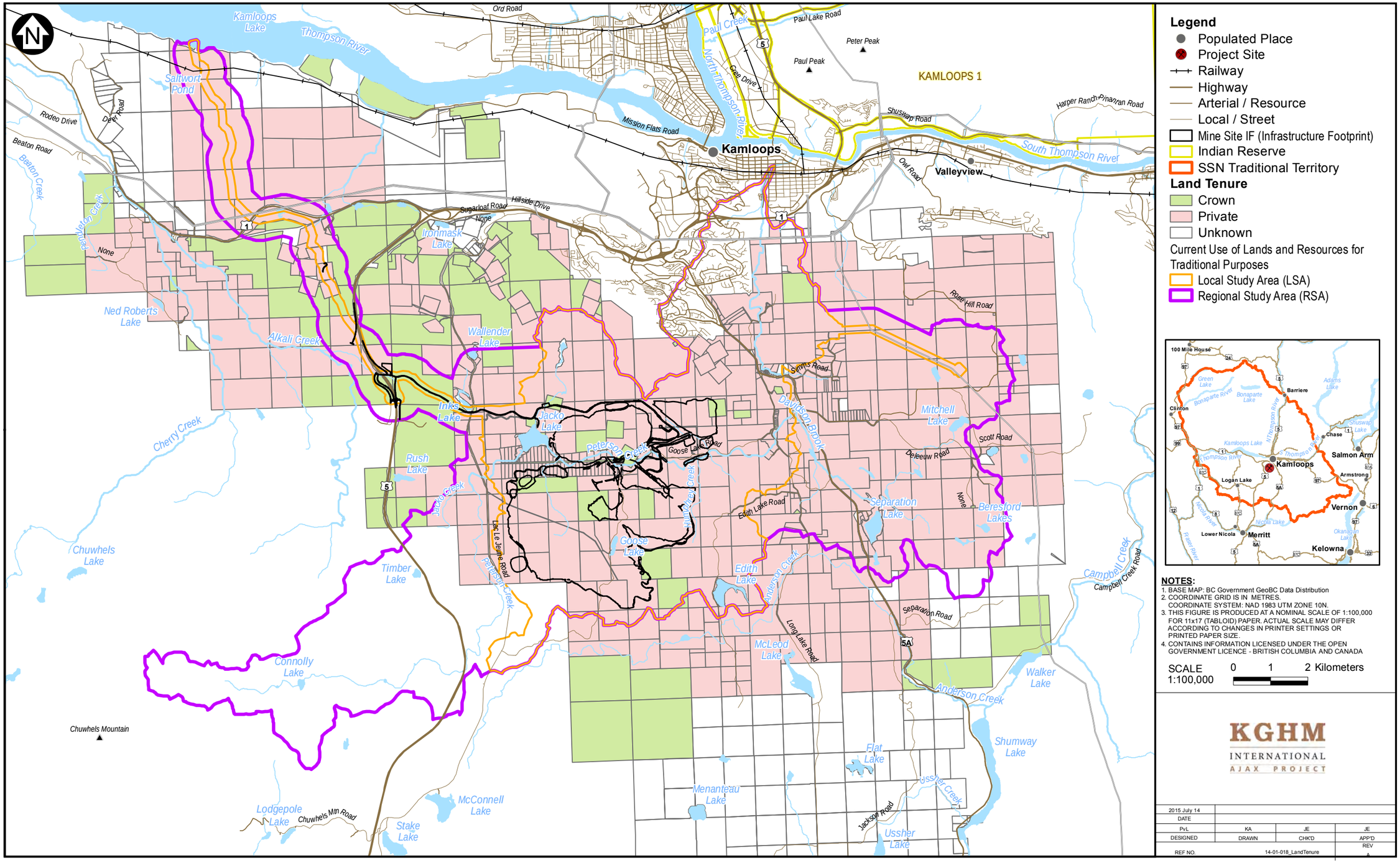


Table 8.5-2. Existing Disturbances within Proposed Mine Footprint

Type of Disturbance	Surface Area
Existing Pits/ Mine Disturbances	36 ha
Disturbed Grasslands	101 ha
Cultivated Fields	62 ha
Roads	26 ha
Total	**225 ha**

Source: Section 3.18 (Closure and Reclamation)

Table 8.5-3 below presents a breakdown of surface right for the LSA and Regional Study Area (RSA).

Table 8.5-3. Surface Rights in LSA and RSA in Hectares

Surface Rights	RSA	LSA
Crown Land Parcels	1,071	614
Private Land Parcels	10,452	5,494
Unknown[1]	4,035	1,058
Total	**15,558**	**7,166**

8.5.2.3 Baseline Information

Data Sources

This baseline summary of CULRTP is a compilation of desk-based research from a variety of secondary sources as well as information gathered during consultation. Background information was gathered using standard approaches of literature review, secondary data collection, and data analysis. The information used to develop this section is described briefly below in terms of data sources and limitations.

The main sources reviewed in detail for this report include:

- Consultation data from activities with Aboriginal Groups from 2011 to 2015;
- Additional information provided by Aboriginal Groups to KAM directly;
- Feedback from Aboriginal Group members at events hosted by KAM during the Pre-Application phase;
- Publically available information regarding Aboriginal current use of the area (e.g., related to New Afton, or Trans Mountain Pipeline Project);
- Effects analysis from other VCs;
- Reports provided by Aboriginal Groups, including:

[1] At the time of writing, information on surface rights was only available for 85% of the LSA and 75% of the RSA

  - Preliminary Mitigation Report drafted in 2014 by SSN to identify any Project related concerns and suggested mitigation;
  - SSN Cultural Heritage Study (CHS) drafted in 2014 by Marianne Ignace to demonstrate traditional use and occupancy of the area involving and surrounding the Project. The report focuses on historic land uses in the area;
  - LNIB Community Profile drafted in July 2014 and provides socio-economic information for LNIB; and
  - MNBC - KGHM/Ajax Mine Initial Project Report, drafted December 2014, which provides a summary of MNBC members' feedback on the proposed Project and land use information.
- Ethnographic studies and reports;
- Aboriginal Groups' official websites; and
- Aboriginal Affairs and Northern Development Canada (AANDC) First Nation Profiles.

Through the course of consultation and engagement related to the Project, a number of important geographic regions have been identified. In particular, these include: Thomspson River, as well as Jacko Lake, Jacko Creek, Peterson Creek, Goose Lake, and the Hunting Blind Complex. The Jacko Lake area, also known as Pípsell, is considered an important cultural landscape and place with spiritual and cultural value for the SSN.

Baseline data and information about current Aboriginal use are described in the context of these geographic regions, which include the importance of using the areas; the interconnectedness between them; and its importance to Aboriginal Groups' seasonal round. As described above, CULRTP includes a number of distinct (yet related) practices. Indicators selected for the assessment of this VC include: fishing; hunting and trapping; plant gathering; and ceremonial or other cultural uses (e.g., cultural and spiritual practices, trails, habituation sites, navigation).

KAM is committed to integrating additional TK/TLU information into mitigation, monitoring, and other Project-related activities, as appropriate, should additional information be made available by Aboriginal Groups.

Limitations

A number of data limitations apply to this section, which include the following:

- Information in these sections comes from publically available data sources as well as non-confidential information provided by Aboriginal Groups. It does not constitute an exhaustive review of background information on the Aboriginal Groups.
- Information in these sections has, in many cases, been summarized. As a result, interpretation of the source data was necessary.
- The results of the research provide limited site-specific information about the locations, seasons, level, and type of current Aboriginal use related to the Project. Traditional knowledge/traditional land use (TK/TLU) information was incorporated for each Aboriginal Group to the extent that it was made available.

- Some of the sources are written from the perspective of ethnographers or persons outside of the Aboriginal Group. Ethnographic accounts only provide a snapshot (i.e., a point in time) of Aboriginal activities within a dynamic and changing Aboriginal culture.

Stk'emlupsemc te Secwépemc Nation

Location of Traditional Territory and Indian Reserves

The SSN traditional territory covers approximately 1,252,600 ha of which 0.14% or 1,705 ha overlap Project footprint (Figure 8.5-2). The LSA represents 0.57% or 7,166 ha of the SSN traditional territory. The SSN territory lies between the Columbia River valley to the Fraser River, and south to the Arrow Lakes (Tk'emlúps Website, 2014).

Figure 8.5-2 presents the Indian Reserves (IRs) within the Project vicinity, including the TteS and SIB (SSN) reserves. With respect to the TteS, Kamloops IR #1 is the main populated reserve with over 700 members residing on the reserve (Table 8.5-4). The majority of the land in Kamloops IR #1 has substantial forest cover and range grazing areas (Tk'emlúps Website, 2014). Data on other populated TteS IRs was unavailable at the time of writing. The SIB occupy four IRs. The Skeetchestn IR is both the largest and most populated reserve. The extent to which the other SIB IRs are populated was unknown at the time of writing (Table 8.5-4).

Table 8.5-4. Skeetchestn Indian Reserves Occupied by SIB

Name	Location	Size (ha)
Hihium Lake 6a	Kamloops District on the north shore of Hihium Lake near the northeast corner of Indian Reserve #6	2.10
Hihium Lake 6b	Kamloops District on south shore of Hihium Lake, near the east end	2
Marshy Lake 1	N/A	62.70
Skeetchestn	Kamloops District, along Deadman Creek and the north bank of the Thompson River	7,975.70
Total		**8,042.50**

Source: (AANDC, 2014)

Chapter 12 of the Application/EIS provides detailed historical information on SSN resource use. Potential environmental effects of the Project have the potential to affect SSN current use of lands and resources. This includes potential changes in the ability to hunt, fish and gather in Pípsell which includes Jacko Lake, Goose Lake, Peterson Creek, Jacko Creek, and the Hunting Blind Complex. Potential changes may also affect the ability to conduct other uses (such as ceremonial or other cultural uses, trails, navigation).

Cultural Context

Governance

The Secwépemc believe that spirituality comes from a connectedness to and a respect for all living things. This respect for all living things, and subsequently the earth, led to the belief that one cannot "own" land; rather it is considered communal and for the good of all (Ignace, 1995). Historically,

there were seven sub-units within the Secwépemc determined by geography. These sub-units consisted of approximately 25 Aboriginal bands (each with a primary village and a Chief, whose role was to coordinate tasks and be an advisor to his people). The groups would typically occupy and move throughout certain parts of the Secwépemc territory seasonally (Ignace, 1995), referred to as the "seasonal round".

Secwépemc Governance

The Secwépemc traditional territory, known as Secwépemcul'ecw, was occupied by the Secwépemc peoples prior to contact and this occupation included a network of camps, village sites, and permanent winter villages. According to ethnographers and other authors, Secwépemc governance was comprised of three units:

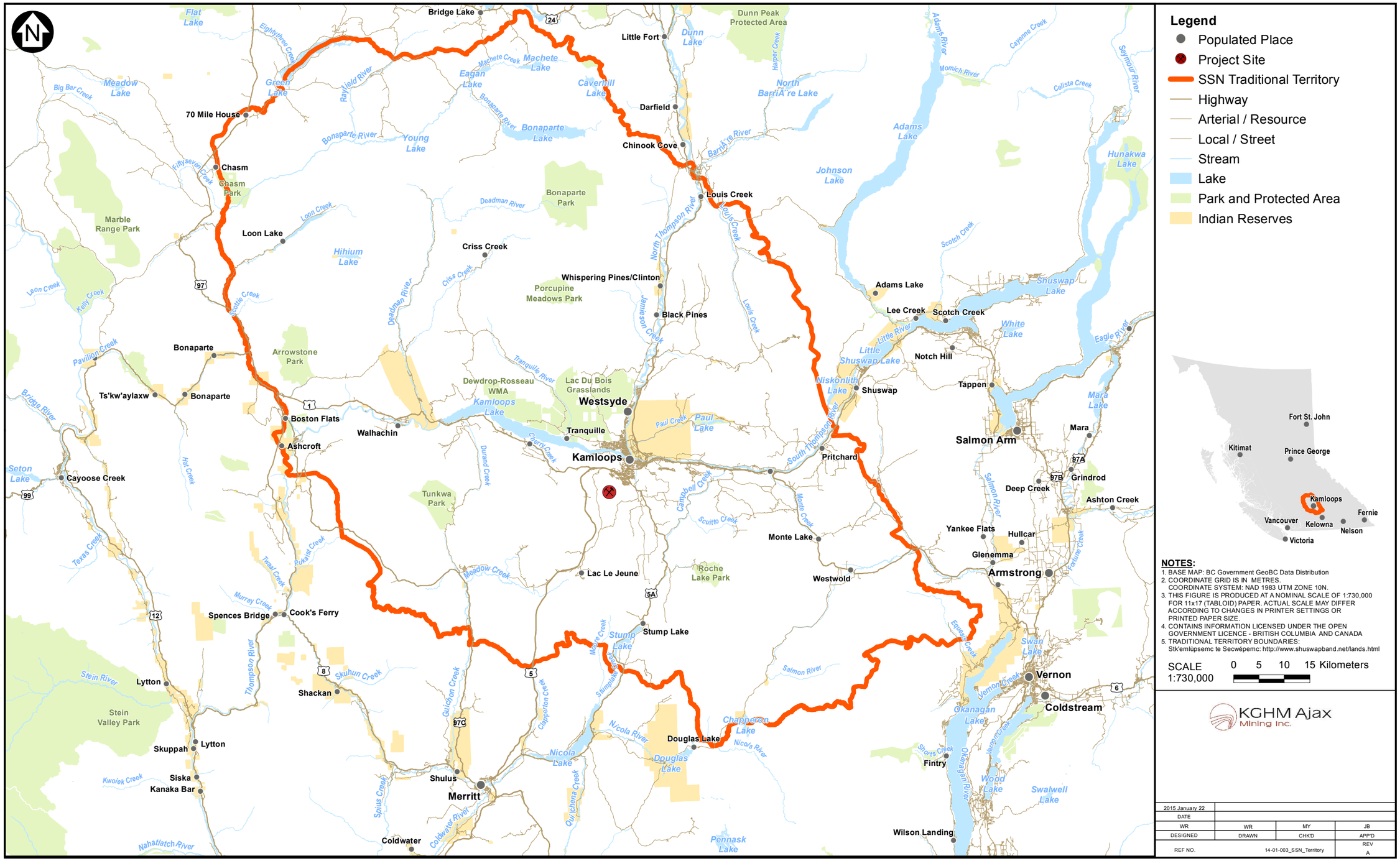
- The family. Family was the basic unit in the complex system of Secwépemc governance. Families were the source of local TK/TLU knowledge which was passed to the next generation. Heads of the families were often given the responsibility of making decisions about resources (Williams Lake Band, 2015). Some property was inheritable.
- The divisions. The term divisions or bands (a term developed by a well known ethnigrapher called James Teit) suggests the Secwépemc people were further divided into groupings that were tied to definite localities. Each division was composed of a group of families closely related among themselves (Ministry of Attorney General, 2007).
- The tribe. The tribal unit refers to the larger cultural grouping of the Secwépemc people. According to ethnnographic sources, land and hunting grounds were viewed as tribal property while each Aboriginal division "owned" fishing, hunting and trapping grounds that could be accessed freely by other Secwépemc members (Ministry of Attorney General, 2007).

Seasonal Round

This section describes the seasonal round, focusing on the timing in which traditional land uses would occur. The participation of the Secwépemc people in the seasonal rounds relies on an intimate connection to the land and its resources. This unique knowledge includes an understanding of how plants and animals behaved and how that behaviour changed depending on the season and the location (National Energy Board: Oral Presentation from Chief Ignace, 2014). The CHS (2014) identifies five major seasons as part of the seasonal round: early spring (snow melting), mid-to-late spring (root gathering), summer (berry and high elevation root and medicinal plant gathering), late summer to early fall (salmon season), and mid to late fall (hunting season).

According to Chief Ignace, the October/November months were when people and animals entered into their winter homes/dens and this time was also associated with various activities. During the crossover moon in December, people lived on stored provisions from trapping and hunting and would tell stories (conduct *stseptekwll*). During this time, there would also be celebrations to signal the end of winter and the gradual shift to longer, warmer days (National Energy Board: Oral Presentation from Chief Ignace, 2014). January also marked a month to stay at home (where SSN people would again rely on stored provisions) and in the cache pit months (February) the SSN participated in ice fishing for steelhead on the Thompson River.

Figure 8.5-2
Stk'emlupsemc te Secwépemc Nation Traditional Territory



The Chinook wind months were said to occur in March, initiating spring fishing activity and some gathering of shoots and balsam roots (National Energy Board: Oral Presentation from Chief Ignace, 2014). In April, the Secwépmec people gathered plants (nodding onion, yellow bells, Mariposa lily), when spring hunting and fishing at Jacko Lake (a component of Pípsell) and Paul Lake would occur. May was considered root-digging month (avalanche lilies, spring sunflower, nodding onion, etc) although spring salmon fishing also occurred at HiHium, Lac Le Jeune, Tunkwa Lake and Halfway Lake. The areas surrounding Pípsell, particularly around Jacko Lake, provided some of the first root plants in the seasonal round. The food plants in the areas of Pípsell provided food during a critical time in early to late spring when higher elevation plants were not yet in season. The SSN also note that the trout from Pípsell (Jacko Lake specifically) provided an early trout run, and the first fish protein of the year. Thus, the SSN assert that some of the areas in Pípsell played a significant role in the food economy and seasonal round of Secwépemc people (SSN pers. comm., 2015).

The mid-summer months also included additional harvesting of berries (strawberries, Saskatoons, soapberries etc.), medicinal plants and roots in the hills surrounding Pípsell (primarily Jacko Lake) and other mid-elevation areas. Spring salmon fishing also occurred in the South, North and Main Thompson River. August, named the many salmon month, initiated sockeye salmon fishing in the South and Main Thompson River as well as plant harvesting at higher elevations. The start of fall hunting typically commenced in August. September was important for the hunting and drying of meat for consumption during the winter months. Deer and formally elk hunting occurred in areas such as Bonaparte, Deadman Creek Plateau, Greenstone Mountain, Lac Le Jeune, Lac Du Bois, Chris Creek, and Tranquille watersheds (National Energy Board: Oral Presentation from Chief Ignace, 2014).

The Secwépmec identified seasons through environmental changes such as change in temperature, precipitation, plant growth, and animal patterns (migration, birthing, rutting) (Ignace, 2014). Chief Ignace notes that every four years, there is a great abundance of sockeye salmon (*sqlelten7uwi*). Similarly, the plants and berries return in abundance every four years.

The resources found in the SSN traditional territory were to be used equally by all Secwépemc and provided necessary sustenance (National Energy Board: Oral Presentation from Chief Ignace, 2014).

The SSN assert Aboriginal rights and title in the areas surrounding the Project, noting that the Secwépemc people lived in, used and supported their way of life on the lands surrounding the Project (SSN, pers. comm., 2014). The SSN also assert rights and title to particular areas of Pípsell which include Jacko Lake and surrounding areas of Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex. The SSN believe there is an interconnectedness between these geographic components and that interconnectedness plays an important role in their worldview and cultural values, practices, and traditions. Figure 8.5-3 provides an overview of TLU areas of importance identified by the SSN in the CHS.

Hunting and Trapping

Traditional Hunting and Hunting Blind Complex

The Project area is located within what Ignace (2014) refers to as an upland mid-elevation region. Ignace (2014) adds that there were prolific hunting areas for deer and moose in the mid and higher elevations surrounding the Project but also in lower elevation areas with southern exposure such as

Six Mile, Tranquille River, Jacko Lake to Lac Le Jeune, and Greenstone Mountain. The SIB have also noted the use of grasslands and nearby mountains for harvesting including Goose Lake, Lac Le Jeune, Tunkwa Lake, and Greenstone Mountain (National Energy Board: Oral Presentation from Chief Ignace, 2014).

For the SSN people, the hunting process was (and still is) accompanied by a series of rituals that provide an advantage to hunters by masking the human smell to animals (Ignace, 2014). Prayers and tobacco offerings were often made. Although people hunted could occur as needed throughout the year, the main hunting season was from August to October. SSN people had an intimate knowledge of the habits and seasonal migration patterns of the animals they depended on for survival. When animals were harvested the SSN would target specific age categories or species to ensure the sustenance of the animals (National Energy Board: Oral Presentation from Chief Ignace, 2014).

The area once supported large elk herds until the mid-1800s; by the mid-1800s elk forage ranges in this area were affected by grazing of large herds of horses (and subsequently cattle). This likely caused the decline of elk in the area (Ignace, 2014). SIB and TteS elders noted that the petroforms in the Project area are also consistent with locations and Hunting Blinds for ungulate hunting, specifically elk. The Hunting Blind structures are called cyegmíñten ne cpixmeñten ("piled up stones in a semi-circle at a human-made hunting ground"). Elk were a primary protein source until the latter half of the 19th century and were likely the predominant species harvested in the Hunting Blind Complex northeast of Jacko Lake (Ignace, 2014). Moose, deer, ducks, and geese were also harvested in the Sugarloaf Ranch area. Interviewees noted the hunting trips would yield four to five deer and large portions of dried meat.

Traditional Trapping

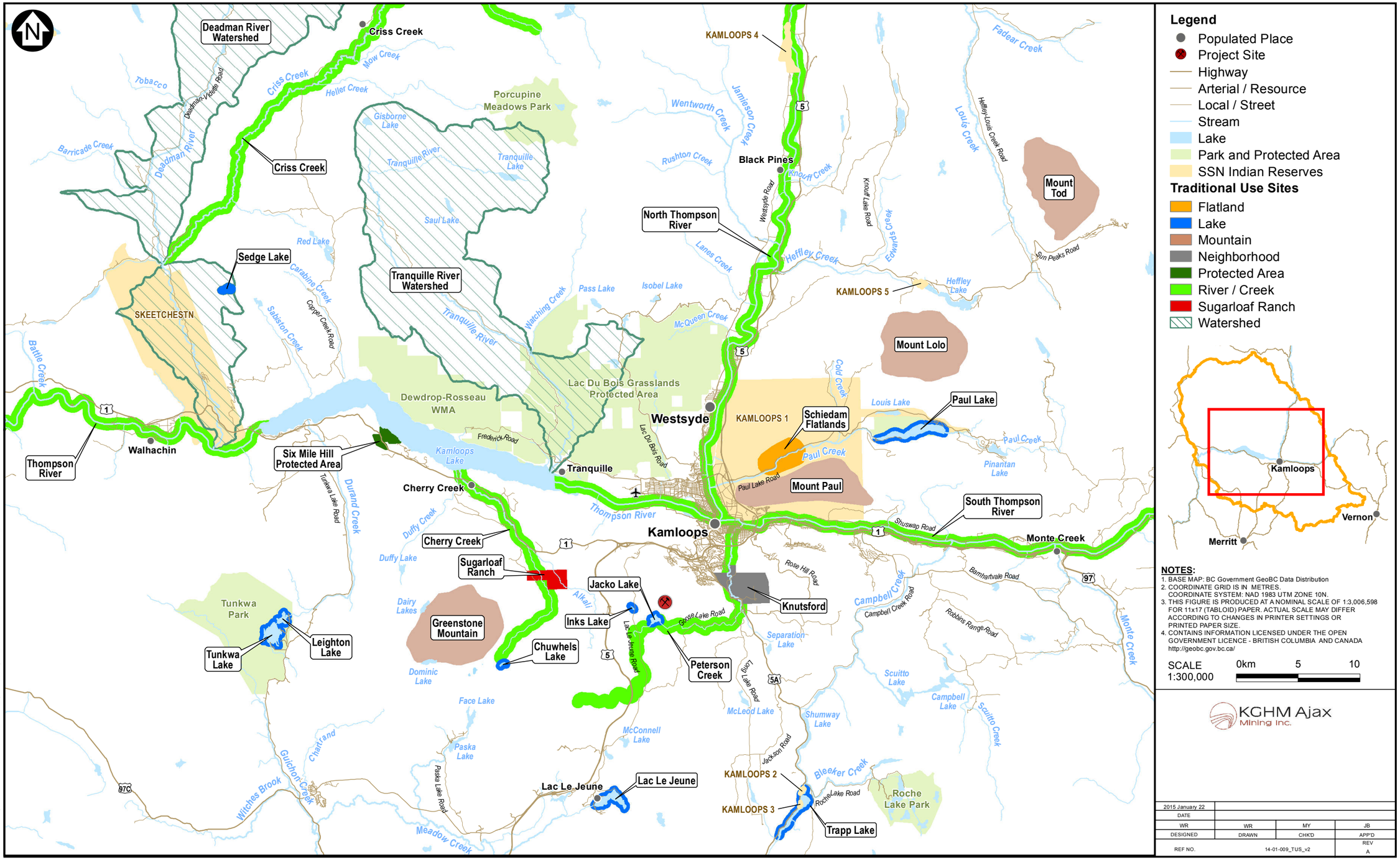
With respect to trapping, historically species targeted included bear, beaver, fisher, muskrat, marten, otter, lynx, and coyote. Additional information on historical hunting and trapping activity by the SSN is presented in Chapter 13 (Background and Aboriginal Group Setting).

Current Use

During interviews with SSN knowledge holders and elders, the Sugarloaf Ranch (see Figure 8.4-3 Ranching Activity in Section 8.4) areas were noted to be an important hunting area by at least seven SSN members (Ignace, 2014). The general locations of historic and potentially current harvesting areas (identified in the CHS) are presented in Figure 8.5-3. Interviewees also noted current deer hunting in the Schiedam Flats area- located approximately 23 km north-east of the Project site, near Paul Lake.

Other popular hunting areas noted by interviewees include Jacko Lake, Cherry Creek, Chuwels Lake, Chuwels Mountain, Lac Le Jeune, Inks Lake, and the Knutsford area. Greenstone Mountain is an area used for hunting too, particularly in the winter. These areas have been used to hunt in the last 40 years (Ignace, 2014). The extent of recent hunting practices in the areas surrounding the Mine Site is likely limited because the landscape has been altered from ranching, urbanization, and mining activity. Interviewees noted frustrations with accessing areas of Pípsell, especially Jacko Lake, due to fencing and private property (Ignace, 2014). A ranch owner within the area noted that there have been some requests by Aboriginal Groups to use the ranch lands for hunting (Landowners, pers. comm., 2015).

Figure 8.5-3
SSN Identified Traditional Land Use Areas



SSN members noted that hunting still occurs in some of these areas. For example, some animal harvesting still occurs around Pípsell particularly Jacko Lake, Peterson Creek and Goose Lake, for moose and deer. The Sugarloaf Ranch area is also used for deer and moose hunting; one member noted they obtain permission from the land owner to hunt there. Hunting also continues in and around Lac Le Jeune, Greenstone Mountain, Chuwels Mountain, and Knutsford. An SSN member has a registered trapline territory on Greenstone Mountain which is an area where moose, deer, cougars, bobcats, and lynx are harvested. This is a large trapline extending to the east of Greenstone Mountain where it is crossed by existing Projects and activities (e.g., New Afton Mine, Highway 5). The trapline will also be crossed by the freshwater pipeline that will bring water from Kamloops Lake to the Mine Site. This pipeline will follow, as possible, existing roads and disturbed areas as it will run in parallel to an existing pipeline currently operated by New Afton Mine. The registered trapline holder purchased the trapline two years ago and noted it had not been used yet. This is consistent with a review of harvest data from the BC Trappers Association and the Ministry of Forestry, Lands and Natural Resource Operation identifying the last harvest on this trapline in 2001. KAM will continue to consult with the registered trapline holder, however there are no anticipated effects on the current use of this trapline therefore it has not been carried forward in the assessment. To date, no current trapping activity has been identified by SSN within the Mine Site and Pípsell. There is a registered trapline overlapping with the Mine Site but it is not held by an SSN member.

Trapping does occur in other areas of the traditional territory. Ignace (2014) identifies late July to mid-August as being important times to harvest marmots in the subalpine and alpine areas of the high mountains, which for the SSN include the areas around Mt. Lolo, Mt. Paul, and Tod Mountain (Skwel°welt) and Duck's Range to the east.

In summary, the SSN harvest wildlife for food, trade (trade amongst other Aboriginal families, divisions and nations), ceremonial, medicinal, and technological purposes (e.g., antlers used to tan hides, skins used to construct clothing). In a report titled *Biological Effects from the Trans Mountain Expansion Project in SSN Territory*, the SSN identify species of concern in the areas surrounding the Project. Species identified in the report include moose, mule deer, and grouse (Pottinger Gaherty Environmental Consultants, on behalf of SSN, 2015).

Secondary information specific to the TteS suggests a large portion of the TteS diet consists of traditional foods and hunting remains important to the communities. Within the larger TteS traditional territory, members also hunt and trap at the Tranquille watershed and Criss Creek area (located outside of the LSA and RSA). At the time of writing, no information was available on hunting camps or cabins in the LSA.

Secondary information specific to the SIB suggest that Skeetchestn people remain involved in traditional activities in their territory, and game harvests make up a critical portion of the Skeetchestn diet. Estimates from SIB suggest that 25-100% of household meat supply may come from hunted game (Skeetchestn Indian Band, n.d.). Animals that are harvested (identified by Skeetchestn) include deer, moose, grouse, bear, rabbit, squirrels, muskrats, and beavers. A Skeetchestn hunting camp is located at Marshy Lake Camp. The Criss Creek and Heller Creek areas (outside of the LSA and RSA) were noted to be of importance for hunting, although these areas are not within the vicinity of the Project.

Information on the frequency and duration of hunting activity was unavailable at the time of writing.

Hunting and Trapping Summary

Table 8.5-5 summarizes the species, harvesting areas, uses, and extent of CULRTP for the SSN. It is based on the information presented in the CHS and Preliminary Mitigation Report.

Traditional Fishing Activity

Fishing is an important part of the SSN's seasonal round. The SSN use songs "to call the fish back" and honour the fish. Similar to hunting, fishing activities are subject to rituals; for example the first fish caught must be thrown back into the water or given away (Ignace, 2014). The SSN also engage in rituals prior to fishing including preparing the fishing location (cleaning paths and the area being used) and preparing the equipment being used (making and cleaning the fishing tools). Ceremonial activities may include drumming and prayer songs. The SSN believe it is critical to have respect for the river, fish, and rocks (Skeetchestn Website, n.d.). Secwépemc trout fishing methods differ from "recreational' angling or sport fishing. The goal is instead to feed the entire community (still practiced today at some lakes and rivers within SSN's traditional territory).

According to Ronald Ignace, a variety of waterbodies in the traditional territory were important for fishing. This includes:

- The clear and somewhat shallow waters of the main Thompson and tributaries of the North Thompson were used to support Secwepemc fishing by use of three-pronged spears (wewtsk) supported by long poles (R. Ignace 2008).
- The still waters of the South Thompson and Main Thompson Rivers, Secwepemc people developed the method of lighting pitch-wood fires on canoes in order to attract salmon, and then spearing the salmon from canoes (R. Ignace 2008).
- Finally, in different locations, like the mouth of Deadman's Creek, the mouth of the Barriere River, the Secwepemc people set up fish dams (ts'elmíñ) made of a lattice of sticks to contain and then selectively harvest salmon as they migrated up the creek (R. Ignace, 2008).

Historically, Secwépmec peoples modified and maintained streams to maximize the fish yield (Ignace, 2014). This was accomplished by ensuring the streams and lake openings were clear of debris for fish to travel. They would also plant green willow trees on either side of streams, as tree roots would clean the water.

Table 8.5-5. Summary of Hunting and Trapping Activity by SSN

Species	Areas where Traditional Hunting Occurs	Uses*	Extent of Current Use
Deer Moose	Jacko Lake area Peterson Creek Goose Lake Cherry Creek Sugarloaf Mountain and area (used for large harvests of deer) Knutsford Greenstone Mountain (wintering ground) Schiedam Flatlands (Kum-gen-nat-kwa) Lac le Jeune Chuwels Lake Six Mile Tranquille Watersheds Deadman's Creek Criss Creek	Mule deer used for food, ceremony, trade, technical, and story Moose noted to be a species of concern to SSN and used for food, technical, and ceremonial	Jacko Lake: game hunting occurs (moose, deer) (Ignace, 2014). Peterson Creek: Consultation indicates moose hunting in this location (SIB, pers. comm., 2014; SSN, pers. comm., 2014). Goose Lake: Indicated during consultation that game hunting occurs (SIB, pers. comm., 2014; SSN, pers. comm., 2014). Cherry Creek: limited hunting in Cherry Creek due to access restrictions including private property signs, ranching, and fencing (Ignace, 2014). Sugarloaf Mountain: Harvesting still occurs (Ignace, 2014). Knutsford: Some hunting still occurs (Ignace, 2014). Greenstone Mountain: Hunting and trapping still occur (Ignace, 2014). Schiedam Flats, Lac Le June, Chuwels Lake: Some hunting and trapping still occur (Ignace, 2014). Tod Mountain: Hunting and trapping occur (Ignace, 2014). Tranquille and Deadman's Creek and Criss Creek: Hunting occurs (Ignace, 2014).
Cougars	Sugarloaf Ranch area Greenstone Mountain	Story	Sugarloaf Ranch: Some harvesting may occur although it has been affected by the extent of ranching and cattle grazing (Ignace, 2014). Greenstone Mountain: Some level of trapping continues today (Ignace, 2014).
Marmot	Mt. Lolo, Mt. Paul, and Tod Mountain (Skwel°welt), and to the east Duck's Range	Story, trade, food, technical, and ceremonial	Harvesting areas (other than Mt. Paul) are likely outside most study areas, however a conservative assumption would be that some level of marmot harvesting exists today.
Muskrat	On Mine Site, currently or historically	Story, trade, and food	n/a
Lynx	Sugarloaf ranch area Greenstone Mountain	Story, trade, food, and technical	Sugarloaf Ranch: Some harvesting may occur although harvests have been affected by the extent of ranching and cattle grazing (Ignace, 2014). Greenstone Mountain: A SSN member holds a trapline in the Greenstone Mountain area (Ignace, 2014).

Species	Areas where Traditional Hunting Occurs	Uses*	Extent of Current Use
Badger	On Mine Site, currently or historically, areas near Jacko Lake	Noted to be a species of concern to SSN and used for story, trade, and food	American Badger Red/Blue-listed, endangered (therefore, likely no hunting or trapping of this species). During consultation with SIB, the importance of the American badger was noted. They indicated the species may be present in Mine Site area.
Red squirrel	On-site, currently or historically	Story, trade, and food	No evidence of current SSN trapping in the LSA.
Bobcats	Sugarloaf ranch area Greenstone Mountain On-site, currently or historically	Trade	Sugarloaf Ranch: Some harvesting may occur (Ignace, 2014). Greenstone Mountain: Hunting and trapping continue today (Ignace, 2014).
Snowshoe hare	On-site, currently or historically	Story, food, technical, ceremonial, and economic	No evidence of current SSN trapping in the LSA
Muskrat	On-site, currently or historically	Story, trade, and food	
Long tailed weasel	On-site, currently or historically	Used for trade, ceremonial, technical and noted to be a valued ecological indicator	
Yellow-bellied marmot	On-site, currently or historically	Story, trade, food, technical, and ceremonial	
Coyote	On-site, currently or historically	Story, trade, and ceremonial	
Grey wolf	On-site, currently or historically	Story, trade, and ceremonial	
Otter	No evidence	n/a	
Fisher	On-site, currently or historically	Fisher are noted to be of concern to SSN and used for story, trade, and technical	
Marten	On-site, currently or historically	Story and trade	
Wolverine	On-site, currently or historically	Story and trade	
Porcupine	On-site, currently or historically	Story, trade, food, and technical	
Beaver	Sugarloaf ranch area On-site, currently or historically	Story, trade, food, technical, and ceremonial	

Species	Areas where Traditional Hunting Occurs	Uses*	Extent of Current Use
Bald eagle	On-site, currently or historically	Used for trade and ceremonial	Extent of harvesting within the LSA is unknown at the time of writing.
Golden eagle	On-site, currently or historically	Used for trade and story	
Northern goshawk	Jacko Lake area On-site, currently or historically	Identified as a concern for SSN, used for trade, technical, and story	
Grouse (sharp-tailed and other species)	Jacko Lake area On-site, currently or historically Sugarloaf ranch area	Identified as a concern for SSN, used for food and story	
Duck	Sugarloaf Ranch area	n/a	
Canada goose	On-site, currently or historically	Story, trade, and food	
Sandhill Crane	On-site, currently or historically	Identified as a concern for SSN, used for food and story, ecological value	
Great blue heron	On-site, currently or historically	Identified as a concern for SSN, used for ceremonial	
Swans	On-site, currently or historically	Used for story, trade, and ceremonial	

** Types of uses (as defined in the CHS) include:*

- *Concern:* *species of concern either provincially or for the SSN*
- *Story:* *figured prominently in traditional stories/laws*
- *Trade:* *is or was a trade item*
- *Food:* *utilized as a food sources*
- *Medicinal:* *has medicinal value*
- *Technical:* *used as clothing or other technological purposes*
- *Ceremonial:* *used for ceremonial or spiritual purposes*
- *Ecological:* *has value as an ecological indicator*

Current Use

The area surrounding the Project provided and continues to provide opportunities for fishing various species. Areas of particular interest for fishing activities include components of Pípsell-Jacko Lake, Petersen Creek, Jacko Creek as well as the Thompson River. These areas are described below.

- **Jacko Lake**. Jacko Lake, a key geographic component of Pípsell, is noted to be of significant spiritual and cultural value to the SSN and this includes the use of the lake for fishing (SSN, pers. comm., 2014). A recent report identifies the use of Jacko Lake as a valued SSN trout fishery (Pottinger Gaherty Environmental Consultants, on behalf of SSN, 2015)

  Ignace (2014) indicates that Jacko Lake was an important rainbow trout fishery before the arrival of Europeans and in the 20th century. Trout were caught by scoop-netting as they prepared to spawn at Jacko Creek at the inlet of the lake. Jacko Lake is typically ice-free in mid-April, and provided an early trout run and the first fish protein of the year (Ignace, 2014). Fishing on Jacko Lake also occurred in the spring and fall.

  Jacko Lake is located largely on private land, with the exception of a seasonally gated public access road (via Lac Le Jeune Road) and a staging, parking and boat launch area located at the north arm of Jacko Lake. Additionally, on account of various lake height raises, private land remains under the now flooded southwest, southeast and northeast arms of the lake.In recent decades, it is possible that some SSN members felt restricted from fishing on Jacko Lake historically, as one interviewee noted that "Jacko Lake it seemed to me that way of fishing, the traditional methods was not, not allowed for us there, like back then 30 to 40 years ago seemed like we were always sneaking around to get our spring fish" (Ignace, 2014). Another interviewee noted that access to the Jacko Lake area is limited due to private property and fences. Provincial fishing regulations currently apply to Jacko Lake, and ice fishing is not permitted. Fish (i.e. trout) from this stocked lake can only be obtained using rod and reel—nets are prohibited.

  SSN members interviewed by Ignace (2014) described fishing in Jacko Lake for large size rainbow trout (over 30 centimetres [cm]), typically fishing along the inflow creek in the spring. Members that were interviewed mentioned ongoing fishing and fly fishing activities today in Jacko Lake using boats. SSN members also fished Jacko Lake using a fishing rod as recently as 2008. The interviewee noted traditional fishing methods are not allowed at Jacko Lake. SSN have noted in meetings that Jacko Lake is a continued fish harvesting location stated during a meeting that members fish in Jacko Lake (TteS pers. comm., 2011).

  The CHS notes that only a few SSN members fish in the Jacko Lake area, and that what fishing that does occur is primarily angling as opposed to traditional fishing methods from lake in- and outflows after spring ice break-up (Ignace, 2014). The major reason is the land at the in- and outflow of Jacko Lake has been private property for roughly 140 years, and has effectively fenced Aboriginal Groups out of areas where traditional resource harvesting did occur.

- **Peterson Creek and Jacko Creek**. Peterson Creek and the Peterson Creek headwaters (locally known as Jacko Creek) begins in the Chuwhels Mountains and flows north entering Jacko Lake on the southwest side. South of the Aberdeen neighbourhood, the creek flows east and north through the city of Kamloops, entering the South Thompson River (Pottinger Gaherty

Environmental Consultants, on behalf of SSN, 2015). Jacko Creek and Peterson Creek are noted to be a valued trout fishery for the SSN. A recent report prepared on behalf of SSN indicates that coho salmon are also found at the mouth of Peterson Creek, where Peterson Creek converges with the South Thompson River although it is unclear if SSN members are fishing there (Pottinger Gaherty Environmental Consultants, on behalf of SSN, 2015).

- **Thompson River**. As the main waterway through the region, the Thompson River is also important for SSN fishing activities. The SSN had many fishing locations in the North, South, and Main Thompson River where salmon fishing was carried out in canoes, with fishing weirs and with nets and spears. In late fall, coho salmon were fished in the tributaries of the Thompson Rivers system (Ignace, Cultural Heritage Study- Final Report, 2014). Fishing yielded fresh protein between March and October, and significant portions of the catch were dried for the winter.

  In spring, the Secwépemc people would fish for trout using drag nets and spears in the streams and lakes. In the fall, they would fish for salmon using three-pronged spears (Ignace, 2013; Siska, 1988; Prince, 2003; Dawson, 1891). They would fish for salmon in the South Thompson River (Murphy, Nicholas, & Ignace, 1999), Fraser River, and Lac la Hache (Ignace, 2013).

  SSN continue to fish in the Thompson River. For example, in 2004, SSN and Bonaparte First Nation deployed a fishwheel in the Thompson River mainstem near the outflow of the Deadman River (Tk'emlúps Website, 2014). A fishwheel is a device used to catch fish and operates similar to a water-powered mill wheel. The SSN noted that the Thompson River steelhead and coho salmon are in serious jeopardy due to various factors (SSN Affidavits, 2011). The fishwheel is located across the river from the outflow of the Deadman River and operates five days per week (Tk'emlúps Website, 2014).

The Tranquille watershed forms an important component of the fishing grounds for TteS members (SSN Affidavits, 2011). However, the Tranquille watershed is experiencing some habitat deterioration evident in the lower reaches. Some fishing also occurs in the Bonaparte areas.

The Skeetchestn people remain involved in traditional activities in their territory and recently asserted their fishing rights for Tunkwa Lake, approximately 30 km west of the Project, which has been used by the Skeetchestn people for centuries. Restrictions were placed on the SIB's use of this area due to over-fishing from area residents. In the spring, fishing typically occurs in Tunkwa and Leighton Lakes as well as the outflow of trout lakes during the spawning period. Salmon fishing usually occurs in the summer. Preparation for fishing is important to Skeetchestn people, with ceremonial activities such as drumming and prayer song completed first. This is a way to show respect for the river, fish, and rocks (Skeetchestn Website, n.d.). The Deadman River watershed is of critical importance to the SIB, given its proximity to the Skeetchestn community (SSN Affidavits, 2011).

Information on the frequency and duration of fishing activity was unavailable at the time of writing.

Fishing Summary

Table 8.5-6 summarizes species, harvesting areas, uses, and extent of CULRTP for the SSN. It is based on the information presented in the CHS and Preliminary Mitigation Report.

Table 8.5-6. Summary of Fishing Activity by SSN

Species [1]	Areas Where Traditional Fishing Occurs	Extent of Use
Rainbow Trout	Jacko Lake, Jacko Creek and its outflow, Peterson Creek (inlet, inflow creek, fly fishing, fishing from boats)	SSN continues to practice fishing rights within Jacko Lake (SSN, 2014; Ignace, 2014) (Pottinger Gaherty Environmental Consultants, on behalf of SSN, 2015).
Salmon (in particular coho, steelhead) Trout Dolly Varden	North Thompson River, South Thompson River, main stem of the Thompson River	SSN continues to practice fish harvesting in the Thompson River and an Aboriginal fishery is present.
Trout Dolly Varden Steelhead Bull trout Salmon Burbot	Kamloops Lake	Sources indicate SSN practice fish harvesting in Kamloops Lake (Tk'emlúps Website, 2014).
Rainbow trout	Lac Le Jeune	SSN continues to practice fish harvesting in Lac Le Jeune (Ignace, 2014).
Trout	Tunkwa Lake, Leighton Lake	SSN continues to practice fish harvesting in these locations (Tk'emlúps Website, 2014; Skeetchestn Website, n.d.).
Trout Kokanee (Paul Lake) Brook trout (Trapp Lake)	Paul Lake, Trapp Lake	SSN continues to practice fish harvesting in these locations.

[1] *Presence of fish species confirmed via FIDQ (Government of BC, 2015). Professional judgement and information from CHS and other sources was also considered.*

Plant Harvesting

Traditional Plant Harvests

Plant harvesting included seeds, nuts, and berries and was a critical source of vitamins and nutrients for the Secwépemc peoples. The Project site and surrounding areas historically provided a variety of plant foods and medicines and given its close proximity to the confluence of the North and South Thompson rivers and Kamloops Lake, it was a desirable harvesting location. According to Ignace (2014), the area surrounding the Project provided opportunities for early spring plant gathering because of its low elevation and it is usually snow free by February or March. Grassland areas provided some of the first fresh protein and vitamins in the Secwépemc diet after a winter diet of dried meat, fish, and plant products.

Pípsell, particularly Jacko Lake, was "preferred picking grounds" for a number of traditional medicinal plants and may be due in part to the mineral content of the soil (Ignace, 2014). Elders interviewed for the CHS noted that root plants and soapberries were also harvested near Jacko Lake (Ignace, 2014). Soapberries, or sxusem, were mentioned numerous times as a plant species that is and was harvested in the general Project area, including the areas near Jacko Lake. Soapberries are tart and create a lather when mixed. The fresh berries can be used to make "Indian Ice Cream" or fresh juice both of which provide critical vitamins and purify the blood. The leaves can also be used

to make medicinal tea (SSN Affidavits, 2011). Interviewees also recalled gathering sweet sage, squirrel tails, Indian potatoes, and other berries in the Jacko Lake area, near the Project.

Seasonal plant harvests vary depending on the time of the year. In mid to late May and June, the cambium of Ponderosa Pine and Lodgepole Pine is harvested (Ignace, 2014; Turner, 1997). In early to midsummer, different root plants may be harvested (balsamroot, nodding onion, biscuit-root, bitterroot, mariposa lily, glacier lily, chocolate lily, spring beauty) at higher elevations as the snow melted in these altitudes. Early to late summer, berries (soapberries, Saskatoon berries, strawberries, huckleberries, blueberries, cranberries) are picked at higher areas on plateaus. Important gathering areas included the slopes east of Mount Peter, Pencentén (Pinantan), the Tranquille area, Mount Lolo and Mount Tod, the Jacko Lake (Pípsell) area, and the meadows above the north shore of Kamloops Lake (Ignace, 2014). When roots were dug out, the corms were placed back in the ground so they could be harvested the following year (National Energy Board: Oral Presentation from Chief Ignace, 2014).

Important plant species harvested include:

- Black tree lichen (wile – *Bryoria fremontii*), was processed and stored for winter use as food;
- Tsets'elq or Balsamroot (*Balsamorhiza sagittata*), once abundant in the area but now restricted to a small disturbed plant community;
- Qweoewile or biscuit-root (*Lomatium macrocarpum*);
- Qwléwe or nodding onion (*Allium cernuum*);
- Li¬ts'e or sagebrush mariposa lily (*Calochortus macrocarpus*);
- Sxusem (*Shepherdia Canadensis* – soapberries);
- Ts'weΣye or Yellowbell (*Fritillaria pudica*);
- Texts'iñ or tigerlily (*Lilium columbianum*); and
- Cilcel or silverweed.

Throughout mid spring to early fall, SSN people harvested medicinal plants, along with plants used in technology to construct dwellings or develop instruments (e.g., various trees, Indian hemp and nettle, birchbark, cattails, etc.), and silverweed (a root plant). During summer, the SSN would dig for roots, such as Columbia lily, chocolate lily, balsam root, wild onion, camass, and cinquefoil. In fall, the Tk'emlúpsemc would harvest kinnikinnick berries and cottonwood mushrooms (Ignace, 2013).

Technological uses of plants were also widespread. For example, a variety of homes were constructed and used as the people moved from one area to another, collecting food. Temporary homes were made from tule, rushes, and grass that were woven into mats and placed onto a framework. The shape of the framework would vary from square to oblong. The framework would be covered with the bark of black pine, spruce, balsam, or cedar. The temporary homes would have a smoke hole centred above the fire that would be used for cooking and heating the home. Additional types of dwellings used by the Secwépemc included hunting lodges, trapping lodges, girls' lodges, women's lodges, sweat houses, and more permanent winter homes or pithouses (Ignace, 2013). Cklutetatu7s (a pre-contact village near Little Dog Creek) was one of the areas where Tk'emlúpsemc ancestors built their pithouses (Ignace, 2013; Palmer, 2005).

Secwépemc peoples may have gathered, processed, and used copper. While most of the pre-1846 copper artefacts found in the BC interior plateau are from burials, some have been found in village sites (Ignace, 2013). There have been reports of copper 'diggings' on the north shore of Kamloops Lake (Ignace, 2013). Although these locations are not in the Project vicinity, Dawson (1891) states that Copper Creek (on the north shore of Kamloops Lake) derives its name from the First Nations historical reference to the minerals located there (Ignace, 2013). Approximately half of the SSN members interviewed for the CHS recalled historic use of copper and gold including the native use of copper for trade, jewelry, or the copper breastplates found in human remains (Ignace, 2014) Copper and dentalium shells were gathered and used for ornaments and other purposes (National Energy Board: Oral Presentation from Chief Ignace, 2014).

Grasslands are valued by SSN because the grasslands played a critical role, supplying plants for medicines, technology, and spiritual and ceremonial purposes. Grasslands comprise a very small percentage of the BC land base but provided a primary SSN food source in spring, and were viewed as an "indigenous garden". SSN would utilize land management techniques such as using fire and landscape burning to promote lusher growth in grasslands, enhance plant production, repel diseases, and facilitate plant gathering along the rivers (Ignace, 2014; National Energy Board: Oral Presentation from Chief Ignace, 2014).

Current Use

Based on an ethnobotanical inventory by the SSN research team, Ignace (2014) states that 127 culturally important species are still present in the Project area. Historically, 90 of these species had medicinal uses, 45 were used as food, 47 were used technologically, six had spiritual significance, and seven were used in ceremonies (Ignace, 2014). This area has seen a large amount of introduced plants, including noxious weed species. Ignace (2014) notes that the areas near roadways, the mining pits and waste deposit areas, and the boat launch site at Jacko Lake, have been overtaken by introduced plant species, including noxious weeds.

Interviewees noted that components of Pípsell are difficult to access such as the Jacko Lake area (a desirable plant gathering location) where access is restricted due to locked gates, private property, and fences. Ignace (2014) notes that current plant harvesting is limited in the LSA because SSN people are largely restricted from accessing this area. The Secwépemc are estimated to use over 100 grassland plants for food, medicine, and technological purposes, however a number of the species in grasslands are considered endangered or threatened as a result of development (city infrastructure, mining, road construction, pipelines)and other activity (ranching, cattle, horse grazing) (National Energy Board: Oral Presentation from Chief Ignace, 2014). A landowner noted that Aboriginal people have been observed gathering mushrooms and Saskatoon berries along public roads in the area (Landowners, pers. comm., 2015). The grasslands surrounding Jacko Lake are noted to be important migration resting places for songbirds and sandhill cranes, breeding grounds for golden and bald eagles, great grey and pygmy owls, and redtailed and Swainson's hawks as well as important habitat for sharp-tailed grouse. Chief Ignace notes the grasslands contain a high level of biodiversity for different plants, medicines, foods, and animal species. However, he argues that historic and current developments (road construction, ranching, mining, and pipelines) in the Jacko Lake area have had negative effects on the area. The CHS notes there has been a substantial reduction in grasslands within the areas surrounding the Project as a result of agricultural activities.

The TteS note that Broken Top Mountain and the Heller Creek watershed are used to gather tea, blueberries, raspberries, soap berries, and small bush huckleberries (SSN Affidavit, 2011). A TteS elder noted the Heller Creek watershed is one of the last areas to access tea beds (which are very important to the culture and cannot be easily replaced). Clear cutting is believed to have negatively affected the availability of plant harvesting locations. Sage, cedar, juniper, and red willow are gathered around the Andy Lake area.

Secondary information suggests that SIB members harvest at least 14 species of berries. These include soapberries, Saskatoon berries, chokecherries, strawberries, raspberries, blueberries, huckleberries, gooseberries, blackberries, red currents, elderberry, black currents, high bush cranberries, and high/low bush blueberries. Vegetables harvested include wild onion, potato, wild asparagus, cactus, celery, wild rhubarb, mushrooms (white and pine), cows parsnip, wild pea and carrots. Tea and root plants gathered include Labrador tea, Hudson Bay tea, rose hip tea, mint tea, tiger lily bulbs, balsam bulbs, and bear roots. There are at least 32 types of medicinal plants gathered by SIB members including kinnickinnick, snowberries, cactus, spruce, juniper berries, pineapple weed, bitterroot, yarrow, prince's pine, showy aster, Oregon grape, and grouse berry. The SIB estimated that approximately 60 to 70 different species of plants including a number of root crops are collected and utilized extensively by community members. These activities were noted to occur within the traditional territory. The Criss Creek and Heller Creek areas were also noted to be of importance for gathering as is the Wood Creek, Heller Creek and Burns Lake areas (SSN Affidavits, 2011).

Information on the frequency and duration of plant harvesting activity was unavailable at the time of writing.

Plant Harvesting Summary

Table 8.5-7 summarizes some of the key plants harvested (note that this does not represent an exhaustive list).

Table 8.5-7. Summary of Plants Harvested by SSN

Species	Areas Where Traditional Harvesting Occurs	Extent of Use
Berries: • Saskatoons • Wild strawberries • Soapberries • Raspberries • Kinnikinnick • Choke cherries • Rose hips • Gooseberries • Squaw current • Hybrid Oregon grape • Rocky Mountain Juniper • Red Osier Dogwood	Jacko Lake to Lac le Jeune Cherry Creek Knutsford Greenstone Mountain	Jacko Lack area: some difficulties noted in gaining access to the 'area' due to private property and fencing which may affect extent of berry-picking (Ignace, 2014). Cherry Creek: Limited to no plant harvesting in Cherry Creek due to access restrictions including private property signs, ranching, and fencing (Ignace, 2014). Knutsford: Berry picking still occurs. Greenstone Mountain: Identified as particularly important for berry picking, especially soapberries.

Species	Areas Where Traditional Harvesting Occurs	Extent of Use
Wild Root Vegetables: • Wild onion • Yellow bells • Arrow leaved balsam root • Sagebrush mariposa lily • Burdock • Fireweed • Edible thistle • Cow parsnip • Tiger Lily • Large fruited/ Fern leaved/Narrow Leaved desert-parsley • Mountain sweet cicely • Shrubby penstemon • Water parsnip • Cattail • Qweoewile	Jacko Lake and Project area Mount Peter Pencentén (Pinantan), the Tranquille area, Mount Lolo and Mount Tod	Jacko Lack area: Some difficulties with respect to access which may limit digging root plants. Some plants are still harvested today (Ignace, 2014). For example, Sagebrush mariposa lily is noted to be "still on site" (Ignace, 2014) but in other cases abundance may be reduced. Existing disturbance and activities have dramatically reduced the quantity and quality of many of the important root crops SSN relied upon for sustenance, medicines and technology (Ignace, 2014). Other areas: Plant harvesting may still occur in other identified areas.
Other Plant foods: • Jack Pine cambium • Stinging nettles • Brittle prickly pear cactus • Field mint • Lambs quarters • Asparagus • Black tree lichen • Orange and green • Coloured wolf lichen	Project site and Jacko Lake area	Some degree of plant harvesting still occurs in the area.
Medicinal Plant Harvesting: • Yarrow • Baneberry • Short Beaked Agoseris • Saskatoon • Cut-leaved anemone • Low pussytoes • Rosy pussytoes • Wild sarsaparilla • Heart leaved arnica • Northern wormwood • Tarragon • Big sagebrush • Showy milkweed	Project site and Jacko Lake area	Harvesting likely still occurs in Jacko Lack area although some difficulties were noted in gaining access to areas due to private property and fencing which may limits medicinal plant harvesting (Ignace, 2014). There are 90 medicinal plants in the Project area (Ignace, 2014).

Species	Areas Where Traditional Harvesting Occurs	Extent of Use
Medicinal Plant Harvesting *(cont'd)* • Lady fern • Water birch • Sagebrush mariposa lily • Thompson's paintbrush • Hoary false yarrow • Fireweed • Douglas's water hemlock • Blue clematis • Narrow leaved collomia • Pale comandra • Red osier dogwood • Slender hawksbeard • Few flowered shooting star • Common horsetail • Smooth horsetail • Cut leaf daisy • Thread leaf fleabane • Linear leaved fleabane • Douglas fir • Pink wintergreen • Squaw current • Black gooseberry • Red raspberry • Willows • Lance-leaved stonecrop • Hooshum, soapberry • Menzies's campion • Birch leaved spirea • Common snowberry • Western meadowrue • Meadow death camas • Cattail • Stinging nettle • Kinnickinnick		
Grasslands	Project site	Very limited to no use due to substantial reduction in grasslands (Ignace, 2014).

Ceremonial or Other Cultural Uses

The SSN believe in an interconnectedness between all species that are linked to their worldview and culture. The CHS and Chief Ronald Ignace's testimony at the Trans Mountain Pipeline National Energy Board Hearing identify a number of sacred, ceremonial and other uses in the areas

surrounding the Project. Refer to Chapter 12 of the Application/EIS for detailed information. All of Pípsell is considered to have ceremonial and cultural values to the SSN. The identified components of *Pípsell* include Jacko Lake, Jacko Creek, Peterson Creek, Goose Lake and the Hunting Blind Complex; collectively, *Pípsell* is an important cultural landscape and place with spiritual and cultural value (SSN, pers. comm., 2014). Components of these geographic locations are described below.

Jacko Lake and its surroundings (Peterson Creek and Jacko Creek). The CHS chronicles many traditional activities that occurred in the Jacko Lake area such as root gathering, fishing and hunting in and around the lake (SSN, pers. comm., 2014). Jacko Lake was also one of several locations in Secwepemc traditional territory used to perform *Etsxem* or ritual fasting and vision quests. Ignace (2014) notes the presence of culturally modified trees in the Jacko Lake area that support stories outlining the special significance of the area to SSN people.

The oral history surrounding this area is said to be connected to the epistemological underpinning for Secwepemc *stsq'ey* (which means indigenous law) that explains the reciprocal and mutually accountable relationships between human beings and the environment (e.g. fish, birds, animals, the atmosphere and the water cycle). This relationship is illustrated in a story called the *The Trout Children*, part of the oral tradition of this area. The story explains the relations between humans and the trout people who are said to live in and under the lake. It explains how water-beings (xqelmecwetkwe) active underneath the lake are also connected to Kamloops Lake, Adams Lake, Shuswap Lake and the North Thompson River. The story is also connected to rituals and ceremonies by way of a song called Chickadee (*tsqiqse7*) which is also connected to Pípsell. The story was also connected to a Prayer Tree (which no longer exists) at the entrance to the Peterson Creek /Jacko Lake area in what is now known as Knutsford. The tree, since destroyed by development of a road decades ago, served as a medium for human communication with the sky (atmosphere) world. It was important to communicate and show respect for the land and creatures in this area. The SSN identify this area as having spiritual, cultural and ceremonial values through oral traditions, an offering tree, spiritual connections and prayers with water beings. Some cultural and ceremonial uses still occur today; however the Secwepemc people, including the SSN have been largely alienated from these lands from various agricultural and industrial activities since the 1860s. Another prayer tree is said to exist in the vicinity of Jacko Lake.

According to Chief Ignace there are three to six sharp-tailed grouse "dance houses" in the vicinity of Jacko Lake (National Energy Board: Oral Presentation from Chief Ignace, 2014). Ignace (2014) notes the presence of culturally modified trees in the Jacko Lake area to support the stories claiming the area had special significance to SSN people.

Goose Lake. Goose Lake, a geographic component of Pípsell, is noted to be an area of cultural importance to the SSN, although additional detail about ceremonial or cultural uses was unavailable at the time of writing (AIR Comments from SSN, 2014). Traditional hunting does occur at Goose Lake.

Hunting Blind Complex. A Hunting Blind (cyegmíñten ne cpixmeñten) is translated in the Secwépemc language as "piled up stones in a semi-circle at a human-made hunting ground". A Hunting Blind Complex was identified in the vicinity of Jacko Lake and it features rocks piled in a circle above and below a gulley. During the Project's Archaeological Impact Assessment (AIA) a number of petroform features were identified, which are consistent with Hunting Blinds. There are

other pertoform features and trees in the area that SSN believe to be markers. The Hunting Blind Complex includes stones that could have been used for seats, which the SSN noted may have been used during ceremonies. While the Hunting Blind Complex historically facilitated efficient game harvesting, it also provided opportunities to teach about the SSN culture, including the important roles the seasonal round, ceremonies, and prayers play.

For the SSN, culture is inextricably connected to the environment, including the activities ancestors carried out on the land. Therefore, the Hunting Blind Complex represents an area of spiritual value and connectedness for the SSN. It also poses an important area for future use, to teach the youth about the traditional hunting methods of SSN ancestors. According to the SSN, the Hunting Blind Complex is a geographic component of Pípsell and is located near key waterbodies (Jacko Lake and Peterson Creek) and valuable grasslands and game trails. During a meeting with the SSN in fall 2014, the Hunting Blind Complex and the area around it was described as an important site with cultural, historical, and spiritual value. Ignace (2014) notes that if the Hunting Blind Complex is removed, a highly significant, unique, and irreplaceable cultural resource, ideal as an aid to demonstrate and teach Stk'emlups people about their culture and practices, and their long-term, intimate connection to the land and natural world will be lost forever.

Information on the frequency and duration of ceremonial or other cultural uses was unavailable at the time of writing.

Ceremonial or Other Cultural Uses Summary

Table 8.5-8 summarizes some of the key other uses (ceremonial) for SSN.

Table 8.5-8. Summary of Ceremonial or Other Cultural Uses by SSN

Location	Types of Use	Extent of Use
Cherry Creek	Camping and sweat lodge at Cherry Creek	Based on the interview/CHS, one can assume that Cherry Creek is no longer available for camping due to access restrictions including private property signs and fencing.
Jacko Lake	Pípsell (Jacko Lake area) are considered a cultural landscape, spiritual value for prayers, vision quests	Assume the area, despite existing disturbance, still has cultural value (including Hunting Blind) as described in the CHS. A "spiritual complex" where SSN members traditionally interact with the spirit world and engage in prayer. It is believed this area connects the water people to transformation sites within the complex and may also include prayer trees, alters, the seasonal round and Hunting Blinds (SSN, pers. comm., 2014). At the time of writing, no additional information was available.
Goose Lake	Goose Lake	Goose Lake is noted to be an area of cultural importance to the SSN, although additional detail was unavailable at the time of writing (AIR Comments from SSN, 2014).
Hunting Blind	Near Jacko Lake historically used for harvesting animals and ceremonies	While the Hunting Blind historically facilitated efficient game harvesting, it also provided opportunities to teach about the SSN culture, including the important roles the seasonal round, ceremonies, and prayers play.

Background Information on Other Land Uses

This section provides an overview of other land uses within the areas of Pípsell and the larger LSA.

Location of Hunting Camps and Cabins. At the time of writing, there was no evidence of present day hunting camps or cabins in the LSA. However, the CHS notes that Pípsell (specifically the Jacko Lake area) historically supported camping for Skeetchestn and Tk'emlups peoples. Some of the members interviewed for the CHS recall the area as being used for camping while members traveled between Kamloops and Skeetchestn (Ignace, 2014). It was used as a campground for members traveling through the area and SSN members recall hearing stories of elders using this area to also process and dry meat from hunting activities. In the CHS, members note the difficulty in accessing this area as a result of roads, private property, and fencing. Cherry Creek, outside of the LSA, is also cited as a historic campground and meeting place for the Tk'emlups and Skeetchestn peoples. The area was used for sweat house ceremonies, trade, and camping. Access to this area has been hampered for decades as a result of access restrictions, private property, fencing and other activities. Historically, portions of Cherry Creek were set aside as reserve lands for the Skeetchestn people but over time the area was pre-empted by white settlers in the late 1860s (Ministry of Attorney General, 2007).

Drinking Water Sources (Permanent, Seasonal, Periodic, or Temporary). Domestic water in this region has historically been sourced from the South Thompson River, which also provided drinking water to local Aboriginal Groups and early settlers. Drinking water at the Kamloops Indian Reserve continues to be drawn from the South Thompson River but since 1998 it has been independently treated at the TteS Water Treatment Plant (TteS Website, 2015). Over 95% of Kamloops water supply, including potable water is supplied by the South Thompson River. The CHS also identifies historic use of the Thompson River as a source of drinking water by local Aboriginal groups (Ignace, 2015). The South Thompson River is outside of the CULRTP LSA and RSA as no effects are anticipated on CULRTP in that area. KAM will continue to consult with the SSN on locations of additional drinking water sources in the LSA.

Reliance on Country Foods, Including Considerations of Food Security. Game harvests make up a critical portion of the Skeetchestn diet. Estimates suggest that 25-100% of household meat supply may come from hunted game (Skeetchestn Indian Band, n.d.). Animals that are harvested (identified by Skeetchestn) include deer, moose, grouse, bear, rabbit, squirrels, muskrats, and beavers. Similarly, the TteS website notes there were three main sectors of the pre-contact economy: fishing; gathering roots and berries, and hunting (Tk'emlúps Website, 2014). The TteS website describes a traditional diet (pre-contact) that would have consisted of roughly one-third fish, one-third roots and berries, and one-third hunted meat. TteS members noted that a large portion of their diet still consists of traditional foods, however this has changed over time due to changes from industrial and agricultural activity within the traditional territory. In the Preliminary Mitigation Report, the SSN raise concerns about food security and loss of access to traditional foods in the LSA. SSN members have noted the importance of the land in providing opportunities for harvesting healthy foods to mitigate against diabetes and other diseases.

Commercial Activities. Commercial activities under taken by the SSN include:

- ***Minerals.*** There is a range of mining activity within the SSN traditional territory. This includes New Gold Incorporated's (New Gold) New Afton Project for which the SSN signed a joint participation agreement. This includes an Economic and Community Development Agreement (ECDA) with New Gold for operating the New Afton Mine that is administered through the BC Ministry of Aboriginal Relations and Resources (BC MARR). The revenue

from this agreement is focused on initiatives to enhance the social, cultural, and economic well-being of members. As of 2013, the last annual payment received was $323,000 (Tk'emlups te Secwépemc, 2013).

The CHS describes some historic use of minerals, particularly gold and copper, although no current use of minerals for traditional purposes was identified (Ignace, 2014). About half of the members interviewed for the CHS recall learning or hearing abouyt historic Secwepemc uses of copper and gold for trade, copper breastplates (found with human remains in the Stk'emlupsemc area), jewelry and possibly armor (Ignace, 2014). The Preliminary Mitigation Report developed by SSN also argues that copper was used for trade and was historically an important feature of the Secwepemc economy centuries before Europeans arrived (2014).

- ***Agriculture***. The Spiyu7ullucw Ranch, (previously the Harper Ranch) is a 500-acre historical agricultural site with freehold land pastures. The ranch has irrigated alfalfa hay and a calf/cow operation. TteS purchased the Spiyu7ullucw Ranch (Spiyu7ullucw Ranch Corporation) in 1999. The purchase added 20,000 acres of fee simple land and Crown leases to the TteS land holdings. TteS intends to use the lands for resource development and for other economic opportunities (Tk'emlúps Website, 2014).
- ***Tourism***. The location of TteS allows the First Nation to capitalize on a range of tourism opportunities. This includes the Secwépemc Museum, Heritage Park (cultural display, trails, archeological remains, and reconstructed pit houses), and the Kamloops Powwow. For the past 35 years, the TteS continues to host one of the largest Powwows in Western Canada each August. The Powwow celebrates Secwépemc culture and heritage, featuring storytelling, song, and dance in traditional regalia (Tk'emlúps Website, 2014). Approximately 20,000 people attended in 2015.
- ***Forestry.*** The TteS owns and operates its own Forestry Development Corporation to generate better value added returns from TteS timber resources. Recent projects include management of a woodlot in the Kamloops forest district, management of a fire salvage license, and jointly managed small wood licenses (Tk'emlúps Website, 2014). The TteS also has a Forestry Contribution Revenue Sharing Agreement with the Province which in 2013 earned annual revenue of $606,000. It is used to enhance the social, cultural, and economic well-being of the community (Tk'emlups te Secwépemc, 2013). In March and April 2012, the SIB and the Province of BC endorsed a FCRSA. The purpose of the agreement is to provide First Nations communities with economic benefits from the timber harvesting activities in their traditional territory.
- ***Leasing.*** As one of the largest industrial parks in Canada, the TteS has successfully developed and operated the Mt. Paul Industrial Park for the past 40 years. It currently provides commercial and industrial leases on 497 acres of designated lands. As of 2013, there were over 300 businesses located in the Mt. Paul Industrial Park. Future activity includes further developing the Park to maximize the space available for leasing (Tk'emlups te Secwépemc, 2013). In addition, the SIB has established a Wildhorse Town movie set (Skeetchestn Indian Band, 2013).
- ***Real Estate.*** The Sun Rivers Golf Resort Community is a real estate development providing an 18-hole championship golf course, walking trails, and 2,000 residential homes. It was the first geothermal community in Canada and was recognized as a finalist for the international

award for Best Development. Future development opportunities include a 200-room resort hotel, a village centre, additional land parcels for townhomes, single family lots or for the adult community, and development of tourist accommodations.

- ***Recreational Uses.*** The TteS facilitate a range of indoor and outdoor recreational activities and programs for members such as snowboarding Sk'elep School Alpine Ski Program, golfing, canoeing and kayaking camps, and speed skating (Tk'emlúps Website, 2014). There are also recreational activities for youth such as day camps in the summer, after school programs, fitness classes, archery and sports. Some of these activities may be hosted at the Youth Centre on Kamloops Road. It is unclear whether these activities occur in the LSA or RSA. Activities such as fishing at Jacko Lake, pow wows, and annual rodeos, are important to the SSN community and offer opportunities for recreation (Skeetchestn Website, n.d.; Tk'emlúps Website, 2014; Ignace, Cultural Heritage Study- Final Report, 2014). Within the LSA, SSN members also use Jacko Lake for boating activities (Ignace, Cultural Heritage Study- Final Report, 2014). Traditional land use activities also offer opportunities for recreation and exercise.

Navigation. Jacko Lake is also used for navigation (e.g., boating) to varying degrees by SSN members when harvesting fish (Ignace, 2014).

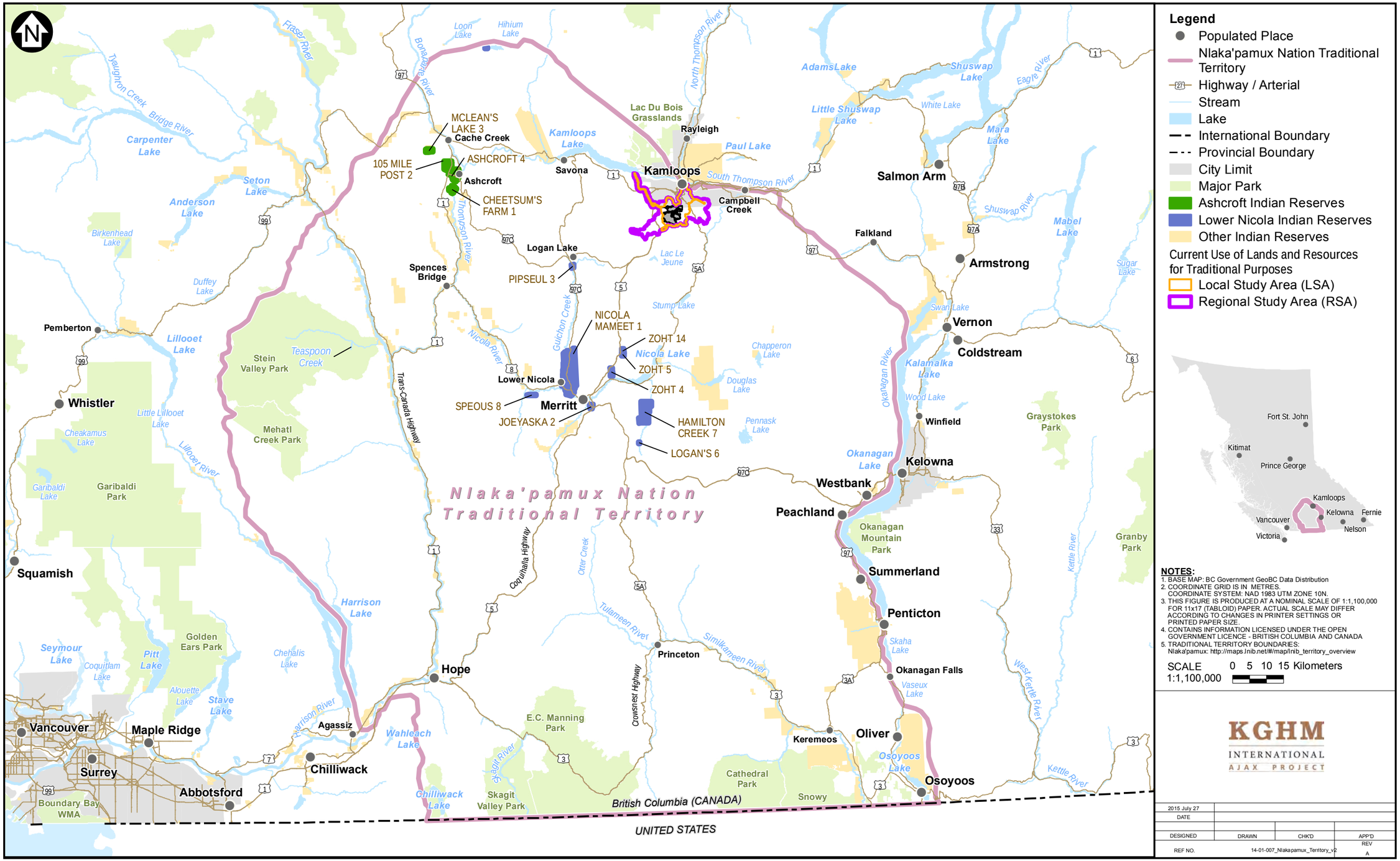
Access and Travel Routes for Conducting Traditional Practices. Prior to the arrival of horses, waterways (including the North Thompson, South Thompson, main Thompson and Fraser River- outside of the LSA) were used to travel throughout the Plateau (Ignace, 2015). Another trade route was located along the upper North Thompson by way of a portage across to Canoe River and down the Columbia to the Revelstoke area. There were also trails around Adams Lake (outside of the LSA and RSA). There was a network of trails in the SSN territory that was used by people on foot, carrying animal parts and baskets of harvested plants. Travel between Tk'emlúps and Skeetchestn followed a route along the south shore of Kamloops Lake through what is now Tobiano (formerly Six Mile Ranch). Another historic trail went from Tk'emlúps to the Fraser River, passing north of Kamloops Lake and crossing over the Criss Creek watershed (Ignace, 2015). The CHS identifies the existence of an old wagon road that went from Skeetchestn to Kamloops through the Jacko Lake area. The trail was not identified during the archaeological and heritage sites investigations, nor has current use of the trail been identified by the SSN. In addition, a historic Aboriginal trail led from Kamloops towards Trout Lake (now known as Lac Le Jeune). The trail crossed Peterson's Creek and over time became the old Highway 1 (now known as the Trans-Canada Highway).

During the twentieth century, some of these trails became part of the network of contemporary motor vehicle highways, logging roads, transmission powerlines and other developments and are difficult to find even for elders who travelled the routes as young people (Ignace, 2015).

Nlaka'pamux Nation

The Nlaka'pamux Nation traditional territory covers approximately 3,456,145 ha, of which 0.05% overlap the Project (Figure 8.5-4). The traditional territory of the Nlaka'pamux Nation extends into the United States of America. Chapter 12 of the Application/EIS provides detailed historical information on Nlaka'pamux Nation resource use.

Figure 8.5-4
Nlaka'pamux Nation Traditional Territory



Ashcroft Indian Band

The AIB is one of 17 member bands within the Nlaka'pamux Nation. The AIB is located on a number of reserves near the Village of Ashcroft (approximately 2 km) and 10 km southwest of Cache Creek (Ashcroft Indian Band Website, 2013). At the time of writing, no asserted traditional territory maps for AIB were available; however the Nlaka'pamux Nation traditional territory is presented on Figure 8.5-4. In a meeting with AIB, it was noted that the Secwépemc and the Nlaka'pamux peoples historically have strong family ties (AIB, pers. comm., 2014).

AIB stated their territory is a vast and ecologically diverse landscape with cultural values and interests inherent to Nlaka'pamux traditions. AIB members have carried and continue to carry out traditional practices and cultural heritage components throughout the traditional territory, including Kamloops and the Project area. Subsequently, during a meeting in December 2014, AIB Chief and Council stated that there is limited, if any, TLU by AIB members in the vicinity of the Project (AIB, pers. comm., 2014).

Consultation is on-going between KAM and AIB, which may yield additional information on the use of lands and resources that may potentially be affected by the Project. Where appropriate, additional information made available by AIB will be considered in on-going Project development planning.

Lower Nicola Indian Band

The LNIB is also a member of the larger Nlaka'pamux Nation. LNIB identifies the Nlaka'pamux Nation territory as a reflection of its traditional territory (LNIB, pers. comm., 2013b).

During a meeting with KAM, LNIB reported they met with TteS in April 2013 to share information on the extent of the two Nations' traditional territories in relation to the Project. LNIB noted that elders in attendance believed both traditional territories overlapped the Project area. At the time, elders noted that according to tradition, Secwépemc people could walk to the Red Bridge in Kamloops but needed Nlaka'pamux permission to cross over to the south side of the Thompson River (LNIB, pers. comm., 2013b).

Consultation between KAM and LNIB is on-going, which may yield additional information on the use of lands and resources that may potentially be affected by the Project. Where appropriate, additional information made available by LNIB will be considered in on-going Project development planning.

Cultural Context

The term 'Nlaka'pamux' means "People of the Canyon," which describes the narrow chasms where the Fraser and Thompson Rivers meet.

The Nlaka'pamux people are divided into Upper and Lower groups; currently there are 17 Nlaka'pamux member bands (Government of BC, 2014c). The Nlaka'pamux territory can also be divided into two areas; the upper area has dry grasslands along river valleys with higher elevations covered in fir and aspen and the lower area has a more coastal climate with forests of cedar and fir (Wyatt, 1998). Nlaka'pamux villages were located along the Fraser, Nicola, and Thompson rivers.

One of the most important fishing sites and trading areas was near Spences Bridge at the confluence of the Nicola and Thompson rivers (Prince, 2001).

The Nlaka'pamux Nation also has a history of farming. Their irrigation ditches suggest grasslands were used for more than herb and medicinal plant gathering, and in fact supported some degree of agricultural activity. Over time, the European ranching activities displaced the Nlaka'pamux activities and they could no longer use the grasslands as a food source so they began to work for the European ranchers, participating in industrial agriculture and in the fur trade economy, using salmon as currency (Prince, 2003).

Ashcroft Indian Band

The AIB continue to practice traditional activities such as medicine gathering, hunting, fishing, plant gathering, spiritual, archaeological, historical, and current family gathering sites. AIB members have carried and continue to carry out these practices and cultural heritage components throughout AIB traditional territory, including Kamloops and the Project area.

Lower Nicola Indian Band

LNIB members fished for salmon, hunted game, and gathered roots and berries. In the past, hunting was done in accordance with the boundaries dictated by heredity hunting grounds, meaning each family had their own region to hunt (Dawson, 1891). LNIB members engage in traditional activities in the Nlaka'pamux territory, including hunting, fishing, gathering, and camping (Lower Nicola Indian Band, 2013).

Drinking Water Sources

Domestic water in this region has historically been sourced from the South Thompson River, which provided drinking water to local Aboriginal Groups and early settlers.

Ashcroft Indian Band

The AIB is in the design and negotiation phase to obtain water from the Thompson River through the Ashcroft water treatment plant that will bring water to AIB homes and businesses on-reserve. It would replace the old well water system and provide safe drinking water (Ashcroft Indian Band Community Report 2012). At the time of writing, no additional drinking water sources (seasonal, periodic, or temporary) in the LSA or RSA were identified for the AIB.

Lower Nicola Indian Band

Domestic and irrigation water at the LNIB Reserves are drawn from a number of sources including the Nicola watershed (including the Nicola River), Chartrand Creek, Clapperton Creek, Godey Creek, Spanish Creek, Guichon Creek, Hector Creek, Meadow Creek, Shuta Creeks, and Mameet Lake (LNIB Annual Report 2014-2015; Government of BC 1999). The LNIB is responsible for four domestic water systems, two of which have reservoirs, a dam at the South end of Mameet Lake, and a waste water system. None of these water sources are within the LSA or RSA. At the time of writing, no drinking water sources (seasonal, periodic, or temporary) in the LSA or RSA were identified for the LNIB. KAM will continue to consult with the LNIB on potential drinking water sources that could be located within the LSA or RSA. LNIB is currently developing its TLU/TK study for the Project and it may identify additional drinking water sources.

Recreational Uses

Ashcroft Indian Band

The AIB Community Centre provides members with access to a comprehensive recreation program. With funding provided by Northern Development, the community centre underwent significant renovations. The centre now has the capacity to serve as a centre for social, health, and fitness in the community while also offering economic support should it be used to host events. The Nl'akapxm Eagle Motorplex, in operation for over 25 years, and provides recreational opportunities such as moto racing. It recently added a 2.1-km motocross track, which was endorsed by the BC Motocross Association of the Southern Interior (Ashcroft Indian Band Website, 2013). Consultation activities conducted with the AIB to date, have not identified recreational uses in the LSA *or the RSA*.

Lower Nicola Indian Band

LNIB offers its members a full range of summer recreation programs tailored to youth. The summer recreation program offers ballet, jazz, gym activities, swimming, golf, and arts and culture programs (including drum making), in addition to team sports (soccer, baseball and volleyball) offered through the City of Merritt (LNIB website 2015).The LNIB also operate the Shulus community arena providing winter recreational activities such as hockey and ice skating. Consultation activities conducted with the LNIB to date, have not identified recreational uses in the LSA *or the RSA*. However, the LNIB is currently developing a Project specific TLU/TK study that may identify recreational uses in the LSA *and the RSA.*

Hunting and Trapping

The grasslands were important to the Nlaka'pamux peoples because they were abundant with hunted food sources such as elk and sharp-tailed grouse. The Nlaka'pamux managed the grasslands using fire to limit sagebrush and encourage the growth of herbs. Grasses attracted ungulates to the area looking for food (Blackstock & McAllister, 2004). Nlaka'pamux peoples harvested many animals, including deer, elk, beaver, bear, duck, goose, and squirrel. These animals were used for their meat, skin, and bones (Highland Valley Copper, 2007).

Ashcroft Indian Band

Traditional land use activities remain an important activity for members, particularly elders. AIB identified that moose, deer, and grouse are hunted in the areas near Ashcroft (AIB, pers. comm., 2014).

Lower Nicola Indian Band

LNIB members still participate in traditional practices including hunting (Lower Nicola Indian Band, 2013). In a letter from LNIB, it was noted that members continue to exercise Aboriginal rights including hunting within the traditional territory. The area surrounding the Project was also noted to have significant cultural importance although no other detail was provided at the time of writing (LNIB, pers. comm., 2012). During meetings, LNIB noted that some members had hunted in the Project area in the past (LNIB, pers. Comm., 2013b). LNIB also expressed concerns about potential effects to hunting activities around Lac Le Jeune (LNIB, pers. comm., 2014).

Fishing

Fishing has been key to the Nlaka'pamux economic, cultural, and social lifestyles; the Nlaka'pamux have a rich history with respect to fish harvesting, particularly salmon. Salmon was noted to be an important source of protein during winter; the principle salmon harvested included Chinook, coho, and sockeye (Teit, 1898). Nlaka'pamux had numerous fishing sites along the Fraser River as well as other waterbodies such as the Stein River and Stein Lake area, which contain Dolly Varden, char, Rocky Mountain whitefish, rainbow trout, as well as steelhead trout, coho, Chinook, and pink salmon.

Fishing activity in the area changed drastically as a result of the Gold Rush, which disrupted delicate spawning habitat. Commercial fishing operations began on the Fraser River that further hampered Aboriginal fishing activity.

Ashcroft Indian Band

AIB noted that members harvest salmon in the Thompson River although specific locations were not provided.

Lower Nicola Indian Band

LNIB members still participate in traditional practices including fishing (Lower Nicola Indian Band, 2013). In a letter from LNIB, it was noted that LNIB continue to exercise Aboriginal rights including fishing within the traditional territory. The area surrounding the Project was also noted to have significant cultural importance although no other detail was provided at the time of writing (LNIB, pers. comm., 2012).

Personal communication with the LNIB indicate that members consider Spences Bridge, where the Thompson and Nicola Rivers meet, as an important location for salmon fishing (LNIB, pers. comm., 2013a).

Plant Harvesting

Nlaka'pamux peoples have traditionally harvested a variety of roots and plants (as described in Table 8.5-9). Traditional plant harvesting activities still continue today. The following table identifies key plants harvested by the Nlaka'pamux peoples which include 15 member bands. The extent to which LNIB and AIB harvest the plants identified is unknown at the time of writing.

Ashcroft Indian Band

Plants gathered include Hoosham, Indian celery, potatoes, and onions in the areas around Ashcroft. In fact, a course on traditional plants is being taught at Thompson Rivers University by an AIB member (AIB, pers. comm., 2014).

Other land uses include the construction of a 10-acre communal garden area with an irrigation system. The AIB plant and harvest vegetables in the garden which are shared and distributed amongst members.

Lower Nicola Indian Band

LNIB members still participate in traditional practices such as gathering berries and picking mushrooms (Lower Nicola Indian Band, 2013). In a letter from LNIB, it was noted that LNIB

continue to exercise Aboriginal rights including gathering within the traditional territory. The area surrounding the Project was noted as having significant cultural importance although no other detail was provided at the time of writing (LNIB, pers. comm., 2012). During consultation Lac Le Jeune was noted as a location where plant gathering occurs (LNIB, pers. comm., 2014).

Table 8.5-9. Nlaka'pamux Plant Harvesting

Species	Harvesting Season	Extent of Use
Nodding onions (*Allium cernuum*)	Dug in spring (April and early May)	Popular food, could be eaten raw or bundled together and steam cooked in underground pits overnight.
Arrow-leaved balsamroot (*Balsamorhiza sagittata*)	March to April	Peeled, steamed, and eaten cooked or dried; often regarded as a dessert.
Sprouts of chocolate-tips (*Lomatium dissectum)*	Early spring, especially April	Young shoots and roots consumed from the young plants (often as a starvation food).
Greens such as water parsnip stems (*Sium siave*) and "Indian celery" Cow Parsnip (*Heracleum lanatum*), also known as "Indian rhubarb" and "wild rhubarb"	Spring, especially April and May	Peeled and eaten raw, or boiled/steamed/ roasted.
Yellowbell bulbs (*Fritillaria pudica*)	Early spring	Eaten raw, boiled, or steamed.
Tiger lily bulbs (*Lilium columbianum*)	Late May and June	Boiled or steamed, often likened to a condiment or flavouring such as pepper or garlic.
Varieties of Saskatoon berries (*Amelanchier alnifolia*)	Early June to August	Very important and extensively used, typically dried. Dried Saskatoon berries were a common trade item.
Mariposa lily (*Calochortus macrocarpus*) is also known as desert lily, lavender lily, sego lily, sagebrush mariposa, "wild gladiola," and "sweet onion"	Dug in April to early June before the plants flowered	Eaten raw or cooked with other foods as flavouring.
Wild rose hips (*Rosa* spp.)	Fall to mid-winter	High in vitamin C, used to make teas, sometimes the leaves were smoked as tobacco.
Kinnickinick berries (*Arctostaphylos uva-ursi*)	Late summer to winter	Berries are eaten raw or cooked (sometimes fried in salmon oil or bear lard); leaves were used for smoking as a tobacco. The leaves were also used to make a tea for medicinal purposes.
Wild Carrot (*Lomatium macrocarpum*) also known as "Indian carrot", "Indian sweet potato", and desert parsley	Spring	Harvested for their long taproots Only the non-flowering or female plants were dug. The male plants with flowers or fruits were said to be too bitter. Cooked and consumed as a food source.
Cat-tail (*Typha latifolia*), also known as bulrush	Dug in early spring	Harvested for their starchy rhizomes, leaf blades, and young flower spikes. Said to be one of the most delicious springtime foods.
Cambium of several other trees, including lodgepole pine, black pine, ponderosa pine (*Pinus ponderosa*), trembling aspen (*Populus tremuloides*), and cottonwood (*P. trichocarpa*)	Late May or June about the time when the new needles are growing and the pollen cones are ripe	Provided Nlaka'pamux peoples vitamins and minerals.

(continued)

Table 8.5-9. Nlaka'pamux Plant Harvesting (completed)

Species	Harvesting Season	Extent of Use
Cattail (*Typha* spp.), tule (*Scirpus* spp.)	Early spring	They were used by the Nlaka'pamux peoples to make baskets, mats, sandals, rope, and building construction. Cattail is also consumed as a food source.
Black tree lichen (*A. fremontii*)	Any time of the year, although June was preferable for some groups	As an emergency food, had to be soaked and steam-cooked before it was fit to eat. It was commonly layered with wild onions in the steaming pit to add flavouring. Could be dried for later consumption.
Trees such as paper birch (*Betula papyrifera)* found in the wetter areas of the grasslands	Spring	Provided materials for the construction of baskets.
Rocky Mountain Juniper and common Juniper (*Juniperus scopulorum sarg* and *Juniperus communis*)	n/a	Used as fumigants, deodorizers, and cleaners, especially in connection with sickness. Used to make tea for medicine (for colds, tuberculosis, or heart trouble).
Douglas-fir seeds	n/a	Occasionally eaten. The young twigs and needles were used to make a tea, which has tonic properties for the treatment of colds.
Soapberry (*Shepherdia canadensis*)	n/a	Consumed as a dessert or sweet. Often made into "Indian-ice-cream" by adding water and whipping the bitter-tasting berries into a frothy mixture resembling beaten egg-white. These were sweetened with Saskatoon (*Amelanchier alnifolia*) and other berries.

Source: (Blackstock & McAllister, 2004; Turner, 1947)

Ceremonial or Other Cultural Uses

Ashcroft Indian Band

No other uses, such as cultural or ceremonial uses, were identified in the Project area by AIB.

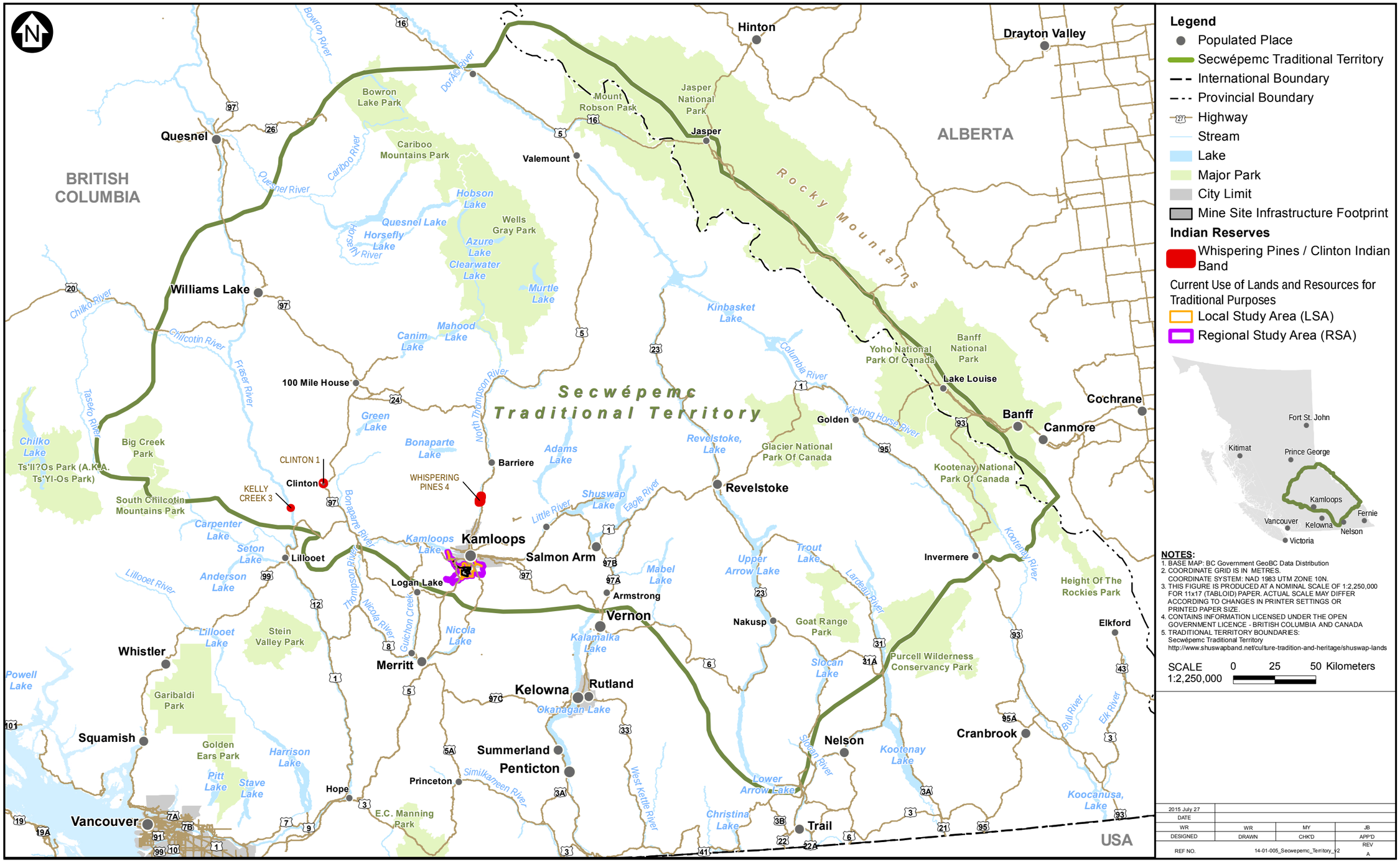
Lower Nicola Indian Band

Though many ceremonies and spiritual practices are not as common as they once were the LNIB continue to engage in ceremonies and other related activities. The area surrounding the Project was noted to have significant cultural importance although no other detail was provided at the time of writing (LNIB, pers. comm., 2012).

Whispering Pines/Clinton Indian Band

The WP/CIB are part of the Secwépemc Nation, sharing a traditional territory that ranges from the Chilcotin and Cariboo Plateaus through to Kamloops (Figure 8.5-5). The main WP/CIB reserve (Whispering Pines Indian Reserve #4) is located on the west side of the North Thompson River.

Figure 8.5-5
Secwépemc Nation Traditional Territory



NOTES:
1. BASE MAP: BC Government GeoBC Data Distribution
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:2,250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA
5. TRADITIONAL TERRITORY BOUNDARIES:
   Secwépemc Traditional Territory
   http://www.shuswapband.net/culture-tradition-and-heritage/shuswap-lands

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A Traditional Land and Resource Use Technical Report prepared for the Trans Mountain Expansion Project by Terra Environmental Consultants identifies some current land uses for the WP/CIB (Tera Environmental Consultants, 2013). Although the TK data provided is specific to sites surrounding the proposed multi-use pipeline, it can be used to infer some land uses that may also occur in areas surrounding the Project.

Cultural Context

The WP/CIB, formerly known as the Clinton Indian Band, is part of the Secwépemc Nation (Shuswap Nation Tribal Council, 2014b). Originally, the WP/CIB was situated near Clinton, BC. The Secwépemc population, once at approximately 10,000 members, was reduced significantly due to the small pox epidemic in the late 1850s (during the Gold Rush). The Whispering Pines is known as Pellt'iq't People, meaning "people of the white earth" (Shuswap Nation Tribal Council, 2014b). It is believed that the Pellt'iq't people have animal powers inherited from the Creator (Whispering Pines Indian Band Website, 2014). The main animal powers (commemorated in the logo of the Whispering Pines people) include: the bear (strength and family), the wolf (alertness and great instinct), the eagle (strength and freedom), and the fish (power to heal, alertness, family, and memory).

The extent to which current use activities occur within the LSA was unknown at the time of writing. Consultation is on-going between KAM and WP/CIB, and may yield additional information on the current use of lands and resources that may potentially be affected by the Project. Where appropriate, additional information made available by WP/CIB will be considered in on-going Project development planning.

Seasonal Round

The WP/CIB, as Secwepemc peoples, followed a seasonal round that is similar to the SSN. Historically the Secwepemc people would travel to food sources and many of these sources were only available at certain times of the year and in specific locations. For example, in the winter families would typically rely on winter stores of dried salmon, deer, elk, plants and berries. Some short trips were made to conduct ice fishing or hunting. In the Spring, the Secwepemc would pursue fresh food sources such as edible greens, cow parsnip, balsam root and Indian celery. These plants were harvested as they became available. At the end of June, Saskatoon berries would usually be ready for harvesting. Typically, other berries would be available for harvesting in July (thimble berries, strawberries, soapberries and raspberries). At the end of the summer, Secwepemc families typically began fishing for spring and sockeye salmon. September to October was when deer, elk, caribou, mountain goat, beaver, grouse and ducks were hunted (Secwepemc School District 73 n.d.). The Secwepemc peoples, including WP/CIB, continue to follow the seasonal rounds as they gather resources in the traditional territory.

Drinking Water Sources

The WP/CIB likely obtains drinking water sources for its members through the Village of Clinton Creek, which obtains its water from Clinton Creek (Village of Clinton website 2008). In November 2014, WP/CIB completed upgrades to its water and wastewater systems on-reserve. This included new water wells and reservoirs, distribution and supply lines and a pump house and treatment system. These areas are outside of the LSA and RSA.

Recreational Uses

The WP/CIB operates a Sports and Recreation Center on 80 ha of land to host and promote events such as rodeos, moto-cross (a type of off-road motorcycle racing held on enclosed circuits), private events, and conventions. It provides an opportunity for rodeos, a playgrounds, and campground facilities. The WP/CIB is planning on further developing the Sports and Recreation Center to include a concession area, a larger playground for children, a multi-purpose area, and Tipi Village (Whispering Pines Indian Band Website, 2014). Consultation activities conducted with the WP/CIB to date, have not identified recreational uses in the LSA or the RSA. However, the WP/CIB is currently developing a Project specific TLU/TK study that may identify recreational uses in the LSA and RSA.

Hunting and Trapping

WP/CIB members continue to participate in hunting and trapping activities and harvest deer (in particular mule deer), moose, and elk. The areas surrounding Whispering Pines IR #4 (which is on the west side of the North Thompson River, north of Heffley Creek) support a range of wildlife including cougar bear, coyote, lynx, bobcat, fox and badger, as well as birds including the bald and golden eagle, turkey vulture, hawk, and blue heron (Tera Environmental Consultants, 2013).

Table 8.5-10 summarizes species, harvesting areas, uses, and extent of current use for the WP/CIB.

Table 8.5-10. Summary of Hunting and Trapping Activity by WP/CIB

Species	VC	Harvesting Locations	Extent of Use
Elk Deer (especially mule deer) Moose	Mammals Land and resource use Country foods Human health	Whispering Pines Indian Reserve #4 (WP/CIB website) Areas west of the Thompson River	Elk, deer and moose harvesting likely occur near IR#4. Some deer/moose harvesting may occur in North Thompson/ Deadman Creek and Tranquille watershed areas although the extent is unknown at the time of writing.
Bear Cougar Coyote Lynx Bobcats Fox Badger	Mammals Land and resource use Country foods Human health	Area surrounding Whispering Pines Indian Reserve #4 Areas west of the Thompson River	Animal harvesting likely still occurs near IR#4 and the area west of Thompson River.
Bald eagle Golden eagle Turkey vulture Hawk Blue heron	Raptors Land and resource use Country foods Human health	Area surrounding Whispering Pines Indian Reserve #4 Areas west of the Thompson River	Animal harvesting likely still occurs near IR#4 and the area west of Thompson River. Vulture, eagles, hawks, heron may be harvested for ceremonial purposes.

Source: Tera Environmental Consultants, 2013

Fishing

Fishing continues today for the WP/CIB. The Thompson River (particularly the North Thompson River) is an important area for boating activity and also a location to catch rainbow trout, Dolly Varden, steelhead, bullhead, and sturgeon. Table 8.5-11 summarizes species, harvesting areas, and extent of current use for the WP/CIB.

Table 8.5-11. Summary of Fishing Activity by WP/CIB

Species	VC	Harvesting Areas	Extent of Use
All Salmon (in particular coho, steelhead) Rainbow trout Bullhead (secondary sources) Sturgeon (secondary sources) Dolly Varden (secondary sources)	Fish populations and fish habitat Surface water quality and quantity Country foods Human health Land and resource use Visual impact/aesthetic features	North Thompson River	Fish harvesting likely occurs in the Thompson River (although the river was noted to be dangerous for some types of salmon fishing).

Source: Tera Environmental Consultants, 2013

Plant Harvesting

Plant gathering appears to be an important activity for WP/CIB members, who harvest chokecherries, Saskatoon berries, rosehips, hawthorn berries, soapberries, raspberries, wild strawberries, thimbleberries, "black caps" (blackberries), bunchberries, skunk berries, and blueberries. Often the women gather berries and preserve them, particularly blueberries, raspberries, and strawberries. In the spring, members harvest balsam bark and devil's club. Table 8.5-12 summarizes species, harvesting areas, uses, and extent of current use for the WP/CIB.

Table 8.5-12. Summary of Plant Harvesting by WP/CIB

Species	VC	Harvesting Areas	Extent of Use
Berries Chokecherries Saskatoon berries Rosehips Hawthorn berries Soapberries Raspberries Wild strawberries Thimbleberries "Black caps" (blackberries) Bunchberries Skunk berries Blueberries	Rare plants Rare and sensitive ecological communities Grasslands Land and resource use Country foods Human health	Area surrounding Whispering Pines Indian Reserve #4 (only identified site to date) Areas west of the Thompson River	Likely that plant harvesting still occurs near IR#4 and the area west of Thompson River.
Other Plant foods: Balsam Bark Devils Club		Area surrounding Whispering Pines Indian Reserve #4 (only identified site to date) Areas west of the Thompson River	Likely that plant harvesting still occurs near IR#4 and the area west of Thompson River.

Source: Tera Environmental Consultants, 2013

Other Uses

The extent to which the WP/CIB engage in other uses, including ceremonial or cultural uses, within the LSA was unknown at the time of writing.

Métis Nation British Columbia

Métis people have a culture that is recognized by Canada as a distinct population with its own languages, history, and cultural traditions. Métis were known as "Children of the Fur Trade" because the ethnicity was born when European explorers and settlers working in the fur trade established familial relationships with Aboriginal women. The offspring produced were of mixed Aboriginal ancestry (now known as Métis). As a result, "mixed" Aboriginal people began to marry one another and a culture developed that is a fusion of European and Aboriginal. The MNBC, unlike other Aboriginal Groups, does not claim territories; instead, on behalf of their citizens, they assert rights and traditional uses over the entire province.

In 2014, KAM provided MNBC with funding to support information-sharing and engagement in the Project and to obtain feedback from Métis chartered communities in the Thompson/Okanagan region. MNBC developed a report, MNBC- KGHM/Ajax Mine Initial Project Report, December 2014 (the Initial Project Report), which provides a summary of the feedback received from members.

There are 52 Harvester Card holders in the Kamloops area. They harvest mule deer, white-tail deer, moose, grouse, migratory birds, and plants such as medicinal plants, berries, and firewood (MNBC, pers. comm., 2014). Harvester Cards grant Métis people in BC limited harvesting rights but does not authorize freshwater fishing, saltwater fishing, hunting (other than migratory birds), cutting timber or trapping (MNBC website, n.d.). It should be noted that not all Métis citizens possess harvester cards and therefore there may be more Métis harvesters within the vicinity of the Project.

The Initial Project Report notes there are five management units within the Project area. Land use activities within these areas include hunting, trapping, fishing, plant gathering (food and medicines), firewood gathering, cultural sites, spiritual practices, camping, and hiking.

During the community information sessions, Métis citizens noted concern about potential effects to Jacko Lake where some citizens may be harvesting fish. Citizens also identified Goose Lake as a plant gathering area for some citizens (MNBC, 2014). They also raised concerns about potential effects to badgers that may be present in the Project area. At the time of writing, no other TLU information for the Project area was available.

Drinking Water Sources

Given the MNBC are not tied to a specific geographic area, it can be challenging to identify drinking water sources. During consultation with MNBC, members were noted to reside in Kamloops as well as other surrounding towns (outside of the LSA and RSA). Water supplied to the City of Kamloops comes from the South Thompson River. At the time of writing, no drinking water sources (seasonal, periodic, or temporary) in the LSA or RSA were identified for the MNBC. KAM will continue to consult with the MNBC on potential drinking water sources that could be located within the LSA or RSA.

Recreational Uses

Given the MNBC are not tied to a specific geographic area, it can be challenging to identify recreational uses. Consultation activities conducted with the MNBC to date, have not identified recreational uses in the LSA or the RSA.

8.5.3 Spatial and Temporal Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for CULRTP, and encompasses possible direct, indirect, and induced effects of the Project on CULRTP, as well as the trends in processes that may be relevant.

8.5.3.1 Spatial Boundaries

The LSA and RSA are illustrated in Figure 8.5-6 and described in the text below.

Local Study Area

The LSA is the area within which Project effects are expected to occur. The LSA for the purpose of the assessment considers the middle and lower sub-catchments of Peterson Creek. As defined, the LSA encompasses components of Pípsell which includes the portions of Peterson Creek affected by the Project, Jacko Lake, Goose Lake, and the Hunting Blind Complex. Pípsell was identified by the SSN as a cultural keystone place. The LSA was selected given how water bodies within the Peterson Creek catchment are interconnected and to better understand the pathways of effects between the Project components, activities and current uses of land and resources in these areas.

Middle Peterson Creek is the area where the mine infrastructure will be developed and where effects caused by the Project will be more noticeable. Lower Peterson also has the potential to experience changes to streamflow which relates to fishing, therefore it is also included in the LSA. The LSA includes the linear developments (i.e., fresh water pipeline and power line) by applying buffers around the proposed Right-of-Way (ROW) to capture effects extending beyond the area where the linear facilities will be developed. The upper portions of Peterson Creek, including Jacko Creek, were excluded from the LSA because they are located upstream of the Project and not affected by mine infrastructure.

Regional Study Area

The RSA for CULRTP was selected based on the potential for interaction of the Project with other projects or activities and therefore for cumulative effects to occur and to provide context for the characterization of the VC. It is defined as the Peterson Creek watershed to the confluence with the South Thompson River. The RSA along the linear components also includes an additional 500 m buffer to the ones applied for the LSA along the linear components of the Project that extend outside of the Peterson Creek catchment.

8.5.3.2 Temporal Boundaries

Temporal boundaries are the time periods considered in the assessment and reflect periods during which planned Project activities are reasonably expected to potentially affect a VC. Potential effects will be considered for each phase of the Project, which are:

- Construction: 2 years;
- Operation: 23 years;
- Decommissioning and Closure: 5 years (includes project decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- Post-Closure: 5+ years (includes ongoing reclamation activities and Post-Closure monitoring).

Activities occurring during each phase are described in Section 3.

8.5.3.3 Administrative and Technical Boundaries

The assessment is constrained by the availability of information about Aboriginal Groups' CULRTP within the LSA and RSA. The information presented on current land and resource use was obtained through SSN's CHS, consultation with Aboriginal Groups (community meetings, meetings with leadership), written correspondence and secondary TK/TLU data sources. The technical limitation relates to the completeness of the information obtained through these sources and affects the confidence of predictions. For example, the TK/TLU information in the SSN CHS provides limited site specific information on harvesting locations and does not estimate the frequency or intensity of harvesting in the LSA.

In addition, confidentiality stipulations as part of SSN's CHS, prevents KAM from reproducing confidential information. KAM has obtained TK/TLU data from SSN and this was considered in the assessment. At the time of writing, none of the other Aboriginal Groups had developed TK/TLU studies for the Project.

The SSN and the LNIB have publically available asserted traditional territories which are considered in the assessment. For the WP/CIB and AIB, the Secwépemc and Nlaka'pamux traditional territories were considered respectively.

8.5.3.4 Assessment Limitations

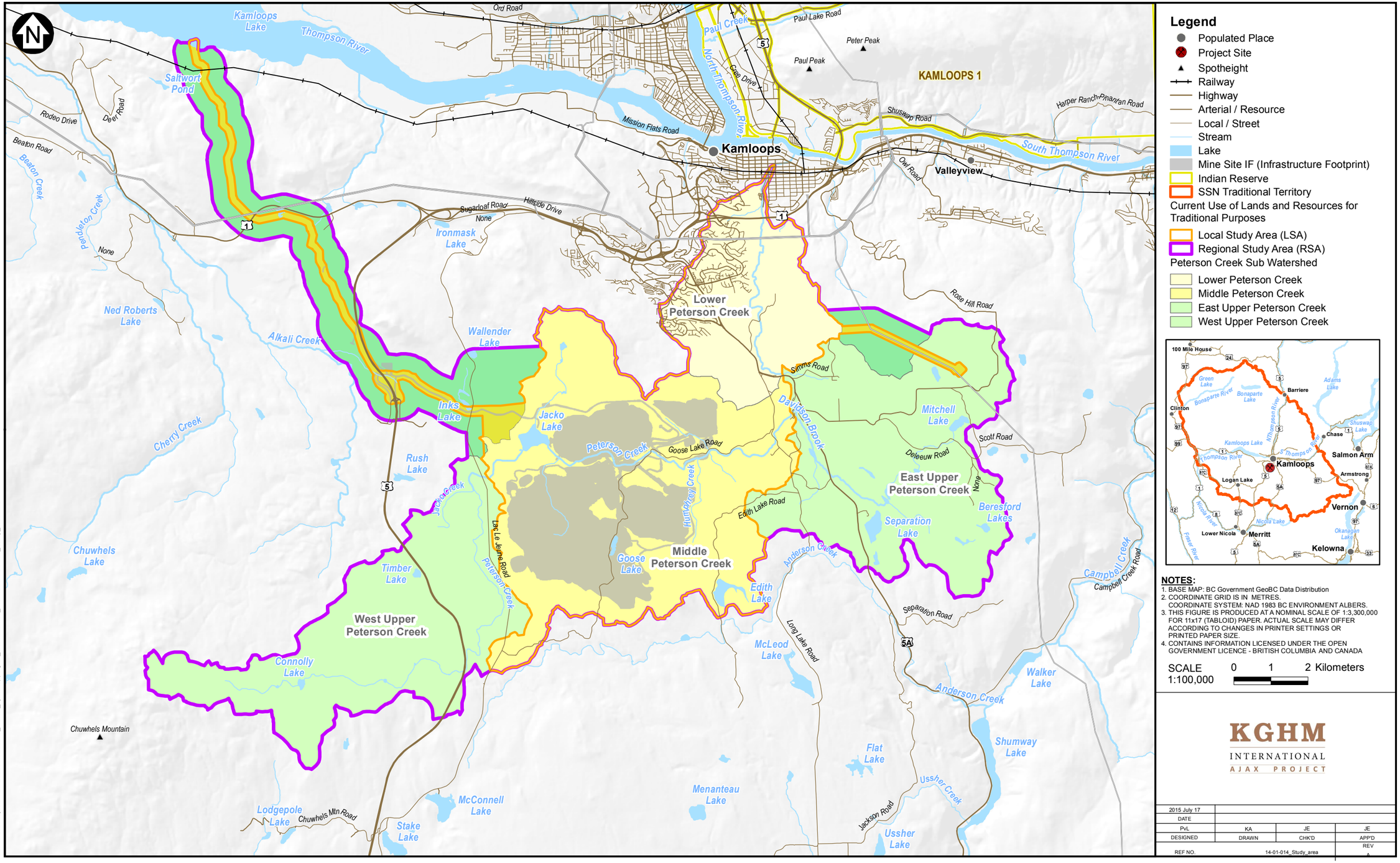
There are a number of limitations which should be considered. These include:

- Differing levels of TK/TLU data. At the time of writing, only one Project-specific TK/TLU study was available (SSN's CHS). Project-specific TK/TLU studies are the preferred source of information for an assessment of potential project effects on Aboriginal Groups' CULRTP. In the absence of completed Project-specific TK/TLU studies, the assessment and preliminary conclusions in this section are derived primarily from assumptions about Aboriginal Groups' land uses, in combination with information from the literature review, information received through the Project Aboriginal consultation program (to March 2015), past project experience and professional judgment.

Figure 8.5-6

Local and Regional Study Area for Current Use of Lands and Resources for Traditional Purposes

amec foster wheeler



Legend

- Populated Place
- Project Site
- Spotheight
- Railway
- Highway
- Arterial / Resource
- Local / Street
- Stream
- Lake
- Mine Site IF (Infrastructure Footprint)
- Indian Reserve
- SSN Traditional Territory

Current Use of Lands and Resources for Traditional Purposes

- Local Study Area (LSA)
- Regional Study Area (RSA)

Peterson Creek Sub Watershed

- Lower Peterson Creek
- Middle Peterson Creek
- East Upper Peterson Creek
- West Upper Peterson Creek

NOTES:

1. BASE MAP: BC Government GeoBC Data Distribution
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,300,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 1:100,000 — 0 1 2 Kilometers

KGHM INTERNATIONAL AJAX PROJECT

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- Distinguishing between historic and current use. In the available CHS, it is difficult to distinguish between historic and current uses.
- Cumulative effects. For the CEA, the footprints of other projects and activities are largely based on available secondary information.
- The reliance on the other VC assessments. The results of bio-physical VCs (wildlife, fish and vegetation species) has informed the assessment of current land and resource harvesting. However, relying on the results of other VC assessments in order to understand effects on current land and resource use has limitations. Firstly, this can be problematic if the key indicator species for the biophysical VCs do not adequately reflect species harvested by Aboriginal Groups. In many cases, species assessed by the vegetation, wildlife and aquatic VCs are chosen based on their status as species of management concern, rather than their traditional use potential. Where possible, we have included species of traditional use.

8.5.4 Summary of Effects Assessments from Other Valued Components

The assessment in CULRTP is informed by the assessment of various VCs, as presented in Figure 8.5-7, which residual effects influence the availability or quality of the resources harvested, the access to the locations where these resources occur, or the experience of harvesting resources or exercising ceremonial or other cultural uses.

Table 8.5-13 provides a summary of the findings from Sections 6 through 10 of the Application/EIS that may influence CULRTP. This summary includes effects on each of the various important geographic components of Pípsell, including Jacko Lake, Jacko/Peterson Creek, Goose Lake, and the Hunting Blind Complex. The table provides a directory as to where other information regarding the important geographic places can be found throughout the Application/EIS.

8.5.5 Potential Effects of the Project and Proposed Mitigation for Current Use of Lands and Resources for Traditional Purposes

This section identifies the potential effects resulting from the Project (Construction, Operation, Decommissioning and Closure, and Post-Closure phases). It also describes measures to mitigate the potential adverse effects.

8.5.5.1 Identifying Potential Effects on Current Use of Lands and Resources for Traditional Purposes

Effects Included for Assessment

The potential effects considered for the assessment are the ones related to activities that will affect the availability or the access to resources that Aboriginal Groups harvest. Sensorial disturbances such as dust, noise and visual effects will be considered together with any changes to the quality of the fish, plants or animals that are harvested for human consumption. Table 8.5-14 identifies Project activities that have the potential to interact with CULRTP. When interactions are identified, these have been rated as negligible, minor, moderate or key. The potential effects are described below and further summarized in Table 8.5-15, which also presents how the effect would be measured in order to come up with a determination of the magnitude of the expected change.

Figure 8.5-7

Inputs to Current Use of Lands and Resources for Traditional Purposes Valued Component

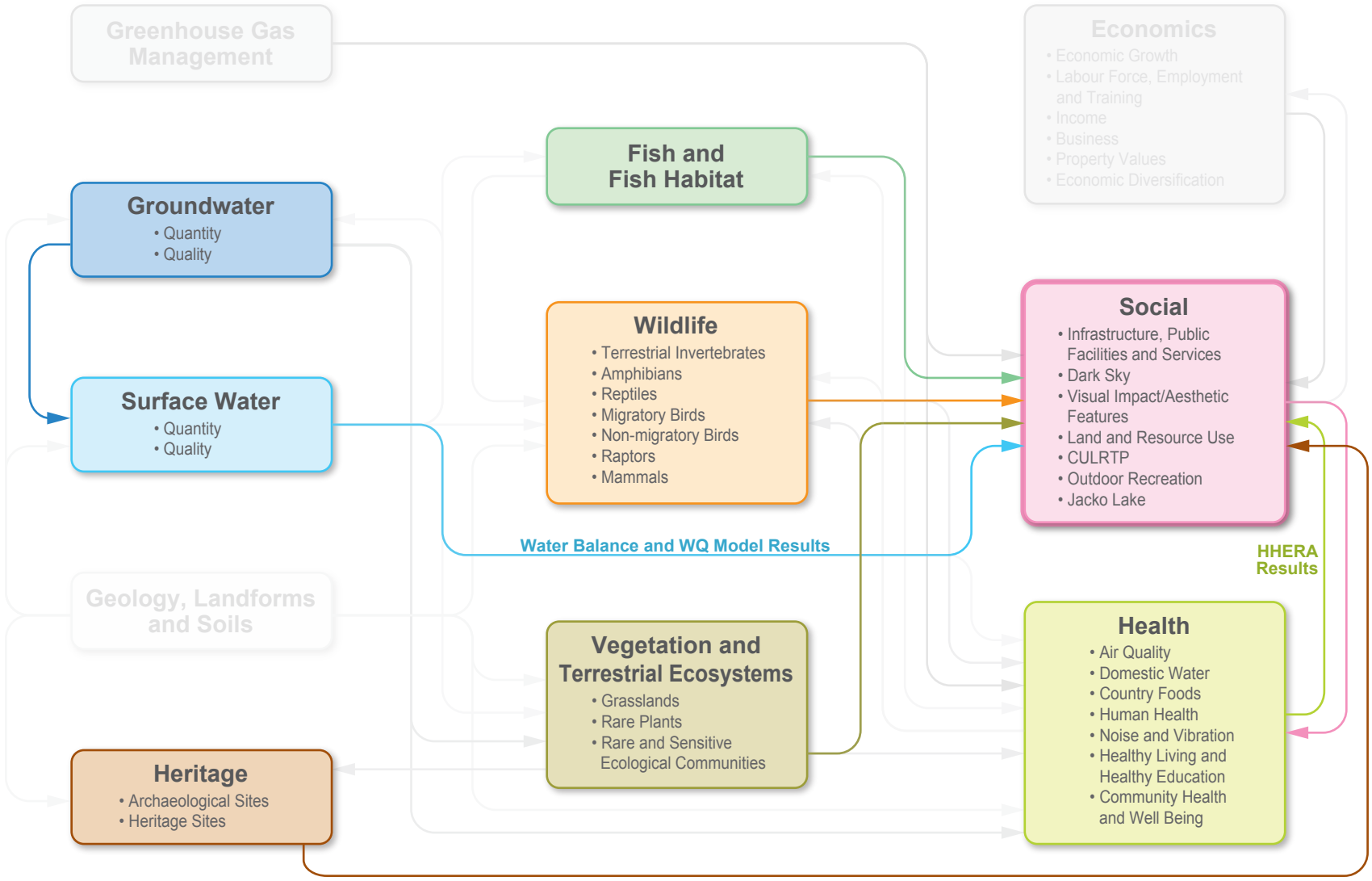


Table 8.5-13. Summary of Effects Assessments from Other Valued Components

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Surface water quality	Section 6.3	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake)	Effects on increase soil erosion and sediments to Jacko Lake and Peterson Creek from clearing, grubbing and earthworks activities, and reclamation activities. Effects from development of open pit contributing to dust in the atmosphere. Effects from contact water: metal leaching and seepage into Jacko Lake and Peterson Creek from project facilities (i.e., TSF and EMRSF). Effects on Humphrey Creek due to seepage from the SMRSF and runoff from the reclaimed SMRSF and reclaimed TSF.	No residual effects identified for Jacko Lake since no parameters are predicted to exceed the water quality guidelines, water quality benchmarks, or science based environmental benchmark in the Base Case or in any of the sensitivity case models. Residual effects for Peterson Creek include contact water (metal leaching and seepage). Rated as Not Significant (minor) for PC02.3 and Not Significant (moderate) for PC02. Residual effects for Humphrey Creek include contact water (metal leaching and seepage). Rated as Not Significant (moderate).	
Surface water quantity	Section 6.4	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake)	Effects on streamflows in Jacko Lake from reduction of surface runoff and baseflows due to construction of the WMRSP and Pond 1. Effects on streamflows in Peterson Creek (Lower) from reduction of surface runoff and baseflows. Water table within pit excavation will be lowered as a result of dewatering throughout mining. Surface runoff from reclaimed MRSF's will be captured in evaporation ponds. Effects on peak flows in Peterson Creek (Lower). Inflows to Jacko Lake will be managed by pumping around the Open Pit and Central Pond; however, these pumped flows will be unable to simulate existing lake spillway flows given constraints on pumping capacity. Effects on Kamloops Lake acting as a source of make-up water, including the filling of the TSF pond for start-up.	No residual effects identified for Jacko Lake since inflows to Jacko Lake are considered non-contact water and these flows will be managed by the Peterson Creek Diversion. Residual effects for Peterson Creek (Lower) include potential decrease in annual flow volume and low flow. Rated as Not Significant (moderate). Residual effects on Peterson Creek (Lower) also include potential flattening of monthly flow distribution and decrease in peak flows. Rated as Not Significant (minor). Residual effects on Kamloops Lake include flattening of monthly flow distribution, decrease in peak flows, decrease in annual flow, volume, and decrease in low flow. Rated as Not Significant (minor).	Cumulative effects on Kamloops Lake potentially resulting from interaction with the New Afton mine use of Kamloops Lake as a source of make-up water. Rated as Not Significant (minor).

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Fish and fish habitat	Section 6.7	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake)	Effects on direct loss of fish and fish habitat due to project activities during Construction and/or Operation, including Peterson Creek bridge construction, use, and maintenance, loading, hauling, and deposition of mine rock, TSF development, development of MRSF (operation), pipeline utility corridor (potable water, sewage, and site water), water intake from Kamloops Lake, open pit development. Effects of changes in hydraulic conditions (water velocity, water depth, wetted width) associated with changes in surface water on fish and fish habitat in Peterson Creek downstream of the Project footprint and Kamloops Lake downstream of the Project area as a result of use of the water intake from Kamloops Lake. Effects on increased mortality in Peterson Creek and Jacko Lake due to increased fishing pressure, project activities such as blasting, instream works, entrainment or impingement on the freshwater intake in Kamloops Lake or the Peterson Creek Diversion intake in Jacko Lake, and fish stranding and isolation. Sub-lethal effects on Jacko Lake and Peterson Creek such as altered water chemistry, altered sediment quality, altered primary productivity, and behavioural changes resulting from increased noise and artificial light.	Residual effects for direct loss of habitat in northeast arm of Jacko Lake from open pit development affecting the productivity of the fish population. Rated as Not Significant (minor). Residual effects for direct loss of habitat in Peterson Creek from open pit development affecting the productivity of the fish population. Rated as Not Significant (minor). Residual effects for indirect habitat loss in Peterson Creek downstream of the Project area associated with flow reductions from Project footprint and contact water. Rated as Not Significant (moderate). Residual effects for fish mortality in Jacko Lake associated with changes in pressure from blasting. Rated as Not Significant (minor). Residual effects for fish mortality in Jacko Lake associated with changes in pressure from installation of the sheet pile dam for open pit development. Rated as Not Significant (minor). Residual effects for sub-lethal effects on fish populations in Peterson Creek downstream of the Project area associated with change in water temperature and primary productivity from reduced flows resulting from Project Footprint and contact water. Rated as Not Significant (minor).	Cumulative effects on fish populations (sub-lethal effects) from altered primary productivity Project footprint and contact water reducing stream flow, and interactions with other activities such as agriculture that causes nutrient runoff into receiving watercourses. Rated as Not Significant (minor).

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Rare plants	Section 6.8	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat alteration resulting from fugitive dust, introduction of invasive species, and contamination of rare and traditional plants. Effects on habitat loss, loss of known rare plant occurrences, and loss of rare plant macrohabitat resulting from clearing and/or grubbing, earthworks and water management dams.	No residual effects for habitat alteration since implementation of management and monitoring plans associated with fugitive dust, invasive species, and hydrological changes is anticipated to mitigate for the adverse effects. Residual effects for loss of known rare plant occurrences, loss of rare plant macrohabitat due to clearing and/or grubbing, and earthworks. Rated as Not Significant (moderate).	Cumulative effects on loss of rare plant habitat, and of rare plant occurrences, resulting from clearing/grubbing and earthworks and interaction with projects/activities in the region (i.e., Kamloops Forest District, Agriculture, city expansion, Kinder Morgan Pipeline). Data deficient with poor understanding of the potential impacts of other projects and activities on rare plants.
Rare and sensitive ecological communities	Section 6.9	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat alteration resulting from fugitive dust, introduction of invasive species, and contamination of wetlands. Effects from chemical hazards resulting from waste transport, concentrate transport, and sewage infrastructure, as well as site road use. Contact water (metal leaching and seepage) may also result in chemical hazards. Effects on habitat loss resulting from clearing and/or grubbing, earthworks and water management dams.	No residual effects for habitat alteration since implementation of management and monitoring plans associated with fugitive dust, invasive species, and hydrological changes is anticipated to mitigate for the adverse effects. No residual effects for chemical hazards since no dissolved metals modelled in Jacko Lake, Peterson Creek and Humphreys Creek are expected to reach levels sufficient to cause toxicity effects to wetland associated plant species. Residual effects for habitat loss resulting from clearing and/or grubbing, earthworks and water management dams. Rated as Not Significant (moderate).	Cumulative effects on habitat loss, including loss of listed communities, wetlands, old growth forest, and rock outcrops, resulting from interaction with projects/activities in the region (i.e., Kamloops Forest District, Agriculture, city expansion, Kinder Morgan Pipeline). Rated as Not Significant (minor).

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Grasslands	Section 6.10	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat alteration resulting from fugitive dust, introduction of invasive species, and contamination of grasslands. Effects on habitat loss resulting from clearing and/or grubbing, earthworks and water management dams.	No residual effects for habitat alteration since grasslands are already considered moderately altered. Residual effects for habitat loss resulting from clearing and/or grubbing, earthworks and water management dams. Rated as Not Significant (moderate).	Cumulative effects on habitat loss, loss of grasslands resulting from interaction with projects/activities in the region (i.e., Kamloops Forest District, Agriculture, city expansion, Kinder Morgan Pipeline). Rated as Not Significant (minor).
Migratory birds	Section 6.14	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat loss resulting from clearing and/or grubbing and earthworks. Effects on habitat alteration resulting of result of fugitive dust deposition, soil compaction, and invasive species introduction. Effects on sensory disturbance resulting from loud construction-related project activities. Noise sensory disturbance include drilling and blasting, public and site road realignment/construction, use and maintenance, crushing waste rock, and loading, hauling and deposition of waste rock. Light disturbance include Project lighting, which will take place in the Construction and Operation phases. Effects on disruption of movement affecting wildlife movement due to Project related activities, such as excavation of the mine (movement barrier) or road construction (corridors). Effects on direct mortality due to vehicle/machinery use on roads, individuals getting killed while their habitat they are in is being removed, and individuals having an unexpected interaction with an anthropogenic feature.	No residual effects for habitat alteration, disruption of movement, direct/indirect mortality, wildlife attractants, and sensory disturbance due to negligible to low impact on migratory birds. Residual effects for habitat loss include reduction in the amount of available habitat resulting from clearing and/or grubbing. Rated as Not Significant (moderate). Residual effects for chemical hazards on waterfowl, Sandhill cranes, and great-blue herons include exposure to selenium, molybdenum and other elements resulting from contact water. Rated as Not Significant (minor).	Cumulative effects on habitat loss resulting from clearing/grubbing and earthworks and interactions with construction of other project infrastructure (i.e., Kamloops Forest District, Agriculture, city expansion, Kinder Morgan Pipeline). Rated as Not Significant (minor). Cumulative effects on chemical hazards resulting from contact water and interactions with the TSF at the New Afton mine, leading to multiple sources of chemical hazards within the RSA. Rated as Not Significant (minor).

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
			Effects on indirect mortality due to increased access for hunting or poaching, from range shifts leading to increased resource competition between individuals, or from increased hunting pressure by natural predators. Effects on wildlife attractants due to increase odours, food waste, sewage, garbage, and stored chemicals from construction crews and camps. Effects on chemical hazards due to wildlife ingesting, inhaling, or absorbing chemicals from improperly stored substances, dust on soil or vegetation, or bioaccumulation from prey. Contact water (metal leaching and seepage) may also negatively migratory birds.		
Non-migratory gamebirds	Section 6.16	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat loss resulting from clearing and/or grubbing and earthworks. Effects on habitat alteration resulting of result of fugitive dust deposition, soil compaction, and invasive species introduction. Effects on sensory disturbance resulting from loud construction-related project activities. Noise sensory disturbance include drilling and blasting, public and site road realignment/construction, use and maintenance, crushing waste rock, and loading, hauling and deposition of waste rock. Light disturbance include Project lighting, which will take place in the Construction and Operation phases. Effects on disruption of movement affecting wildlife movement due to Project related activities, such as excavation of the mine (movement barrier) or road construction (corridors).	No residual effects for habitat alteration, disruption of movement, direct/indirect mortality, wildlife attractants, and chemical hazards due to negligible to low impact on grouse. Residual effects for habitat loss include loss of suitable habitat and known lek sites resulting from clearing and/or grubbing. Rated as Not Significant (moderate). Residual effects for sensory disturbance include decreased usage or abandonment of nests resulting from road noise/drilling and blasting/loud Project activities. Rated as Not Significant (moderate).	Cumulative effects on habitat loss resulting from clearing/grubbing and earthworks and interactions with construction of other project infrastructure (i.e., Kamloops Forest District, Agriculture, city expansion, Kinder Morgan Pipeline) leading to loss of leks and suitable growing season habitat. Rated as Not Significant (minor).

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
			Effects on direct mortality due to vehicle/machinery use on roads, individuals getting killed while their habitat they are in is being removed, and individuals having an unexpected interaction with an anthropogenic feature. Effects on indirect mortality due to increased access for hunting or poaching, from range shifts leading to increased resource competition between individuals, or from increased hunting pressure by natural predators. Effects on wildlife attractants due to increase odours, food waste, sewage, garbage, and stored chemicals from construction crews and camps. Effects on chemical hazards due to wildlife ingesting, inhaling, or absorbing chemicals from improperly stored substances, dust on soil or vegetation, or bioaccumulation from prey. Contact water (metal leaching and seepage) may also negatively affect grouse.		
Mammals	Section 6.17	Pípsell (Jacko Lake, Peterson Creek, Jacko Creek, Goose Lake and the Hunting Blind Complex)	Effects on habitat loss resulting from clearing and/or grubbing and earthworks. Effects on habitat alteration resulting of result of fugitive dust deposition, soil compaction, and invasive species introduction. Effects on sensory disturbance resulting from loud construction-related project activities. Noise sensory disturbance include drilling and blasting, public and site road realignment/construction, use and maintenance, crushing waste rock, and loading, hauling and deposition of waste rock. Light disturbance include Project	No residual effects for habitat alteration, direct/indirect mortality, and wildlife attractants due to negligible to low impact on mammals. Residuals effects for habitat loss on mammals (American badger, mule deer) due to removal of vegetation and habitat features from clearing and/or grubbing, and earthworks. Rated as Not Significant (moderate). Residual effects for sensory disturbance on mammals (American badger, bats) due displacement from roosts, dens, reduced ability to hunt from road noise/drilling and	Cumulative effects on habitat loss, including reduction in available habitat resulting from clearing/grubbing and earthworks and interactions with the construction of other project infrastructure. Rated as Not Significant (moderate). Cumulative effects on sensory disturbance due to loud, short duration

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
			lighting, which will take place in the Construction and Operation phases. Effects on disruption of movement affecting wildlife movement due to Project related activities, such as excavation of the mine (movement barrier) or road construction (corridors). Effects on direct mortality due to vehicle/machinery use on roads, individuals getting killed while their habitat they are in is being removed, and individuals having an unexpected interaction with an anthropogenic feature. Effects on indirect mortality due to increased access for hunting or poaching, from range shifts leading to increased resource competition between individuals, or from increased hunting pressure by natural predators. Effects on wildlife attractants due to increase odours, food waste, sewage, garbage, and stored chemicals from construction crews and camps. Effects on chemical hazards due to wildlife ingesting, inhaling, or absorbing chemicals from improperly stored substances, dust on soil or vegetation, or bioaccumulation from prey. Contact water (metal leaching and seepage) may also negatively affect mammals.	blasting/loud Project activities. Stress levels may increase and forage efficiency may decrease. Rated as Not Significant (minor). Residual effects for disruption of movement on mammals (American badger) due to inability to travel between areas of suitable habitat from clearing and/or grubbing, and earthworks. May result in increased energy expenditure/ reduced fitness/ decrease in reproductive success. Rated as Not Significant (moderate). Residual effects for chemical hazards on mammals (bats) due to ingestion of toxic water. Rated as Not Significant (minor).	noises, and traffic on project and public roads, resulting from drilling/ blasting, crushing/ hauling mine rock, road noise and increased access to other project sites/ activities. May cause difficulty in locating prey/detecting predators, may disturb roosting/ hibernating individuals Rated as Not Significant (minor). Cumulative effects on disruption of moving, including Reduced ability to travel between areas of suitable habitat resulting from clearing/grubbing and earthworks and interactions with existing motorways. Individuals may require more energy to travel within home range, or may have difficulty locating a mate. Rated as Not Significant (minor). Cumulative effect on chemical hazards, including the accumulation of toxic/ hazardous materials over time resulting from contact water and the release of hazardous materials into

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
					environment. Individuals may suffer reduced fitness or illness a result of exposure to various chemicals. Rated as Not Significant (minor).
Land and resource use	Section 8.4	Pípsell (Jacko Lake, Peterson Creek)	Effects on the City of Kamloops and TNRD, including project population growth and overlap with existing land use designations. Effects also include the perceived quality of land use in the proximity of the Project, including land used for recreational, agricultural, and residential purposes. Effects on ranching resulting from the physical presence of the Project and through various Project activities.	Residual effects for land use planning due to presence of Project and activities, which may limit the ability of City of Kamloops to achieve land use planning goals and objectives. Rated as Not Significant (moderate). Residual effects for land use planning due to presence of Project and activities, which may limit the ability of the TNRD to achieve land use planning goals and objectives. Rated as Not Significant (moderate).	n/a
Outdoor recreation	Section 8.6	Pípsell (Jacko Lake, Goose Lake), Indian Reserves and Communities	Effects on reduced opportunities as a result of changes in access due to project activities such as the removal of Goose Lake, increased traffic levels, impoundment of northeast arm of Jacko Lake, closure of Goose Lake Road, and blasting activities. Presence of the Project may preclude individuals from engaging in certain outdoor recreational activities or alter the current baseline experience. Effects on diminished outdoor recreation experience due to project activities such as the removal of Goose Lake, increased traffic levels, impoundment of northeast arm of Jacko Lake, closure of Goose Lake Road, and blasting activities. Effects on diminished outdoor recreational experience due to increase of labour force and population growth, adverse effects on	Residual effects for reduced opportunities as a result of changes to access due to activities for project development and Operation. Rated as Not Significant (moderate). Residual effects for diminished outdoor recreation experience due to activities for project development and Operation (project activities, increase of labour force and population, effects on air quality and visual and aesthetic features). Rated as Not Significant (moderate). Residual effects for reduced opportunities related to reduced resources (fish, fish habitat, and wildlife) due to activities for project development and Operation. Rated as Not Significant (minor).	n/a

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
			air quality, and adverse effects on visual and aesthetic features. Effects on reduced opportunities related to reduced resources, such as adverse effects on fish and fish habitat in Jacko Lake and effects on wildlife in relation to hunting and trapping.		
Archaeological sites	Section 9.1	Pípsell (Jacko Lake, Peterson Creek, Hunting Blind Complex)	Disturbance of known archaeological sites identified in the AIA due to activities associated with the movement, excavation, or disturbance of soil, and clearing and grubbing of vegetation. Disturbance of unknown archaeological sites, including those currently unrecorded that may be identified during ground altering activity, due to activities associated with the movement, excavation, or disturbance of soil, and clearing and grubbing of vegetation.	Residual effects for disturbance of 44 known archaeological sites resulting from ground disturbance during construction. Rated as Not Significant (minor). Residual effects for disturbance of known archaeological site EdRc-25 (Hunting Blind Complex) due to ground disturbance during Construction, resulting in impact with culturally significant features. Rated as Not Significant (moderate). Residual effects for disturbance of unknown archaeological sites during all phases of the Project. Rated as Not Significant (minor).	n/a
Heritage sites	Section 9.2	Pípsell (Jacko Lake, Peterson Creek, Goose Lake, Cherry Creek, Hunting Blind Complex)	Disturbance of paleontological sites. One small area of rocks of the Kamloops Group that may have fossil potential located along the power transmission corridor. Disturbance of Aboriginal heritage sites, including destruction of the Hunting Blind Complex (EdRc-25) and associated historic, cultural and instructional values, effects on potential burial cairns, effects on Jacko Lake, and potential effects to historic campgrounds (Cherry Creek). Disturbance of non-Aboriginal heritage sites including the location of the St. Peter's Church and built heritage associated with early settlement of the area.	Residual effects anticipated as Not Significant (minor) for the disturbance of paleontological sites, Aboriginal heritage sites, and non-Aboriginal heritage sites with the application of mitigation and management measures including site avoidance, Project personnel education, and implementation of the Heritage Management Plan and Chance Find Procedure.	n/a

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Air quality	Section 10.1	Indian Reserves and Communities	Construction activities will produce air emissions from fuel combustion for mobile equipment (direct emissions) and fugitive dust (indirect emissions). Operation activities will produce air emissions from fuel combustion for the mobile equipment (e.g., direct emissions), ore processing and concentrate handling and fugitive dust (indirect) emissions from a variety of exposed surfaces (e.g., exposed tailings, disturbed land surfaces and mine rock piles). The activities during the Closure and Reclamation and Post-Closure phases do not generate sufficient air emissions to justify a quantitative analysis using an air dispersion model.	Change in CAC concentrations rated as Not Significant (moderate). The Project will generate atmospheric emissions (i.e., particulate matter and combustion gases) during the Construction and Operation phases, which will increase the concentration of Criteria Air Contaminants (CAC) in the vicinity of the Project. The change in CAC concentrations is considered not significant (moderate) for the Construction and Operation phases. Although there are predicted exceedances for 24-hour TSP, 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentrations at the boundary of the Mine Site, the area of exceedances is small and it corresponds to undeveloped grasslands without permanent residents. In addition, the Project has a very limited effect on the air quality in the built-up urban area of Kamloops. Project effects will cease during the Closure and Decommissioning phase.	The cumulative air quality effects assessment for future projects determined that there was no Project interactions with approved, announced or foreseeable future projects. The assessed residual cumulative effect on the CAC concentrations for the Construction phase and Operation phase was considered not significant.
Domestic water quality	Section 10.2	Peterson Creek and Indian Reserves and Communities	Effects on municipal water quality due to ore dust containing traces of metals deposited to the surrounding environment. Effects on groundwater quality in the Peterson Creek aquifer, potentially influenced by Project activities over the lifetime of the mine. Effluent discharge and seepage may occur over time and eventually contact groundwater supplies.	No residual effects for domestic drinking water since change in drinking water quality represents one component of the total human health risk associated with the Project, and cannot be independently assessed for significance. Other contributing components include the consumption of country foods. The predicted change in quality to country foods and drinking water are applied in the human health VC (Section 10.4) to determine the significance of potential changes to human health risk.	n/a

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
Country foods	Section 10.3	Jacko Lake, Peterson Creek, Indian Reserves and Communities	Effects on trace metal concentrations in tissue (mammals, birds, fish, traditional plants) occurring as a result of changes in trace metal concentrations in soil and surface water. Changes in trace metal concentrations in soil driven by the Project's contribution to the deposition of metal-bearing dust to surface soil over the operational life of the mine. Effects on trace metal concentrations in surface water in the Peterson Creek watershed driven by effluent discharge and the seepage of water from mine operations, to Jacko Lake and Peterson Creek.	No residual effects for country foods since exposure to trace metals through the consumption of country foods and backyard garden produce represents one component of the overall exposure to trace metals from the Project. Refer to human health (Section 10.4) for discussion of effects from across exposure pathways.	n/a
Human health	Section 10.4	Jacko Lake, Peterson Creek, Indian Reserves and communities	Effects on air quality and human health resulting from emission and dispersion of criteria air contaminants and metals from project activities. Effects on country foods due to deposition of metals from dust onto soil as a result of project activities, affecting soil quality and surface water quality, with subsequent chemical uptake by wildlife and vegetation (Jacko Lake, Peterson Creek). Effects on drinking water and country foods due to discharges and runoff from project operations, releasing chemicals into groundwater or surface water (Jacko Lake, Peterson Creek).	Residual effects anticipated for human health (including on air quality, soil quality, surface water quality, groundwater quality, and country foods) with the application of mitigation and management measures. Rated as Not Significant (minor).	n/a
Noise and vibration	Section 10.5	Jacko Lake and Indian Reserves and communities	Effects on noise due to project activities resulting in a change in the existing acoustic environment that may affect humans and wildlife. Effects on vibration due to project activities resulting in a change in the existing vibration environment that may affect	Residual effects for noise include change in acoustic environment (increase of baseline sound level), quantified by daytime (L_d), nighttime (L_n), and day-night (L_{dn}) equivalent sound level at a receptors, resulting from Construction and Operation activities. Rated as Not Significant (minor).	Cumulative effects on noise and vibration due to noise emissions and interaction with other activities such as city expansion and growth, agriculture, ranching, and

Valued Component	Section of the Application/EIS	CULRTP Geographic Component Considered	Potential Effects	Residual Effects	Cumulative Effects
			humans, structures, wildlife, and aquatic life.	Residual effects for vibration include change in vibration environment (increase of baseline vibration level), quantified by ground vibration and air blast level at receptors, resulting from Construction and Operation activities. Rated as Not Significant (minor).	recreational hunting/ fishing practices, and existing infrastructure, resulting in change in acoustic environment, quantified by daytime (L_d), nighttime (L_n), and day-night (L_{dn}) equivalent sound level at a receptors. Rated as Not Significant (moderate).
Community health and well-being	Section 10.7	Indian Reserves and communities	Effects on the biophysical environment as a result of project activities. Effects on traffic volume over the life of the Project, particularly, Construction and Operation phases, affecting road conditions and the safety of road users. Effects on population changes during the Construction and Operation phases resulting from temporary/non-local workforce and in- and out-migration of workers. Potential risk of physicians and/or other medical professionals leaving the community. Effects on income from increased employment and disposable income. Increases in disposable income can result in increased spending on activities that are deleterious to the health, well-being and safety of individuals, families and communities. Effects on community image for the City of Kamloops.	Residual effects for change in the biophysical environment due to emissions in air and water, which may lead to human ingestion. Rated as Not Significant (minor). Residual effects for increased traffic volume and the potential for increased accidents due to transportation of people, materials and equipment to and from Project site. Rated as Not Significant (minor). Residual effects for population changes due to increase in workforce personnel resulting in increase of health care demands. Rated as Not Significant (moderate). Residual effects for community image due to the presence of the Project, causing stress and anxiety. Rated as Not Significant (moderate).	Cumulative effects on potential for increased traffic accidents due to project activities and interaction with the Kinder Morgan Pipeline. Rated as Not Significant (minor).

Table 8.5-14. Identifying Potential Project Interactions and Effects on Current Use of Lands and Resources for Traditional Purposes

	Project Activities	Potential Effects on Current Use of Lands and Resources for Traditional Purposes			
		Change in the Availability	Change in Access	Change in the Experience	Change in the Quality
Construction	Clearing and Grubbing	H	H	H	O
	Earthworks	H	H	H	O
	Overburden/Topsoil Stockpile	O	O	H	M
	Laydown Areas and Storage Yards	O	O	M	O
	Project Lighting	L	O	M	O
	Site Security and Fencing	M	H	L	O
	Fuel Storage and Filling Area	O	O	O	L
	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	L
	Construction Wastes Transport, Storage, and Disposal	O	O	O	L
	Sewage Infrastructure and Disposal	O	O	O	L
	Public Road Realignment, Use, and Maintenance	M	H	L	O
	Site Road Construction, Use and Maintenance	O	O	M	M
	Peterson Creek Bridge Construction, Use, and Maintenance	L	L	L	L
	Site Buildings and Process Plant	O	O	M	M
	Explosives Magazine and Storage Facilities	O	O	M	M
	Open Pit Development	O	O	H	M
	Drilling and Blasting	O	O	H	M
	Crushing Waste Rock	O	O	H	M
	Loading, Hauling, and Deposition of Waste Rock	O	O	H	M
	Temporary Ore Stockpile	O	O	H	M
	Tailing Storage Facility Development	O	O	H	M
	Power Transmission, Distribution	O	O	L	O
	Natural Gas Line	O	O	L	O

	Project Activities	Potential Effects on Current Use of Lands and Resources for Traditional Purposes			
		Change in the Availability	Change in Access	Change in the Experience	Change in the Quality
Construction *(cont'd)*	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	O	O	L	O
	Water Intake from Kamloops Lake	O	O	L	O
	Fire Suppression Infrastructure	O	O	L	O
	Contact Water	M	O	O	L
	Non-contact Water	M	O	O	O
	Peterson Creek Diversion	M	O	O	O
Operation	Water Management Dams	H	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	O
	Contracted Employment	O	O	O	O
	Open Pit Development	H	O	H	M
	Drilling and Blasting	O	H	H	M
	Hauling Waste Rock and Ore from Pit	O	O	H	M
	Crushing and Conveying Ore	O	O	H	M
	Temporary Ore Stockpile	O	O	H	M
	Development of Waste Rock Management Facilities	H	O	H	M
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	H	O	H	M
	Revegetation through Progressive Reclamation	O	O	O	O
	Process Plant Operation	O	O	M	O
	Deposition to Tailing Storage Facility	H	O	M	M
	Site Road Use and Maintenance (Materials, Personnel, Supplies)	O	O	L	L
	Concentrate Transport and Storage	O	O	L	L
	Explosives Magazine and Storage Facilities	O	O	O	O
	Fire Suppression Infrastructure	O	O	O	O
	Fuel Storage and Filling Area	O	O	O	O

	Project Activities	Potential Effects on Current Use of Lands and Resources for Traditional Purposes			
		Change in the Availability	Change in Access	Change in the Experience	Change in the Quality
Operation (*cont'd*)	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	L
	General Wastes Transport, Storage, and Disposal	O	O	O	L
	Sewage Infrastructure and Disposal	O	O	O	L
	Laydown Areas and Storage Yards	O	O	M	O
	Power Transmission, Distribution	O	O	L	O
	Project Lighting	L	O	M	O
	Site Access, Security and Fencing	M	H	L	O
	Water Intake from Kamloops Lake	O	O	O	O
	Contact Water	M	O	O	L
	Non-contact Water	M	O	O	O
	Potable Water Treatment and Use	O	O	O	O
	Peterson Creek Diversion	M	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	O
	Contracted Employment	O	O	O	O
	Taxation	O	O	O	O
Decommissioning and Closure	Dismantling of Ancillary Buildings	O	O	O	O
	Pit Lake Planning	H	O	L	L
	Site Road/Bridge Decommissioning	M	O	L	L
	Tailing Storage Facility Decommissioning and Reclamation	M	O	L	L
	Waste Rock Management Facilities Reclamation	M	O	L	L
	Fuel Storage and Filling Area	M	O	L	L
	Hazardous Wastes Transport, Storage, and Disposal	O	O	O	L
	General Wastes Transport, Storage, and Disposal	O	O	O	L
	Sewage Infrastructure and Disposal	O	O	O	O

Project Activities		Potential Effects on Current Use of Lands and Resources for Traditional Purposes			
		Change in the Availability	Change in Access	Change in the Experience	Change in the Quality
Decommissioning and Closure (*cont'd*)	Laydown Areas and Storage Yards	L	L	L	L
	Power Transmission, Distribution	L	L	L	L
	Project Lighting	O	O	O	O
	Site Access, Security and Fencing	M	H	L	O
	Contact Water	M	O	O	L
	Non-contact Water	M	O	O	O
	Potable Water Treatment and Use	O	O	O	O
	Peterson Creek Diversion	M	O	O	O
	Road use to the Project (Materials, Personnel, Supplies)	O	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	O
	Contracted Employment	O	O	O	O
	Taxation	O	O	O	O
Post-Closure	General Site Inspections and Maintenance	O	O	O	O
	Contact Water	M	H	L	O
	Non-contact Water	M	O	O	L
	Road use to the Project (Materials, Personnel, Supplies)	L	O	O	O
	Mine Staffing (Direct Employment)	O	O	O	O
	Contracted Employment	O	O	O	O

Notes:

O *No interaction anticipated.*

L *Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*

M *Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*

H *Key interaction; warrants further consideration.*

Table 8.5-15. Effects Included for Assessment

Potential Effect	Definition of Project Effect	Measurement of Project Effects
Change in the availability of harvested resources	Construction, Operation and Decommissioning and Closure of the Project may change habitat through direct habitat loss due to the upgrading of the access road or site clearing and preparation or indirect habitat loss through sensory disturbance such as noise or human presence. Project activities may also change mortality risk through increased access by humans or predators resulting in increased mortality risk. Mortality risk may also be increased due to project traffic along the access road.	Quantitative changes in fish habitat (estimation will be based on fish habitat losses in surface area of fish habitat losses-m^2) Quantitative changes in wildlife habitat for preferred harvested species (estimation will be based on habitat suitability modeling conducted as part of the wildlife effects assessment) Changes in wildlife mortality as a result of the Project Quantitative change in habitat for preferred harvested plants (estimation will be based on the terrestrial ecological mapping) Areas described in hectares (ha) and as a percentage of the traditional territory
Change in access to land/resources	During Construction, Operation, and Decommissioning and Closure of the Project may change access to harvest areas preventing Aboriginal harvest and result in the loss of opportunities to harvest.	Changes in access to preferred harvesting areas (qualitative) Descriptions of areas where access by non-Aboriginal users may increase, generating competition for resources Descriptions of potential restrictions or obstructions to preferred resource harvesting areas (qualitative)
Change in the experience of using lands and resources (sensory disturbances)	Noise from the Project and the visibility of the Project during Construction, Operation, and Decommissioning and Closure may affect the enjoyment or quality of experience for Aboriginal harvesters.	Qualitative changes in the visual experience of using the land and resources Quantitative effects due to potential noise disturbances
Changes in the quality of resources	Construction, Operation and Decommissioning and Closure of the Project may change the health of hunted, trapped or fished species, and vegetation harvested by Aboriginal Groups due to fugitive dust, water contamination from accidental spills, and bioaccumulation of contaminants of potential concern (COPCs) through the food chain. Fishing, hunting, trapping and gathering by Aboriginal people in the Project area may be curtailed due to perceptions that the quality of harvested resources in the Project area has changed.	Quantitative changes in human health related to dust deposition, air quality, and water quality changes

The Project has the potential to generate effects on the availability of resources from the onset of the Construction phase through Operation, Decommissioning and Closure, and during Post-Closure. The Project will generate habitat losses associated with the clearing of vegetation required for the Construction of Project related infrastructure. The availability of fish, plants and wildlife in the areas where suitable habitats are lost will change during the Construction phase and this effect will persist during the Operation phase while mine facilities expand to accommodate the waste rock and tailing resulting from mining and ore processing. The Project will generate fish habitat losses associated the Project Footprint development in Peterson Creek and the loss of the northeast arm of Jacko Lake. The losses in availability of resources will be mitigated by re-vegetation activities that will be implemented during the Operation phase (i.e., progressive re-revegetation) and most importantly during the Decommissioning and Closure phase when Project activities are focussed on restoring the land to an acceptable long-term use objective. There is the potential that during the Post-Closure phase some areas of the Project could not be restored to a condition that would be suitable for activities such as fishing, hunting or trapping or other uses; therefore the potential for losses in availability of resources could extend during the Post-Closure phase and become permanent.

Because of the need to protect the health and safety of the public, access to the Project will be restricted during the Construction and Operation phase. As closure measures are implemented and areas of the Project are rehabilitated, access could be allowed for activities such as plant harvesting or hunting may be reinstated, provided that it is safe and that closure objectives are achieved.

Sensorial disturbances such as noise or dust and visual effects have the potential to affect activities such as fishing, hunting, plant harvesting and other uses of the land and resources. Noise and dust would occur mainly during the Construction and Operation phases of the Project but would greatly diminished during the Decommissioning and Closure and Post-Closure phase. Visual effects would persist during the Decommissioning and Closure and Post-Closure phase (although it will diminish during the Post-Closure phase due to revegetation and blending with the landscape) because some of the Project components such as the mine rock storage facilities and the TSF. These will remain as permanent elements of the landscape but not in the same state as during Operation because the areas will be reclaimed and revegetated.

The quality of the fish, plants and animals that Aboriginal Groups harvest has the potential to be affected due to exposure to contaminants that would be generated by the Project during the Construction and Operation phases. The pathways through which contaminants could affect fish, plants, animals and ultimately humans include ingestion or inhalation. These potential effects will be considered in the assessment, which will be informed by the human and ecological risk assessment done for the Project.

8.5.5.2 Other Potential Effects

The Project has the potential to generate effects that do not fall within the temporal or spatial boundaries proposed for this assessment because they relate to intangible elements of culture such as language or identity. This section acknowledges the potential for effects and proposes mitigation to mitigate these effects.

Disruption of the Seasonal Round

The CHS (2014) identifies five major seasons as part of the seasonal round:

- early spring (snow melting);
- mid-to-late spring (root gathering);
- summer (berry and high elevation root and medicinal plant gathering);
- late summer to early fall (salmon season); and
- mid to late fall (hunting season).

Mid-to-late spring is identified as **root gathering** time in the seasonal round. Jacko Lake was historically an important location for plants and root gathering often providing the first plant foods of the season. The Project affects a relatively small area (north east arm of Jacko Lake) and will not impede plant gathering around the south sides of Jacko Lake. Access to Jacko Lake will be maintained similar to current conditions. During the Operation phase, Project activities such as drilling, blasting, ore hauling and disposal of mine rock and tailings will be executed on a continuous basis, therefore there are not specific Project activities that would affect mid-to-late spring practices in a different manner compared to other seasons. The Mine Site will not be available for root gathering practices, sensorial disturbances such as dust, noise and visual changes will occur. Mitigation through habitat rehabilitation will be implemented during the Decommissiing and Closure phase, and once Decommissioning and Closure objective are achieved access to the Mine Site will be restored similar to current conditions, with the exception of the open pit area where access will not be restored.

Jacko Lake is typically ice-free in mid-April, and provided an early trout run and the first fish protein of the seasonal round (Ignace, 2014). The ability to continue **s**pring fishing in Jacko Lake as part of the seasonal round, will continue with some modifications as outlined above. The practice of fishing rights during early spring will be subject to some restrictions in access created by the Project (i.e., blasting exclusion zone during blasting periods). Similar sensorial disturbances experienced during other seasons will also occur during early spring, but dust generation would probably be lesser due to the snow melting and unpaved road surfaces being wetter than compared to other seasons. Sediment control measures will be of particular importance during this season to deal with sediments transport generated by the snow melting which has the potential to affect water quality. To accommodate SSN's use of Jacko Lake as an early spring trout fishery, KAM will avoid construction activities within Jacko Lake during spring.

Late summer to early fall is called salmon season as part of the seasonal round. Juvenile Coho salmon have been observed in Peterson Creek at the confluence with the South Thompson River. Given that Coho salmon only use the confluence of Peterson Creek with South Thompson River, no effect as a result of the Project are anticipated on this species of fish, therefore late summer to early fall salmon harvesting of salmon will not be affected by the Project.

The ability to continue hunting in Goose Lake and Jacko Lake as part of the seasonal round, will change. During the Operation phase, Project activities such as drilling, blasting, ore hauling and

disposal of mine rock and tailings will be executed on a continuous basis, therefore there are not specific Project activities that would affect mid to late hunting practices in a different manner compared to other seasons. During Operation, the Mine Site will not be available for hunting practices, sensorial disturbances such as dust, noise and visual changes will occur. Mitigation through habitat rehabilitation will be completed during the Decommissioning and Closure phase, and once Decommissioning and Closure objective are achieved access to the Mine Site will be restored similar to current conditions, with the exception of the open pit area where access will not be restored.

The estimated duration of the Construction phase of the Project is approximately 30 months or two and a half years. Given this duration, construction activities have the potential to overlap with all seasonal round activities listed above, but to a different degree compared to the Operation phase, as the quantities of drilling, blasting and overall earth movement activities will be lower. Access to the Mine Site will be restricted during the entire Construction phase for health and safety reasons, therefore plant gathering or hunting activities will not be possible within the Mine Site. During the Construction phase the open pit development activities will be confined to areas within close proximity of the historic open pit boundaries, therefore air quality and noise effects originated by the open pit will be of lower magnitude compared to Operation when some mining activities take place in closer proximity to the mine site boundaries. The TSF embankment development will start during the Construction phase and air quality and noise effects will be perceived off-site but will not prevent plant gathering or hunting activities in areas immediately adjacent to the Mine Site. Also, during the Construction phase a dyke (sheet pile and dam) will be constructed allow the removal and relocation of the Kinder Morgan Pipeline. During this period of approximately two months, access to NE section of the Jacko Lake will be restricted and noise effects will be perceived by lake users; but this will not prevent the practice of fishing.

Interconnectedness of Pípsell

Pípsell was identified by the SSN as a cultural keystone place. The Peterson Creek catchment is the area where the components of Pípsell are located, as noted by SSN (i.e. Jacko Lake, Jacko Creek, Peterson Creek, Goose Lake and the Hunting Blind complex). Jacko Creek, Jacko Lake and Peterson Creek are interconnected water bodies.

Jacko Creek is located in West Upper Peterson Creek and joins Peterson Creek approximately 2 km upstream of Jacko Lake. The Jacko Creek sub-catchment is not affected by any of the Project facilities but some of the facilities will be visible and noise and dust may be noticeable from Jacko Creek. Jacko Lake will be affected by the Project due to effects on the north east arm. Jacko Lake will discharge into a pipeline which will cross the Mine Site and discharge into the water in the Peterson Creek Downstream Pond, from where there will be a controlled discharge of non-contact water from Jacko Lake to the lower Peterson Creek. Noise, dust and changes to the visual landscape will be noticeable from Jacko Lake during the Construction and Operation phases, but noise and dust will greatly diminish during Decommissioning and Closure and will cease during Post-Closure.

The upper portions of Peterson Creek catchment will not be affected by the Project. Middle Peterson Creek is the section where most of the disturbances will occur given the mine facilities occupy 1,705 ha or 90% of this portion of the catchment. The connection between Upper and Lower Peterson

creek will continue artificially, as described above by allowing the discharge of Jacko Lake to reach lower Peterson Creek by pipeline and controlled discharge from the Peterson Creek Downstream Pond. The Project will cause lower than baseline flows in Lower Peterson creek because the run-off falling within the Mine Site during Construction and Operation (i.e., contact water) will be contained and used in the ore processing. During Decommissioning and Closure and Post-Closure phases when mining activities cease, there will be lower flows will continue in lower Peterson Creek (lower than baseline flows) because of the reduced catchment area within middle Peterson Creek.

Goose Lake falls within the Peterson Creek watershed but it is an isolated water body which does not discharge into the Peterson Creek main channel or any other tributaries. Goose Lake acts as an evaporation pond and has a shallow depth, therefore the lake does not support fish but it has been reported that the areas around the Lake are preferred hunting grounds. Goose Lake and the surrounding area will no longer be available and will become part of the TSF. During Decommissioning and Closure, a dry cover will be placed on the TSF pond and grassland type habitat is expected to develop.

The Hunting Blind Complex and surrounding areas fall within the boundaries of the open pit and will be removed to allow access to the ore body. Once mining activities cease the open pit will be closed and access to this area will not be allowed. The open pit will partially fill with water and a pit lake will form during the Post-Closure phase, but the slopes of the pit will not be restored as suitable habitat for wildlife nor will the pit lake support aquatic life. The open pit occupies approximately 300 ha and represents 17% of the mine footprint (and .02% of SSN traditional territory).

Disruption of Cultural Value

The Project could affect the inter-generational teaching of language or the teaching of traditional practices such as fishing, trapping, hunting, plant harvesting or ceremonial or cultural practices. This effect would be the result of working schedules conflicting with the periods of time when inter-generational teaching takes place. There is the potential for Project activities during the Construction and Operation phases to overlap with the timing of traditional activities such as hunting that ocurr during specific periods of the year (i.e., the seasonal round).

To mitigate this potential effects and as detailed information regarding intergenerational teaching and the seasonal round becomes available, KAM will make reasonable efforts to accommodate working schedules for members of Aboriginal Groups that engage in activities for traditional purposes. Also, as part of its corporate social responsibility policy, KAM will inform all employees of their duty to respect Aboriginal culture and practices.

Also, the Project could affect communal gatherings, but at the time of writing, there was not evidence that communal gatherings are taking place in the LSA. Access to the Mine Site will be re-established to current conditions during the Post-Closure phase for areas that are rehabilitated and where it is safe.

Alienation from the Land

The traditional use of lands and resources has value to Aboriginal Groups that are within the LSA and RSA but also extend to the entirety of the traditional territory. The SSN raised concerns about

potential effects from alienation from the land. This could result due to reduced opportunities to engage in activities for traditional purposes. Similar measures will be applied to mitigate this potential effect as for the disruption of cultural value and KAM will make reasonable efforts to accommodate working schedules for members of Aboriginal Groups that engage in activities for traditional purposes. Also, as part of its corporate policy, KAM will inform all employees of their duty to respect Aboriginal culture and practices.

8.5.5.3 Effects on Current Use of Land and Resources for Traditional Purposes

The Construction, Operation, and Decommissioning and Closure phases of the Project have the potential to affect current harvesting and other land use-related activities for traditional purposes as described in Table 8.5-14**.** This section will describe those interactions with a high or moderate level of interaction with CULRTP for each of the indicators: fishing, hunting, gathering, and ceremonial use.

Effects on Fishing Opportunities and Practices

Change in the Availability of Fish Species Harvested

According to the fish and fish habitat effects assessment (Section 6.7), activities during the Construction, Operation, and Decommissioning and Closure phases that may result in changes to fish and fish habitat include the following:

- During Construction and Operation, fish mortality may increase due to the ground vibrations (i.e., changes in pressure) caused by blasting in the open pit and the installation of the sheet pile dam required for the development of the open pit.
- During Construction and Operation, there may be increased fishing pressure in the LSA due to increased access by recreational fishers (i.e., employees and contractors).
- During Construction and Operation, there may be sub-lethal effects to fish population in Peterson Creek downstream of the Project caused by temperature changes and flow reductions.
- During Operation, fish habitat in the northeast arm of Jacko Lake will be lost. This portion of the lake, identified as a highly productive area for fishing, will no longer be available to fishers, potentially leading to reductions in fish and diminishing the overall fishing experience.
- During Operation, the Project will result in a reduction of mean annual discharge in lower Peterson Creek. The Fish and Fish Habitat VC assesses potential indirect habitat losses caused by flow reductions downstream of the Mine Site. In order to assess if the predicted flow regime is expected to cause a reduction in fish habitat, pre-mine and mine affected streamflow in lower Peterson Creek were compared to provincial thresholds calculated as recommended in the British Columbia Instream Flow Guideline for Fish (Hatfield et al. 2003). On an annual basis, the Project meets the threshold values; however, on a monthly basis the Project may not meet the thresholds during September to April. Importantly, predicted flows are very close meeting thresholds – the difference between the predicted flow and guideline threshold flow from September to April in lower Peterson Creek is often on the order 0.001 m^3/s, which is likely within the resolution of the water balance model and field validation measurements. Despite the threshold predictions, meso-habitat measurements

were collected in lower Peterson Creek at flows as low as those predicted during September to April and these data suggest that water depths and velocities suitable for small bodied rainbow trout will remain at these conditions. Nonetheless, indirect habitat loss associated with reduced flows was assessed as a residual effect.

- Additional habitat losses are also expected within Peterson Creek downstream of the Project associated with the establishment of the Peterson Creek Diversion.

Change in Access or Ability to Access or Use Fishing Areas

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to access or the ability to access or use fishing areas include the following:

- There is a potential effect on access to Jacko Lake due to use of the existing road by Project vehicles. This has the potential to create delays on users accessing Jacko Lake via the boat launch (north west side of Jacko Lake) which is currently the only way to access the lake.
- During Construction and Operation, safety zones will be enforced around the open pit during blasting periods, will include restricted access to fishing areas (specifically Jacko Lake). Blasting is expected to be undertaken once per day near 12:00 pm. This will create a window of approximately 2 hours during which lake users will not be able to engage in activities within the specified blasting buffer area. Time is required before the blasting to clear the blasting buffer area of people and after the blasting to ensure that the blasting has been completed satisfactorily and that there are no hazards to people. According to the current mine plan, it is expected that during the first ten years of operations this blasting buffer could extend across approximately the eastern half of the lake (Figure 8.5-8).
- During Construction, Operation, and Decommissioning and Closure, roads (a portion of Goose Lake Road) within the Mine Site will be closed affecting access. Access to Jacko Lake will continue although there will be modifications to the access road, and is proposed to be further south.
- During Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access fishing sites (Lac Le Jeune Road, Inks Lake Road).
- Potential changes in navigation waterbodies in the LSA. According to the Outdoor Recreation VC, Jacko Lake is a navigable body of water by small boat although both the inlet and outlet channels are narrow and shallow. A boat ramp area is located on the north shore of Jacko Lake and some changes to navigability are expected from the loss of the northeast arm of the lake. Petersen Creek is not considered navigable due to its width, intermittent dry periods and the presence of Bridal Veil Falls at its eastern reaches. According to the Outdoor Recreation VC, Goose Lake is not considered a navigable lake. Goose Lake is located on private land, is very shallow (up to 1 m) and is limited with respect to inflow/outflow.

Change in the Experience of Using Lands and Resources (Sensory Disturbances)

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the experience of using fishing areas include the following:

- Project-related noise disturbances during Construction, Operation, and Decommissioning and Closure. Project-related noise will be noticeable in the Jacko Lake area. Increased levels of traffic and related noise associated with the Project could also potentially diminish their experience of fishing. At Jacko Lake, the expected levels of noise will be the highest during sheet-piling activities during the Construction phase. The sheet piling activities are expected to be audible but they will take place only during the day and for a period of approximately 2 months. Noise levels are predicted to be over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" outdoor activities; however, the enjoyment of the outdoor activities may be affected. During Construction, Operation and Decommissioning and Closure, air quality deterioration particulate matter (i.e., dust) has the potential to affect the experience of fishing if dust generation by fugitive of point sources is noticeable. During Decommissioning and Closure phase, noise and air quality effects should be largely diminished. During Post-Closure, there should be no air quality of noise effects.
- Visual disturbances may result from views of Project infrastructure or activities. It is anticipated that main project components such as the mine rock storage facilities and the Tailings Storage Facility (TSF) will be visible from locations such as Jacko Lake. The predicted views from Jacko Lake and other locations are illustrated in Section 8.3 (Visual Impact and Aesthetic Features). During the Post-Closure phase, visual disturbances will be diminished due to revegetation and blending of the landscape.

Changes in the Quality of Resources

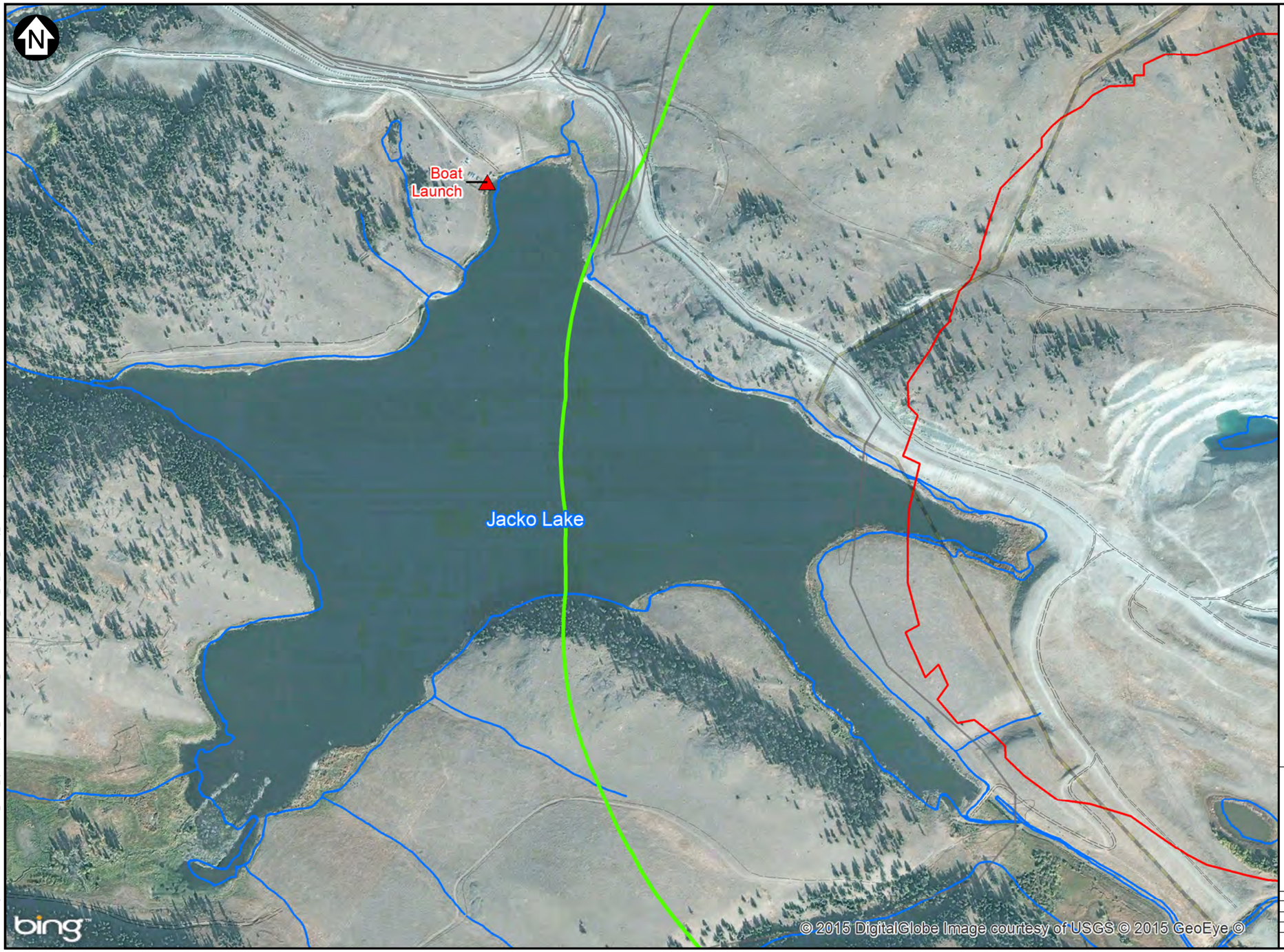
Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the quality of fish include the accumulation of contaminants generated by the Project in fish consumed by Aboriginal Groups (i.e., country foods). The human health and ecological risk assessment (HHERA) considered predicted changes in water quality resulting from the Project (Jacko Lake and Peterson Creek), to estimate the resulting implications to the quality of fish tissue for consumption. Fish consumption was one aspect of country foods considered in the calculation of total health risk.

The assessment under the human health VC (Section 10.4) does not identify mitigation measures specific to human health. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

Mitigation – Fishing Opportunities and Practices

Table 8.5-16 presents the measures proposed to mitigate potential effects on fishing opportunities and practices (CULRTP). It identifies relevant management and monitoring plans that will aim to reduce effects on CULRTP with respect to fish harvested for traditional purposes. Although there is not a standalone CULRTP Management and Monitoring Plan, there are a range of management and monitoring plans which include mitigation measures to reduce effects on the availability of resources used for traditional purposes by Aboriginal Groups, changes to access (i.e., Access Management Plan), changes to the experience (e.g., Noise Management Plan) and changes to the quality of the resource (i.e., Air Quality Monitoring Plan).

Figure 8.5-8
Health and Safety Buffer Around Open Pit



Boat Launch
Highway
Paved Road
Gravel Road
Rough Road
Recreational
Maximum Open Pit Rim
500 m Health and Safety buffer during blasting
Current Use of Lands and Resources for Traditional Purposes
Local Study Area (LSA)
Regional Study Area (RSA)



NOTES:
1. BASE MAP: BC Government GeoBC Data Distribution
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:6,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

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KGHM INTERNATIONAL AJAX PROJECT

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Table 8.5-16. Mitigation Measures for Potential Project Effects on Fishing Opportunities and Practices

Factors	Mitigation
Change in the Availability of Fish Species Harvested	Avoidance: • Mitigation and Best Management Practices Meet the recommended flow threshold for BC streams, and as needed, work with the provincial government to manage releases from the Peterson Creek Downstream Pond to meet instream flow needs. Water will be recycled to the greatest extent possible. • To mitigate potential effects of increased fishing pressure associated with the introduction of workers (who may fish in Jacko Lake) will be mitigated through no fishing policies for workers and contractors at site during their shifts. • Fish salvage will be conducted in any work areas that will be dewatered • Project components that will be constructed within the wetted areas of creeks or lakes (e.g., the northeast dyke, Peterson Creek Bridge, Kamloops Lake Water Intake) will be conducted in the dry, either by scheduling the work for low flow periods or by isolating (e.g. using cofferdams) and dewatering the work area • Blast Design includes measures to protect fish and fish habitat (described in Section 6.7) • No equipment refuelling or servicing will be undertaken within 30 m of any watercourse or surface water drainage • All hydraulic machinery entering a stream or waterbody will use hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable • Surface Water Quality Management and Monitoring Plan (Section 11.23) • Groundwater Quality Management and Monitoring Plan (Section 11.24) • Erosion and Sediment Control Plan (Section 11.2) • Metal Leaching and Acid Rock Drainage Management and Monitoring Plan (Section 11.5) • Air Quality Monitoring and Dust Control Plan (Section 11.6) • Water Management and Hydrometric Monitoring Plan (Section 11.7) • Explosives Management Plan (Section 11.11) • Soil Salvage and Handling Plan (Section 11.3) • Dark Sky Management and Monitoring Plan (Section 11.19) • Noise and Vibration Management Plan (Section 11.22) • Fisheries and Aquatic Life Monitoring Plan (Section 11.25) Compensation: • Fish Habitat Offsetting Measures (Appendix 6.7-D)
Change in Access or Ability to Access or Use Fishing Areas	• Develop an Access Management Plan in consultation with Aboriginal Groups • To accommodate SSN's use of Jacko Lake as an early spring trout fishery, KAM will avoid construction activities within Jacko Lake during spring • Develop an alternate road access to Jacko Lake to facilitate access to Jacko Lake for fishing • Develop an alternate parking lot to Jacko Lake to facilitate access to Jacko Lake for fishing • Appropriate signage indicating blasting times • Communicating with Aboriginal Groups regarding when blasting is likely to occur and demarcating those areas • Reducing traffic by implementing the Transportation Management Plan (Section 11.20)

Factors	Mitigation
Change in the Experience of Using Land and Resources (Sensory Disturbances)	• Noise mitigation by Project design includes: conveyor from crusher to plant will be covered to reduce noise emission; enclosed heavy equipment such as mills, secondary crusher, compressors, pumps, and motors will be located inside buildings; design roads to minimize haul distances; use large trucks for ore and waste transport to minimize the number of trips required between the source and destination; ensure that the mobile equipment is equipped with the manufacturer-recommended exhaust mufflers (Section 10.5) • Blast design to minimize disturbances to Jacko Lake and its users (Section 10.5) • Limit the use of vehicle horns during each shovel and haul truck loading cycle (Section 10.5) • Use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission (Section 10.5) • Conduct piling activities only during the daytime period (Section 10.5) • Noise mitigation and noise management plan (Section 10.5) • Vibration management plan for blasting activities (Section 10.5) • Progressive re-vegetation of Project components and other disturbed areas on an ongoing basis during the Construction and Operation phases with larger Project components further re-vegetated at Decommissioning and Closure (Section 8.3) • Employ good visual design principles (Section 8.3) • Infrastructure aesthetics will consider use of non-reflective materials in the construction of buildings and other infrastructure • Infrastructure will be painted with natural colours that blend into the landscape, or screened with tall shrubs or trees • During Post-Closure, monitor the re-vegetation of the Project components to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape
Changes in the Quality of Resources	To mitigate dust fall on water bodies: • Haul road-associated dust will be mitigated with use of coarse gravel and aggregate material on road beds and minimizing haul distances • Other operational mitigation measures include watering haul roads, reducing idling of vehicles and equipment, and maintaining mobile equipment to meet emission standards • design mitigation measures such as installation of covers over coarse and fine ore stockpiles • dust collectors, and use of covered concentrate transport trucks To mitigate effects on water quality: • Water Management and Hydrometric Monitoring Plan (Section 11.7) • Construction Waste Management Plan (Section 11.4) • Solid Waste Management Plan (Section 119.) • Soil Salvage and Handling Plan (Section 11.3) • Hazardous Waste Management Plan (Section 11.10) • Risk Management Plan (Accidents and Malfunctions) (Section 11.12) • Emergency Response Plan (Section 11.14) • Landscape Design and Restoration Plan (Section 11.26) • Groundwater Quality Management and Monitoring Plan (Section 11.24) • Erosion and Sediment Control Plan (Section 11.2) • Metal Leaching and Acid Rock Drainage Management and Monitoring Plan (Section 11.5)

Effects on Hunting and Trapping Opportunities and Practices

Identifying Effects

The Construction, Operation, and Decommissioning and Closure of the Project has the potential to affect hunting for traditional purposes. Many of the potential effects are anticipated to occur during construction and development of the Mine Site. Several VCs are of particular relevance to the assessment of effects on hunting for traditional purposes as they provide information on Project effects on hunted wildlife species (Section 6.16, Assessment of Potential Effects on Non-migratory Gamebirds; Section 6.17, Assessment of Potential Effects on Mammals; and Chapter 10, Assessment of Potential Health Effects). VCs considered in the wildlife effects assessment considered input from Aboriginal Groups. The wildlife VCs consider effects on habitat, changes in the distribution and behaviour of animal populations, and mortality.

Change in the Availability of Resources

According to the effects assessment on gamebirds and mammals (Sections 6.16 and 6.17), activities during the Construction, Operation, and Decommissioning and Closure phases that may result in changes to gamebird and mammal habitat and availability include:

- during Construction and Operation, terrestrial habitat of value to the species of wildlife that are harvested could be lost due to land clearing (i.e., vegetation and soils removal);
- during Construction and Operation, terrestrial habitats of value to the species of wildlife that are harvested could be altered due to air emissions (nitrogen or dust deposition);
- during Construction and Operation, noise disturbances could deter species of animals that are harvested from using valuable terrestrial habitats;
- during Construction, Operation, and Decommissioning and Closure, increased project-related traffic could result in increased wildlife mortality, affecting species of animals that are harvested; and
- during Construction and Operation, there could be increased hunting pressure due to employees and contractors that may engage in hunting.

Change in Access or Ability to Access or Use Hunting Areas

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to access or the ability to access or use hunting areas include:

- during Construction and Operation, the Mine Site will not be accessible. Conditional access may be allowed during Decomissioning and Closure and Post-Closure;
- during Construction and Operation, safety zones, enforced around the open pit during blasting periods, will include restricted access to potential hunting areas (e.g., south shores of Jacko Lake);
- during Construction, Operation, Decommissioning and Closure, and Post-Closure, existing roads within the Mine Site will be closed (i.e., Goose Lake Road) which may affect access to hunting locations outside of the Mine Site but currently accessible via Goose Lake Road; and

- during Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access sites.

Change in the Experience of Using Land and Resources (Sensory Disturbances)

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the experience of using hunting areas include:

- project-related noise disturbances during Construction, Operation, and Decommissioning and Closure;
- during Construction, Operation, and Decommissioning and Closure, air quality deterioration due to combustion gases and/or particulate matter; and
- visual disturbances caused by Project infrastructure or activities.

Changes in the Quality of Resources

Activities during the Construction, Operation, and Closure phases may result in changes to the quality of hunted resources include the accumulation of contaminants generated by the Project in terrestrial wildlife consumed by Aboriginal Groups (i.e., country foods).

Mitigation – Hunting and Trapping Opportunities and Practices

Table 8.5-17 presents the measures proposed to mitigate potential effects on hunting and trapping opportunities and practices (CULRTP). It identifies relevant management and monitoring plans that will aim to reduce effects on CULRTP with respect to animals harvested for traditional purposes. Although there is not a standalone CULRTP Management and Monitoring Plan, there are a range of management and monitoring plans which include mitigation measures to reduce effects on the availability of resources used for traditional purposes by Aboriginal Groups, changes to access (i.e., Access Management Plan), changes to the experience (e.g., Noise Management Plan) and changes to the quality of the resource (i.e., Air Quality Monitoring Plan).

Effects on Gathering Opportunities and Practices

Identifying Effects

The Construction, Operation, and Decommissioning and Closure phases of the Project have the potential to affect gathering opportunities and practices. These effects are related to the construction and development of the Mine Site. Some chapters are of particular relevance to the assessment of impacts on gathering opportunities and practices as they provide information on project effects on plant species (Sections 6.8 to 6.10, Assessment of Potential Terrestrial Ecology Effects, and Chapter 10, Assessment of Potential Health Effects). VCs considered in the terrestrial ecosystem effects assessment include a VC related to economically and culturally important plants.

Table 8.5-17. Mitigation Measures for Potential Project Effects on Hunting and Trapping Opportunities and Practices

Factors	Mitigation
Change in the Availability of Species Harvested	Avoidance: • Specific mine footprints were redesigned to ensure the minimum possible effect on habitat • With respect to deer, sensitive sites (e.g., deer wintering habitat planning cells) will be avoided as possible and where practical • Sharp-tailed Grouse leks (leks) will be avoided if possible and where practical • Deer wintering habitat planning cell locations will be provided to reduce or avoid impacts to these sites (Section 6.16) • Avoidance of clearing vegetation during sensitive breeding periods and working within timing windows as required and where possible Mitigation and Best Management Practices: • Prohibit employees and contractors from hunting while on shift • General mitigation for all species with respect to noise includes ensuring impulse events, such as blasting, will be limited to certain times of the day (blasting will not take place before 10 am); considering noise ratings when selecting equipment; adjusting blasting configurations to minimise simultaneous blasting effects; optimizing the operation of equipment to minimize noise (e.g., reduced speed limits); optimizing the site layout to minimize noise impact (e.g., through use of natural screens such as buildings, facing away from relevant receptors, minimizing the need for mobile equipment to use their backup alarms); and noise dampening measures will be applied where possible, including conducting loud procedures indoors, where practical • General mitigation to avoid direct mortality include: vehicles will yield to wildlife observed along Project roads and the locations of observed wildlife will be communicated to the environmental manager; traffic will be minimized by providing a vehicle parking lot for staff, and shuttling of mine personnel; speed limits and wildlife signage will be implemented; a specific height for roadside vegetation will be maintained to improve drivers' sight lines; habitat near roads be modified to decrease suitability for badgers and their prey; training and education programs to inform staff of sensitive sites to ensure they avoid accidental destruction of key areas; and guns and hunting activities will be banned on site by any mine employees or contractors • With respect to badgers, KAM owned lands that are conducive to suitable badger habitat will be enhanced to provide better forage opportunities to badgers. Grassland habitat known to be used by badgers will be fenced off and livestock grazing will be controlled/minimized on KAM owned lands during sensitive times; and consideration will be given to badger habitat conservation during strategic planning (Section 6.16) • With respect to grouse, in the decommissioning and Decommissioning and Closure phase, grouse habitat will be restored through reclamation and revegetation processes. Existing riparian zones along Peterson Creek and other nearby areas will be enhanced to provide suitable winter habitat. Reclaimed aspen groves may also provide feeding and security habitat for both species of grouse, once an appropriate structural stage is reached (Section 6.17)

Factors	Mitigation
Change in the Availability of Species Harvested *(cont'd)*	• Wildlife and Vegetation Monitoring Plan (Section 11.27) which will include measures to facilitate movement among badger populations by maintaining habitat across the landscape; and confirm movements of individuals among populations via monitoring • Fish Habitat Offsetting Plan (Appendix 6.6-C) • Reducing traffic and fugitive dust effects by implementing the Transportation Management Plan and the Access Management Plan (Sections 11.20 and 11.21) • Air Quality Monitoring and Dust Control Plan (Section 11.6) will also reduce the potential for negative effects of dust • The Soil Salvage and Handling Plan and the Landscape Design and Restoration Plan (Sections 11.3 and 11.26, respectively) as well as the Invasive Species Management Section in the Invasive Plants Management Plan (Section 11.17) and a vehicle wash station at site entrance may also help to reduce the impact of invasive plants • Noise and Vibration Management Plan (Section 11.22) will be developed with the objective to ensure that noise levels during all phases of the Project are acceptably low for human and wildlife receptors, as per human health guidelines Compensation: • KAM will increase grassland and open forest restoration and support and encourage conservation land acquisition to compensate for badger habitat losses (Section 6.16) • KAM recognizes the importance of preserving sensitive habitat features for provincially Red- and Blue-listed species. New lek locations will be created to compensate for the one active lek that will be removed. As the success of lek creation is not well known, two potential lek sites will be created for every known lek removed (Section 6.17)
Change in Access or Use of Preferred Hunting Areas	• Develop an Access Management Plan (Section 11.21) in consultation with Aboriginal Groups to facilitate access to areas in the vicinity of the Mine Site • Develop an alternate road access to Jacko Lake to facilitate access to Jacko Lake area for harvesting • Develop an alternate parking lot to Jacko Lake to facilitate access to Jacko Lake area for harvesting • Appropriate signage indicating blasting times and restricted areas • Communicating with Aboriginal Groups regarding when blasting is likely to occur • Continue to support the permit system (provisions to allow Aboriginal harvesters access to ranch lands) for accessing ranch or grazing leases owned by KAM and not within the Project footprint • Reducing traffic by implementing the Transportation Management Plan (Section 11.20)
Change in the Experience of Using Land and Resources (Sensory Disturbances)	• Noise mitigation by Project design includes: conveyor from crusher to plant will be covered to reduce noise emission; enclosed heavy equipment such as mills, secondary crusher, compressors, pumps, and motors will be located inside buildings; design roads to minimize haul distances; use large trucks for ore and waste transport to minimize the number of trips required between the source and destination; ensure that the mobile equipment is equipped with the manufacturer-recommended exhaust mufflers (Section 10.5)

Factors	Mitigation
Change in the Experience of Using Land and Resources (Sensory Disturbances) *(cont'd)*	• Blast design to minimize sensory disturbances to harvesters (Section 10.5) • Limit the use of vehicle horn during each shovel and haul truck loading cycle (Section 10.5) • Use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission (Section 10.5) • Conduct piling activities only during the daytime period (Section 10.5) • Noise mitigation and noise management plan (Section 10.5) • Vibration management plan for blasting activities(Section 10.5) • To reduce visual disturbances, progressive re-vegetation of Project components and other disturbed areas on an ongoing basis during the Construction and Operation phases with larger Project components further re-vegetated at Decommissioning and Closure (Section 8.3) • Employ good visual design principles (Section 8.3) • Infrastructure aesthetics will consider use of non-reflective materials in the construction of buildings and other infrastructure • Infrastructure will be painted with natural colours that blend into the landscape, or screened with tall shrubs or trees • During Post-Closure, monitor the re-vegetation of the large Project components to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape
Changes in the Quality of the Harvested Resources	• Haul road-associated dust will be mitigated with use of coarse gravel and aggregate material on road beds and minimizing haul distances • Other operational mitigation measures include watering haul roads, reducing idling of vehicles and equipment, and maintaining mobile equipment to meet emission standards • Design mitigation measures such as installation of covers over coarse and fine ore stockpiles • Dust collectors, and use of covered concentrate transport trucks • To minimize contamination of harvested species through potential ingestion of contaminated water, KAM will implement a Surface Water Quality Management and Monitoring Plan (Section 11.23), a Groundwater Quality Management and Monitoring Plan (Section 11.24), and a Water Management and Hydrometric Monitoring Plan (Section 11.7) Other management plans to protect harvested species from contamination include: – a Construction Waste Management Plan (Section 11.4) – a Metal Leaching and Acid Rock Drainage Management and Monitoring Plan (Section 11.5) – a Contaminated Sites Management Plan (Section 11.8) – a Solid Waste Management Plan (Section 11.9) – a Hazardous Waste Management Plan (Section 11.10) – a Risk Management Plan (Accidents and Malfunctions) (Section 11.12) – a Natural Hazards Management Plan (Section 11.13) – an Emergency Response Plan (Section 11.14)

Change in the Availability of Plant Resources

According to the effects assessment on rare plants, rare and sensitive ecosystem composition and grasslands (Sections 6.8, 6.9, and 6.10), activities during the Construction, Operation, and Decommissioning and Closure phases that may result in changes to plant resource availability include:

- during Construction and Operation, vegetation and terrestrial habitat will be lost due to land clearing (i.e., vegetation and soils removal);
- during Construction and Operation, vegetation and terrestrial habitats could be altered due to air emissions (nitrogen or dust deposition) and result in losses to plant resources; and
- there is a potential for invasive species to affect availability of plants used for traditional purposes, however, no residual effects of grassland habitat alteration are anticipated given the implementation of the invasive species management plan and the fact that grasslands are already considered altered in the Project area.

Change in Access or Ability to Access or Use Gathering Areas

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to access or the ability to access or use plant gathering areas include:

- during Construction and Operation, the Mine Site will not be accessible. Conditional access may be allowed during Decomissioning and Closure and Post-Closure;
- during Construction and Operation, safety zones, enforced around the open pit during blasting periods, will include restricted access to plant gathering areas;
- during Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed affecting access (i.e., Goose Lake Access Road); and
- during Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access sites.

Change in the Experience of Using Land and Resources (Sensory Disturbances)

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the experience of using plant gathering areas include:

- project-related noise disturbances during Construction, Operation, and Decommissioning and Closure;
- during Construction, Operation, and Decommissioning and Closure, air quality deterioration due to combustion gases and/or particulate matter; and
- visual disturbances caused by Project infrastructure or activities.

Changes in the Quality of Resources

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the quality of gathered resources include the accumulation of contaminants generated by the Project in vegetation consumed by Aboriginal Groups (i.e., country foods). Human risk

associated with the ingestion of country foods has been assessed under the human health VC (Section 10.4). Mitigation measures specific to human health were not recommended. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

Mitigation – Gathering Opportunities and Practices

Table 8.5-18 presents the measures proposed to mitigate potential effects on plant gathering opportunities and practices (CULRTP). It identifies relevant management and monitoring plans that will aim to reduce effects on CULRTP with respect to plants gathered for traditional purposes Although there is not a standalone CULRTP Management and Monitoring Plan, there are a range of management and monitoring plans which include mitigation measures to reduce effects on the availability of resources used for traditional purposes by Aboriginal Groups, changes to access (i.e., Access Management Plan), changes to the experience (e.g., Noise Management Plan) and changes to the quality of the resource (i.e., Air Quality Monitoring Plan).

Table 8.5-18. Mitigation Measures for Potential Project Effects on Plant Gathering Opportunities and Practices

Factors	Mitigation
Change in the Availability of Species Harvested	Avoidance: • During Project planning, specific mine footprints were redesigned to ensure the minimum possible effects on the surrounding habitat • Maps and a spatial database of known rare plant locations in the vicinity of Project facilities will be maintained and consulted to avoid impacts during Operation and maintenance activities. Ongoing monitoring by QEP or Project Environmental Manager will occur. The database should be actively updated as new information becomes available • Exclusion areas will be created at all known rare plant occurrences located adjacent to Construction and Operation areas. These areas will be clearly flagged to discourage accidental encroachment with machines. Signage will be added where necessary to indicate the boundaries of the exclusion area • Roads and transmission lines will be designed to minimize the number of water crossings and to avoid running parallel to watercourses. They will also be designed to minimize the removal of known rare plant occurrences Mitigation and Best Management Practices: • Known rare plant occurrences will be used as inputs during the final design and Construction phase. Where feasible, Project footprint will be placed so as to avoid direct impacts to these occurrences • Construction personnel will attend a field-based orientation session where the exclusion areas will be explained, and avoidance of these areas will be mandatory • Erosion prevention and bank stabilization techniques will be used (Section 11.2). Soil degradation and erosion control mitigation explained in the Erosion and Sediment Control Plan (11.2) • For those rare plant occurrences that cannot be avoided, transplantation of these rare plants will be considered based upon guiding principles

Factors	Mitigation
Change in the Availability of Species Harvested *(cont'd)*	• KAM will support regional rare plant surveys and research to determine the distribution of these rare plant species throughout the RSA • Mitigation measures to protect air quality are described in Section 10.1 and in the Air Quality Monitoring and Dust Control Plan (Section 11.6) • Implementation of the Wildlife and Vegetation Monitoring Plan (Section 11.27) • Fish Habitat Offsetting Plan (Appendix 6.6-C) • Reducing traffic and fugitive dust effects by implementing the Transportation Management Plan and the Access Management Plan (Sections 11.20 and 11.21) • The Soil Salvage and Handling Plan and the Landscape Design and Restoration Plan (Sections 11.3 and 11.26, respectively) as well as the InvasivePlants Management S Plan (Section 11.17) and a vehicle wash station at site entrance may also help to reduce the impact of invasive plants • The reclamation plan will prioritize the rapid re-vegetation of all temporarily disturbed areas and will use appropriate seed mixes that minimize the spread of invasive plants (Section 11.17). Prior to reclamation work commencing, surveys will be conducted to record populations of invasive species throughout the LSA. This survey will identify high priority areas, and treatment will be initiated as required Compensation: • KAM will increase grassland and open forest restoration and support and encourage conservation land acquisition to compensate for habitat losses (Section 6.16) • KAM will implement further mitigation in the form of a compensation program. The objective of the compensation program will be to achieve like-for-like offsetting of wetland loss. Compensation efforts will initially focus on local wetlands, including enhancement around the verges of Jacko Lake, and creation of wetland habitat at Inks Lake • Further details of this plan are discussed in the wildlife/vegetation monitoring plan
Change in Access or Use of Preferred Hunting Areas	• Develop an Access Management Plan in consultation with Aboriginal Groups • Develop an alternate road access to Jacko Lake to facilitate access to Jacko Lake area for harvesting • Develop an alternate parking lot Jacko Lake to facilitate access to Jacko Lake area for harvesting • Appropriate signage indicating blasting times • Communicating with Aboriginal Groups regarding when blasting is likely to occur • Continue to support the permit system (provisions to allow Aboriginal harvesters access to ranch lands) for accessing ranch or grazing leases owned by KAM and not within the Project footprint • Reducing traffic by implementing the Transportation Management Plan (Section 11.20)
Change in the Experience of Using Land and Resources (Sensory Disturbances)	• General mitigation with respect to noise includes ensuring impulse events, such as blasting, will be limited to certain times of the day (blasting will not take place before 10 am); considering noise ratings when selecting equipment; adjusting blasting configurations to minimise simultaneous blasting effects; optimizing the operation of equipment to minimize noise (e.g., reduced speed limits); optimizing the site layout to minimize noise impact (e.g., through use of natural screens such as buildings, facing away from relevant receptors, minimizing the need for mobile equipment to use their backup alarms); and noise dampening measures will be applied where possible, including conducting loud procedures indoors, where practical

Factors	Mitigation
	• Blast design to minimize sensory disturbances to harvesters (Section 10.5) • Limit the use of vehicle horn during each shovel and haul truck loading cycle (Section 10.5) • Use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission (Section 10.5) • Noise mitigation and noise management plan (Section 10.5) • Vibration management plan for blasting activities (Section 10.5) • To reduce visual disturbances, progressive re-vegetation of Project components and other disturbed areas on an ongoing basis during the Construction and Operation phases with larger Project components further re-vegetated at Decommissioning and Closure (Section 8.3) • Employ good visual design principles (Section 8.3) • Infrastructure aesthetics will consider use of non-reflective materials in the construction of buildings and other infrastructure • Infrastructure will be painted with natural colours that blend into the landscape, or screened with tall shrubs or trees • During Post-Closure, monitor the re-vegetation of the large Project components to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape
Changes in the Quality of the Harvested Resources	• Haul road-associated dust will be mitigated with use of coarse gravel and aggregate material on road beds and minimizing haul distances • Other operational mitigation measures include watering haul roads, reducing idling of vehicles and equipment, and maintaining mobile equipment to meet emission standards • Design mitigation measures such as installation of covers over coarse and fine ore stockpiles • Dust collectors, and use of covered concentrate transport trucks • To minimize contamination of harvested species through potential ingestion of contaminated water, KAM will implement a Surface Water Quality Management and Monitoring Plan (Section 11.23), a Groundwater Quality Management and Monitoring Plan (Section 11.24), and a Water Management and Hydrometric Monitoring Plan (Section 11.7). Other management plans to protect harvested species from contamination include: – a Construction Waste Management Plan (Section 11.4) – a Metal Leaching and Acid Rock Drainage Management and Monitoring Plan (Section 11.5) – a Contaminated Sites Management Plan (Section 11.8) – a Solid Waste Management Plan (Section 11.9) – a Hazardous Waste Management Plan (Section 11.10) – a Risk Management Plan (Accidents and Malfunctions) (Section 11.12) – a Natural Hazards Management Plan (Section 11.13) – an Emergency Response Plan (Section 11.14)

Key Effects on Ceremonial and Other Cultural Uses

Identifying Key Effects

The Construction, Operation, and Decommissioning and Closure phases of the Project have the potential to affect other uses of land and resources for traditional purposes. These effects are related to the Construction and development of the Mine Site. Some sections are of particular relevance to the assessment of effects on ceremonial or cultural uses for traditional purposes and practices as they provide information on project effects on traditional uses of lands and resources. Several VCs are of particular relevance to the assessment of effects on ceremonial or cultural uses as they provide information on Project effects on heritage sites and archaeological sites (Section 9.1, Archaeological Sites, and Section 9.2, Heritage Sites). These VCs considered input from Aboriginal Groups. The heritage and archaeological sites VCs consider effects on sites and resources of importance to Aboriginal Groups.

Change in Availability of Ceremonial or Other Cultural Sites

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes in the availability of ceremonial or cultural sites:

- during Construction and Operation, the Mine Site will occupy components of Pípsell including the Hunting Blind Complex, Goose Lake, and middle Peterson Creek (from the discharge of Jacko Lake to the Peterson Creek diversion discharge).

Change in Access or Ability to Access or Use Other Traditional/Cultural Areas

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to access or the ability to access or use other traditional/cultural areas include:

- during Construction and Operation, the Mine Site will not be accessible. Conditional access can be allowed during Decommissioning and Closure and Post-Closure;
- during Construction and Operation, safety zones, enforced around the open pit during blasting periods, will include restricted access to ceremonial/cultural use areas. The Prayer Tree (identified by SSN) is located in the vicinity of Jacko Lake and falls within the blasting safety zone and therefore will not be accessible during blasting periods. This Prayer Tree will not be affected by Project activities;
- during Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed affecting access (i.e., Goose Lake Access Road); and
- during Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access sites.

Change in the Experience of Using Land and Resources (Sensory Disturbances)

Activities during the Construction, Operation, and Decommissioning and Closure phases may result in changes to the experience of using other traditional/cultural areas include:

- project-related noise disturbances during Construction, Operation, and Decommissioning and Closure;

- during Construction, Operation, and Decommissioning and Closure, air quality deterioration due to combustion gases and/or particulate matter; and
- visual disturbances caused by Project infrastructure or activities.

Mitigation – Ceremonial or Other Cultural Uses

Table 8.5-19 presents the measures proposed to mitigate potential effects on use of ceremonial/cultural areas. It identifies relevant management and monitoring plans that will aim to reduce effects on CULRTP with respect to ceremonial and other cultural uses. Although there is not a standalone CULRTP Management and Monitoring Plan, there are a range of management and monitoring plans which include mitigation measures to reduce effects on archaeological and heritage sites, changes to access (i.e., Access Management Plan), and changes to the experience (e.g., Noise Management Plan, Air Quality Monitoring Plan).

Table 8.5-19. Mitigation Measures for Potential Project Effects on Use of Traditional/Cultural Areas

Factors	Mitigation
Change in Access or Use of Preferred Cultural/Ceremonial Use Areas	• Develop an Access Management Plan in consultation with Aboriginal Groups • Develop an alternate road access to Jacko Lake to facilitate access to Jacko Lake area for cultural/ceremonial use • Develop an alternate parking lot to Jacko Lake to facilitate access to Jacko Lake area for cultural/ceremonial use • Appropriate signage indicating blasting times • Communicating with Aboriginal Groups regarding when blasting is likely to occur • Continue to support the permit system (provisions to allow Aboriginal users access to ranch lands) for accessing ranch or grazing leases owned by KAM and not within the Project footprint • Reducing traffic by implementing the Transportation Management Plan (Section 11.20)
Change in the Experience of Using Land and Resources (Sensory Disturbances)	• General mitigation with respect to noise includes ensuring impulse events, such as blasting, will be limited to certain times of the day (blasting will not take place before 10 am); considering noise ratings when selecting equipment; adjusting blasting configurations to minimise simultaneous blasting effects; optimizing the operation of equipment to minimize noise (e.g., reduced speed limits); optimizing the site layout to minimize noise impact (e.g., through use of natural screens such as buildings, facing away from relevant receptors, minimizing the need for mobile equipment to use their backup alarms); and noise dampening measures will be applied where possible, including conducting loud procedures indoors, where practical • Blast design to minimize sensory disturbances to harvesters (Section 10.5) • Limit the use of vehicle horn during each shovel and haul truck loading cycle (Section 10.5) • Use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission (Section 10.5) • Noise mitigation and noise and vibration management plan (Sections 10.5 and 11.22) • Vibration management plan for blasting activities (Sections 10.5 and 11.22) • To reduce visual disturbances, progressive re-vegetation of Project components and other disturbed areas on an ongoing basis during the Construction and Operation phases with larger Project components further re-vegetated at Decommissioning and Closure (Section 8.3)

Factors	Mitigation
Change in the Experience of Using Land and Resources (Sensory Disturbances) *(cont'd)*	• Employ good visual design principles (Section 8.3) • Infrastructure aesthetics will consider use of non-reflective materials in the construction of buildings and other infrastructure • Infrastructure will be painted with natural colours that blend into the landscape, or screened with tall shrubs or trees • During Post-Closure, monitor the re-vegetation of the large Project components to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape

Project Design Changes to Mitigate Potential Effects

KAM made a number of design changes to mitigate potential effects on CULRTP as a result of the Project. Some of these changes include:

- As a result of concerns raised with respect to Inks Lake (an area widely used by waterfowl, other wildlife, and Aboriginal Groups) the updated GA no longer directly overlaps Inks Lake.
- As a result of concerns regarding water quality and quantity, KAM designed the Project to be a zero discharge facility and to optimize use of fresh water. This approach reduces potential effects on surface water, including Jacko Lake and Peterson Creek. Other mitigation proposed includes recycling and reusing all water at the Mine Site, and investigating the potential to use waste water from the City of Kamloops.
- As a result of concerns about potential effects to the Cherry Creek watershed, KAM relocated the TSF away from the Alkali Creek watershed (including Cherry Creek). The location and redesign to a conventional tailings storage facility reduces potential for dust by using wet tailings storage methods.
- To mitigate potential effects from dust fall, the TSF was relocated further away from key transportation infrastructure and residential areas and closer to mine operations. Redesigning the TSF from a dry stack (potential dust generation) to a conventional wet design storage facility also allows the recapture and recirculation of water. The updated GA proposes other mitigation to reduce dust generation. This includes covering crushed ore stockpile to reduce fugitive dust and associated potential for dispersing contaminants; spray/misting and vacuum systems will be used to minimize the opportunity for dust to escape from key ore transfer points; wetting roads; new design with fewer roads; and controlling vehicle speed limits to reduce dust production. With respect to concerns on traditional land use, the updated GA minimizes potential for dust-related project effects on traditionally-used plants, Jacko Lake, and grasslands.
- To reduce concerns about visibility of the Project, KAM relocated the North Waste Rock Storage Facility and Temporary Ore Stockpiles 3.5 km closer to mine operations (and further away from residential areas). The south and eastward shift of the mine's major industrial structures means views from the Coquihalla Highway and Lac Le Jeune Road will be protected. The mine's facilities will be much less visible from most prominent viewpoints as they move away from the city and local roads. The new plan opens up the possibility of redeveloping KAM lands to the north of mine operations for recreational and Aboriginal Groups use.

- To address concerns about light pollution, the updated GA proposes use of LED lighting. Unnecessary lighting will be avoided and lighting will be shielded where needed and automated to turn off when not needed, reducing visual effects and disruption to wildlife.
- To mitigate concerns about air quality, the KGHM aims to reduce fuel consumption and air emissions through the use of EPA-rated diesel engine technology in the mine's haul trucks, heavy equipment and other vehicles.
- KAM is committed to a robust environmental management system and is investigating ISO 14001 Environmental Management System certification requirements. This international standard governs environmental management and ensures conformity to recognized standards and practices for monitoring environmental aspects such as noise, air, water and the soil.

8.5.5.4 Potential to Return Affected Areas to Pre-Disturbance Conditions

This section assesses the potential to return affected areas to pre-disturbance conditions to support traditional practices. The Project will disturb land in order to develop necessary project components including the open pit, processing facilities, tailings and ore rock storage facilities, roads, a transmission line, and a water supply system. Not all disturbed areas in the Mine Site will be suitable for returning the land to pre-disturbance conditions. Specifically, during Post-Closure the open pit will not be safe for use by the public. Therefore, access will be restricted and the land will not be returned to a condition similar to pre-disturbance conditions. Table 8.5-20 summarizes the areas with potential to be returned to pre-disturbance conditions.

Table 8.5-20. Potential Areas for Return to Pre-Disturbance Conditions

Project Component	Size (ha)	Percentage (%)
Without Potential (i.e., Open Pit)	293	17
With Potential	1,412	83
Total Mine Footprint	1,705	100

Section 3.17 (Mine Closure and Reclamation Plan) describes the objectives and methods that will be applied at Closure in order to return affected areas to pre-disturbance conditions. Closure planning has guided Project design with the end land use objective of returning the site to pre-disturbance conditions to support the same land uses in place today. Although the post-mining landscape will not be identical to the pre-mining landscape, the reclamation plan aims to replicate pre-mining ecosystems by re-establishing the original ecological diversity of landforms (slope, aspect and elevation), soil thickness/moisture regimes and vegetation communities.

Planning for ecological diversity will enhance wildlife habitat. The Closure and Reclamation Plan includes habitats types such as Douglas fir and Ponderosa pine forests; aspen groves with associated shrubs and herbaceous communities; grasslands with shrubs; streamside riparian ecosystems and pastures. For more detailed descriptions of target habitat types, please see Section 11.26 (Landscape Design and Restoration Plan). This aims to support traditional fishing, hunting and plant gathering uses of the lands.

8.5.6 Residual Effects and their Significance

8.5.6.1 Summary of Residual Effects

Tables 8.5-21 to 8.5-25 present the summary of residual effects for each of the Aboriginal Groups.

8.5.6.2 Criteria for Characterization of Residual Effects

Residual effects are characterized using standard criteria (i.e., the magnitude, geographic extent, duration, frequency, reversibility, and ecological or social context associated with each residual effect must be described). Definitions are presented in Table 8.5-26.

Standard ratings (e.g., major, moderate, minor/low, medium, high) for these characterization criteria are consistent with Chapter 5, Assessment Methodology.

Table 8.5-21. Summary of Residual Effects – SSN

Indicator	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Fishing	All phases	Presence of Project	Presence of Project and activities may result in losses of available fish habitat and alter access to traditional fishing sites, including sites associated with Pípsell	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Disruption of fishing uses, changes in the experience of fishing and the quality of fish resources
Hunting	All phases	Presence of Project	Presence of Project and activities may result in losses of available hunted species habitat and alter access to traditional hunting sites, including sites associated with Pípsell	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources
Plant Gathering	All phases	Presence of Project	Presence of Project and activities may result in losses of available Traditional Use plant habitat and alter access to traditional gathering sites, including sites associated with Pípsell	Invasive Species Management Plan, Closure and Reclamation Plan, No plant gathering policy, Transportation Management Plan	Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants
Ceremonial and Other Cultural Uses	All phases	Presence of Project	Presence of Project and activities may result in losses of Ceremonial Use sites, including Pípsell, and access to these sites	Closure and Reclamation Plan	Disruption of Ceremonial Use and changes in the experience of ceremonial or other cultural uses

Table 8.5-22. Summary of Residual Effects – AIB

Indicator	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Fishing	All phases	Presence of Project	Presence of Project and activities may result in losses of available fish habitat and alter access to traditional fishing sites	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Disruption of fishing uses, changes in the experience of fishing and the quality of fish resources
Hunting	All phases	Presence of Project	Presence of Project and activities may result in losses of available hunted species habitat and alter access to traditional hunting sites	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources
Plant Gathering	All phases	Presence of Project	Presence of Project and activities may result in losses of available Traditional Use plant habitat and alter access to traditional gathering sites	Invasive Species Management Plan, Closure and Reclamation Plan, No plant gathering policy, Transportation Management Plan	Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants

Table 8.5-23. Summary of Residual Effects – LNIB

Indicator	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Fishing	All phases	Presence of Project	Presence of Project and activities may result in losses of available fish habitat and alter access to traditional fishing sites	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Disruption of fishing uses, changes in the experience of fishing and the quality of fish resources
Hunting	All phases	Presence of Project	Presence of Project and activities may result in losses of available hunted species habitat and alter access to traditional hunting sites	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources
Plant Gathering	All phases	Presence of Project	Presence of Project and activities may result in losses of available Traditional Use plant habitat and alter access to traditional gathering sites	Invasive Species Management Plan, Closure and Reclamation Plan, No plant gathering policy, Transportation Management Plan	Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants

Table 8.5-24. Summary of Residual Effects – WP/CIB

Indicator	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Fishing	All phases	Presence of Project	Presence of Project and activities may result in losses of available fish habitat and alter access to traditional fishing sites	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Disruption of fishing uses, changes in the experience of fishing and the quality of fish resources
Hunting	All phases	Presence of Project	Presence of Project and activities may result in losses of available hunted species habitat and alter access to traditional hunting sites	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources
Plant Gathering	All phases	Presence of Project	Presence of Project and activities may result in losses of available Traditional Use plant habitat and alter access to traditional gathering sites	Invasive Species Management Plan, Closure and Reclamation Plan, No plant gathering policy, Transportation Management Plan	Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants

Table 8.5-25. Summary of Residual Effects – MNBC

Indicator	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Fishing	All phases	Presence of Project	Presence of Project and activities may result in losses of available fish habitat and alter access to traditional fishing sites	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Disruption of fishing uses, changes in the experience of fishing and the quality of fish resources
Hunting	All phases	Presence of Project	Presence of Project and activities may result in losses of available hunted species habitat and alter access to traditional hunting sites	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources
Plant Gathering	All phases	Presence of Project	Presence of Project and activities may result in losses of available Traditional Use plant habitat and alter access to traditional gathering sites	Invasive Species Management Plan, Closure and Reclamation Plan, No plant gathering policy, Transportation Management Plan	Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants

Table 8.5-26. Definitions of Characterization Criteria for Residual Effects on Current Use of Land and Resources for Traditional Purposes

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Ecological Context	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*How far will the effect reach?*	*To what degree is the effect reversible?*	*How resilient is the receiving environment or population?*	*What is the current condition of the ecosystem and how commonly is it represented in the LSA?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change on the use of areas identified by Aboriginal Groups. **Minor:** Detectable changes from baseline conditions and the ability to practice the use is slightly impeded. **Medium:** Detectable changes from baseline conditions and the ability to practice the use is notably impeded. **Major:** Detectable changes from baseline conditions and the ability to practice the use is severely or totally impeded.	**Short-term:** Effect lasts from year -2 to 1 (Construction phase). **Medium-term:** Effect extents through year 23 (Operation phase). **Long-term:** Effect extends through year 29 (Decommissioning and Closure phase). **Far Future:** Effect extends beyond year 29 (Post-Closure phase).	**Once:** Effect occurs once during the life of the Project. **Sporadic:** Effect occurs at sporadic or intermittent intervals (i.e., once every few months) during the life of the Project. **Regular:** Effect occurs on a regular basis (i.e., every week, every month) during the life of the Project. **Continuous:** Effect occurs constantly during the majority of the life of the Project.	**Site-specific:** Effect occurs within the Project site. **Local:** Effect occurs within the LSA. **Regional:** Effect occurs within the RSA. **Beyond Regional:** Effect extends beyond the RSA.	**Reversible Short-term:** Effect can be reversed relatively quickly (within 2 years). **Reversible Long-term:** Effect can be reversed within 20 years of Post-Closure. **Irreversible:** Effect is permanent, and cannot be reversed.	**Low:** Not applicable. **Neutral:** Not applicable. **High:** Not applicable.	**Low:** The traditional use areas are resilient to additional change (i.e., there is an abundance of traditional use areas and opportunities). **Neutral:** Not applicable. **High:** The traditional use areas are not resilient to additional change (i.e., there are limited traditional use areas and opportunities).	**High:** It is highly likely that this effect will occur. **Medium:** This effect is likely, but may not occur. **Low:** This effect is unlikely but could occur.	**High:** There is a good understanding of the current Aboriginal land use in the area and the cause-effect relationship is clear. There is a low degree of uncertainty and variation from the predicted effect is expected to be low. Mitigation has been proven to be effective. **Medium:** The cause-effect relationships are not fully understood, there are a number of unknown external variables, or current Aboriginal land use data for the Project area are partially available. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident. Mitigation has been proven to be effective elsewhere. **Low:** The cause-effect relationships are poorly understood, there are a number of unknown external variables, and current Aboriginal land use data for the Project area are limited. High degree of uncertainty and final results may vary considerably. Mitigation has not been demonstrated to be effective.

8.5.6.3 Assessment of Residual Effects: Stk'emlupsemc te Secwépemc Nation

Characterization of Residual Effects

The criterion for the characterization of residual effects, significance, likelihood, and confidence for CULRTP is shown above in Table 8.5-26. The characterization of residual effects for SSN is presented in Table 8.5-27 and summarized in the following subsections which describe potential effects on the SSN's current fishing, hunting, plant gathering, and ceremonial practices; each subsection concludes with an assessment of the significance of effects, the likelihood that effects will occur as described, and the confidence of the assessment. The assessment of potential residual effects on other Aboriginal Groups is provided in Section 8.5.5.3.

Fishing

The Construction, Operation, and Decommissioning and Closure phases of the Project have a residual effect on the current use of resources for fishing purposes. Although fishing activity occurs throughout the SSN traditional territory the following section will focus on fishing activity in LSA where residual effects may occur. For example, Cherry Creek was also identified as an important watershed to the SSN; however, KAM made changes to the Project design to avoid effects in the Alkali watershed, which includes Cherry Creek. The Thompson River was also identified as an important fishing location but after mitigation, no effects to fishing practices in the Thompson River are anticipated. Thus, the following discussion will focus on Jacko Lake, Jacko Creek, and Peterson Creek, which are also identified as important fishing areas for the SSN.

Changes in the Availability of Harvested Resources

Construction and Operation of the Project will result in the removal of the northeast arm of Jacko Lake which comprises 6% of the total area of Jacko Lake at full pool and approximately 12% of the Jacko lake littoral area. The northeast dyke will displace the volume of water currently contained in the northeast arm throughout the rest of Jacko Lake and result in an incremental increase in littoral habitat with the increased water level. The results from the fish habitat and populations VC do not predict effects on the availability of rainbow trout for the SSN fishery in Jacko Lake. Resiliency of the rainbow trout population in Jacko Lake to the imposed stress of direct habitat loss is characterized as high, since the lake was presumably able to maintain the larger numbers of stocked fish within the smaller area between 1954 and 1990 compared to the current area. The VC also predicts no effects or loss of productivity in Jacko Lake as a result of ground vibrations generated by blasting. During Operation, fish habitat in the northeast arm of Jacko Lake will be lost. This portion of the lake, identified as a highly productive area for fishing, will no longer be available to the SSN for fishing. It is expected that availability of rainbow trout for the SSN fishery in Jacko Lake will not be affected.

Additional habitat losses are also expected within Peterson Creek downstream of the Project associated with flow reductions. 4.6 ha of wetted area and 9.7 ha of riparian area will be lost where Peterson Creek is diverted around the north side of the open pit. However, fish habitat offsetting will aim to address the habitat loss. There will be flow reductions in the lower Peterson Creek catchment as a result of mining activities during the Construction and Operation phases but this will be restored to similar to existing conditions during the Decommissioning and Closure phase. The Fish Habitat Mitigation and Offsetting Plan (FHMOP) proposes measures to offset anticipated habitat losses in lower Peterson Creek.

Table 8.5-27. Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources for Traditional Purposes for SSN

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use	Minor	Long-term	Regular	· | · | ·	Reversible long-term	n/a	High	Not significant (minor)	High	Medium
Disruption of Hunting Use	Medium	Far Future	Continuous	Local	Reversible long-term	n/a	High	Not significant (moderate)	High	Medium
Disruption of Plant Gathering	Medium	Far Future	Continuous	Local	Reversible long-term	n/a	High	Not significant (moderate)	High	Medium
Disruption of Ceremonial Use	Medium	Far Future	Continuous	Local	Reversible long-term to Irreversible (depending on the site)	n/a	High	Not significant (moderate)	High	Medium

Note: Effect applies to availability, access, quality, and experience of the Aboriginal Use.

Given that only a very small portion of the Jacko Creek catchment is affected by Project activities, no effects are anticipated on the availability of fish in Jacko Creek.

As a result of fish habitat compensation and offsetting, it is expected that fish habitat will increase in Inks Lake, providing a greater availability of harvestable fish species for use by SSN.

In total, the anticipated habitat losses identified as unavoidable serious harm to fish of about 4 ha for the Project. However, after mitigation and compensation measures, it is expected that there will be net gains in fish habitat, as a result of offsetting measures mainly around Inks Lake. It is expected that a net fish habitat gain will be achieved.

With the proposed offsetting ratios (habitat loss: habitat gain) and the similarity of the offsetting measures with the historical and on-going mitigation and management measures in Jacko Lake (fish stocking, installation of outlet dams to raise the water level and increase water storage) the effectiveness of the offsetting plan to address serious harm to fish associated with direct habitat loss in Jacko Lake and Peterson Creek is assumed to be high.

To mitigate potential effects of increased fishing pressure associated with the introduction of workers (who may fish in Jacko Lake) will be mitigated through no fishing policies for employees and contractors during their shifts.

Changes in Access to Land and Resources

As discussed, the SSN identified Jacko Lake and portions of Peterson Creek as key fishing locations. The Project may cause changes in access to areas of Jacko Lake and Peterson Creek as described below.

- During Construction and Operation, safety zones, will be enforced around the open pit during blasting periods, resulting in temporarily restricted access to fishing areas. Blasting is expected to be undertaken once per day near 12:00 pm. This would create a window of approximately two hours during which SSN harvesters will be unable to engage in activities within the specified blasting buffer area. Time is required before the blasting to clear the blasting buffer area of people and after the blasting to ensure that the blasting has been completed satisfactorily and that there are no hazards to people. According to the current mine plan, it is expected that during the first ten years of operations this blasting buffer could extend across the eastern half of the lake. KAM will have appropriate signage indicating blasting times and restricted areas and will communicate with Aboriginal Groups regarding when blasting is likely to occur and demarcate those areas. To accommodate SSN's use of Jacko Lake as an early spring trout fishery, KAM will avoid construction activities within Jacko Lake during spring.
- During Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed except to authorized Project vehicles. This will affect access to Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to Jacko Lake.
- During Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could also affect access as more time could be required to access

fishing sites (e.g., Inks Lake interchange). The Project will also implement a Transportation Management Plan to reduce traffic effects.

- Portions of Peterson Creek within the mine footprint will continue to be inaccessible for SSN harvesters.

Changes in the Experience of Using Lands and Resources (Sensory Disturbances)

The Construction, Operation, and Decommissioning and Closure phases of the Project may produce a change in the experience of using lands and resources for fishing purposes. These are described below.

- Project-related noise disturbances during Construction, Operation, and Decommissioning and Closure may diminish the experience. Project related noise will be noticeable in the Jacko Lake area. Also, increased levels of traffic and related noise associated with the Project could potentially diminish the experience of fishing. The expected levels of noise at Jacko Lake during sheet piling activities taking place during the Construction phase will be the highest. The sheet piling activities are expected to be audible and will occur during the day, only for a period of about two months. The predicted level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" fishing in Jacko Lake; however, the enjoyment of the experience may be affected (subjective to the user for no longer than two months).
- Dust during Construction of the Project may result in a decrease in the quality of the experience. During Construction, Operation and Decommissioning and Closure, air quality deterioration particulate matter (i.e., dust) has the potential to affect the experience of fishing if dust generation by fugitive point sources is noticeable.
- Visual disturbances caused by Project infrastructure or activities. There will be a moderate degree of visual effect during Construction and Operation from Jacko Lake (including the boat launch), Goose Lake Road (East and West), the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. The Peterson Creek water pond will be visible and may act as a barrier to users trying to access middle Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. Figure 8.5-9 below shows the current baseline and estimated visual effects during Post-Closure from a viewpoint located at Jacko Lake.

Changes to the Quality of Resources

SSN representatives expressed concern about potential changes to the quality of resources- in this case, contamination of fish for human consumption. While Jacko Lake is a popular recreational fishing spot it is unlikely that SSN obtain a substantial portion of their fish intake from Jacko Lake or Peterson Creek. If SSN were to obtain a substantial portion of their fish intake from the general Kamloops area, it is more likely they would obtain it from the Thompson River, where the principal target species is salmon and devices such as nets and fishing wheels are permitted. This is consistent with secondary research that indicates the SSN have a fishwheel deployed at the Thompson River mainstem near the outflow of the Deadman River (Tk'emlúps Website, 2014). The human health VC (Section 10.4) assumes Aboriginal Groups (including SSN) obtain 10% of their total fish intake from Jacko Lake.

Baseline Condition



Post-Closure Condition



The Project will generate dust fall and will change the hydrological regime in the LSA. The risk to human health associated with the ingestion of country foods, including fish, has been assessed under the human health VC (Section 10.4). Mitigation measures specific to human health were not been recommended. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

In addition to the mitigation proposed above, KAM proposes to establish a committee with the SSN to facilitate implementation of mitigation and monitoring. The committee will foster SSN's participation in evaluating the effectiveness of the mitigation proposed on an ongoing basis.

Characterization of Residual Effects on SSN

The residual effect on current SSN fishing practices is adverse and rated as Not Significant (minor). The main reason for this rating is that the Project affects a relatively small area (north east arm of Jacko Lake and middle Peterson Creek which is already affected by past projects and activities) of the overall Peterson Creek catchment, and will not impede fishing in other areas of the catchment (i.e. lower Peterson Creek and upper portions of Peterson Creek including Jacko Creek- identified as fishing sites and part of Pípsell). A compensation and offsetting plan will be implemented at the Project onset that proposes to develop fish availability and habitat in Inks Lake (within the LSA and in close proximity to Pípsell). Access to Jacko Lake will be maintained relatively similar to current conditions but affected during Operation due to blasting. The magnitude of the residual effect on fishing was therefore rated to be minor. Context was rated to be high, because of the importance of the area (Pípsell) to SSN, therefore a low resiliency to additional changes to the area. The residual effect occurs within the LSA can be reserved progressively with the implementation of the fish habitat offsetting plan during the Construction phase and the cease of Operation activities creating sensorial disturbances affecting fishing in Jacko Lake.

Characterization of Likelihood and Confidence

The ecological context of the potential effect on fishing was rated to be low, given there are other identified fish harvesting locations within the LSA and RSA. There is a high likelihood that the effect will occur. Confidence in this prediction is medium since mitigation measures are well understood but the actual effect on fishing practices will also depend on personal preferences and choices, particularly with respect to changes in sensory experience. However, it should be noted that information on current fishing for traditional purposes by the SSN was interpreted through the review of the CHS, and therefore there could be some variation within the SSN membership about the importance and use of Peterson Creek and Jacko Lake.

Hunting

The Construction, Operation, and Decommissioning and Closure phases of the Project have a residual effect on the current use of lands for hunting purposes. Although, hunting occurs throughout the SSN traditional territory the following section will focus on current hunting practices in or near the Project footprint where residual effects may occur; in areas surrounding Jacko Lake, Peterson Creek and Goose Lake. Hunting areas within the Mine Site will be unavailable to the SSN during Construction and Operation. It is likely that hunting activity in this area is limited given the

majority of the land is private. Habitat changes, sensory disturbance and disruption of movement may cause changes in wildlife habitat and populations. Clearing and Construction of the Mine Site infrastructure may result in loss of habitat and access to hunting areas, particularly along Goose Lake Road. Road construction and use during Operation may result in loss of areas for hunting, and changes in wildlife habitat and abundance through mortality from collision with vehicles. The Construction and Operation phases of the Project may also produce changes to the experience of hunting due to auditory and visual disturbances.

Changes in the Availability of Harvested Resources

Changes in the availability of hunting resources for SSN is quantified through spatial analysis of habitat losses presented in Table 8.5-28. Additionally, the effect of noise on wildlife, which can affect the availability of resources, is assessed. The wildlife LSA and RSA were used to describe losses of habitat within SSN's traditional territory.

Table 8.5-28. Changes in the Availability of Harvested Resources

Species	Changes in the Availability of Wildlife Habitat
Moose	No critical moose habitat was identified in the LSA although it is present in the RSA. Since suitable habitat within the LSA is limited to small patches of forested and riparian areas, moose are not expected to have an interaction with the Project.
Bear	Bear habitat is not anticipated to occur throughout the majority of the Project area and it was not selected as indicator species.
Beaver	The Project Footprint overlaps mainly terrestrial habitats such as grasslands that are not used by beavers. However, there is evidence of the use of Peterson Creek by beavers.
Deer	33 ha out of 449 ha of critical deer winter range will be lost in the LSA. In total there is over 1,600 ha of critical deer winter range present in the RSA.
American Badger	1,163 ha of suitable badger habitat will be lost in the LSA. In total there is over 4,620 ha of suitable badger habitat present in the RSA. 13 out of the 26 identified badger dig sites in the LSA will be lost.
Sharp-tailed Grouse	1,085 ha of suitable grouse growing habitat will be lost in the LSA. Within the RSA, there is over 3,875 ha of suitable grouse growing habitat. 401 ha of suitable grouse winter habitat will be lost in the LSA. Within the RSA, there is over 1,395 ha of suitable grouse winter habitat.

As stated in the mammals VC, noise from Project Construction and Operation may affect 3-10% of suitable wildlife habitat (deer, American badger and sharp-tailed grouse) within the LSA. However, habituation to routine disturbances over the length of the Project may reduce noise effects. Wildlife mortality, including mortality from collisions with Project-related vehicles, also has the potential to affect changes in the availability of harvested resources for SSN hunters. To mitigate these effects, KAM is enforcing speed limits and will utilize wildlife signage. Other strategies include ensuring vehicles yield to wildlife observed along Project roads; reporting wildlife sightings to supervisory personnel as soon as possible; and reporting wildlife incidents (e.g., traffic accidents) to supervisory personnel immediately. With mitigation, residual effects to direct mortality for wildlife are not anticipated to affect wildlife availability for SSN harvesters.

The mine may indirectly increase competition for hunted resources from the presence of KAM employees and contractors. To mitigate these effects, KAM will implement a strict Firearms and Hunting Policy banning these activities on site, or while on shift, by any mine employees or contractors.

Changes in Access to Land and Resources

Access to hunting locations via Goose Lake Road will no longer be available for those portions of Goose Lake Road which will be closed (6.8 km loss out of 12.8 km total length; Figure 8.5-10). Goose Lake will be removed entirely and this area will no longer be available for hunting activities although hunting in this area is currently limited due to private property and fencing. Access to the portion of Peterson Creek, within the footprint of the mine, will continue to be inaccessible for hunting until the Post-Closure phase when, KAM will support the permit system (which may include provisions to allow Aboriginal users for accessing ranch or grazing leases owned by KAM and not within areas deemed unsafe (e.g., open pit).

During Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed which will affect access to Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to the areas surrounding Jacko Lake.

During Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access hunting areas.

Given the nature of Project activities and likely disturbances generated by the Construction and Operation phases, it is anticipated that SSN will no longer be able to hunt in the Mine Site footprint until the Post-Closure phase where KAM will support the permit system and access may be granted to areas deemed safe. This loss of land represents a 0.14% proportion of SSN traditional territory.

Changes in the Experience of Using Lands and Resources

The Construction, Operation, and Decommissioning and Closure phases of the Project may produce a change in the experience of using lands and resources for hunting. These are described below.

- Project-related noise disturbances during Construction, Operation, and Decommissioning and Closure may diminish the experience. Project related noise will be noticeable in the Jacko Lake area. Increased levels of traffic and related noise associated with the Project could also potentially diminish the experience of hunting. The expected levels of noise at Jacko Lake during sheet piling activities taking place during the Construction phase will be the highest, representing the worst case scenario. The sheet piling activities are expected to be audible and will occur during the day, only for a period of approximately 2 months. The predicted level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" hunting in the Jacko Lake area; however, the enjoyment of the experience may be affected (subjective to the user for no longer than two months). Lower levels of noise will continue to be noticeable during the remaining Construction phase, once sheet piling activities are completed.
- Dust during Construction of the Project may result in a decrease in the quality of the experience. During Construction, Operation, and Decommissioning and Closure, air quality deterioration particulate matter (i.e., dust) has the potential to affect the experience of hunting if dust generation by fugitive point sources is noticeable.

- Visual disturbances caused by Project infrastructure or activities. There will be a moderate degree of visual effect during Construction and Operation from Jacko Lake (including the boat launch), Goose Lake Road (East and West), the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. However, some changes to the visual landscape will be permanent. Mitigation involves re-contouring and re-vegetation to blend the new features with the natural landscape.

Changes to the Quality of Resources

SSN have expressed concern about potential changes to the quality of resources- in this case, contamination of wildlife for human consumption. The Project will generate dust fall and will change the hydrological regime in the LSA. Project activities are not expected to result in harmful accumulation and release of metals from downstream surface water which would be consumed by people. As a result, the remaining significant source for the release of COPCs is through air emissions.

The risk to human health associated with the ingestion of country foods, including wildlife, has been assessed under the human health VC (Section 10.4) Mitigation measures specific to human health were not recommended. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

In addition, to the mitigation proposed above, KAM also proposes establishment of a committee with the SSN to facilitate implementation of mitigation and monitoring. The committee will foster SSN's participation in evaluating the effectiveness of the mitigation proposed on an ongoing basis.

Characterization of Residual Effects on SSN

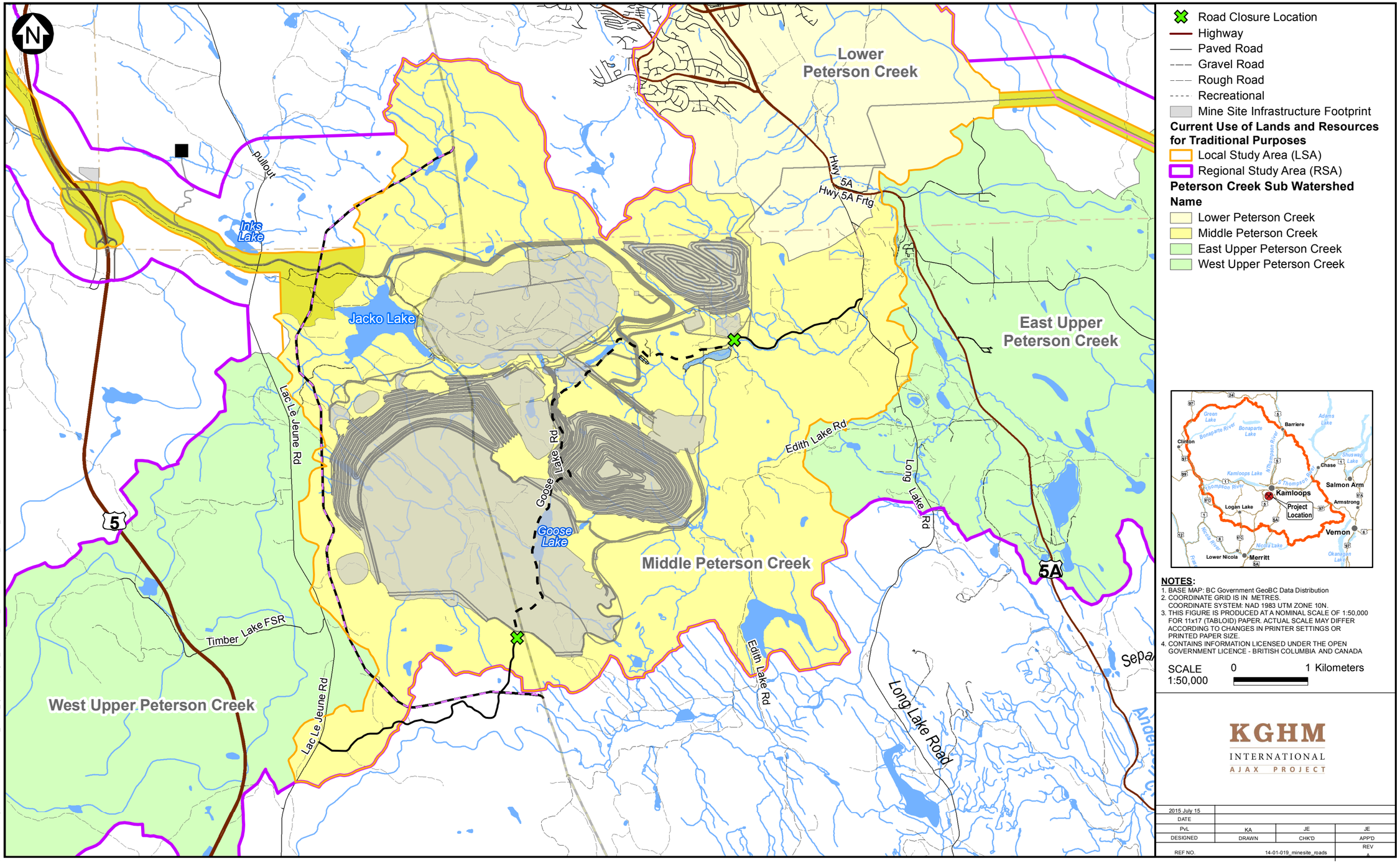
The residual effect on hunting for the SSN is adverse and rated as Not Significant (moderate). The reason for this rating is the losses of suitable habitat to grouse, badger and deer within the LSA. The hunting area surrounding Goose Lake, one of the sites associated with Pípsell, will also be lost, the Goose Lake Road closed and therefore area that this road provided access to will no longer be available for hunting. The magnitude of the residual effect was therefore determined to be medium due to the detectable changes from baseline conditions and the notable impediment in the ability to hunt. Access to Jacko Lake will be maintained relatively similar to current conditions but will be affected during Operation. Context was rated to be high, because of the importance of this area known as Pípsell to SSN, therefore a low resiliency to additional changes to the area. The residual effect occurs in the LSA and can be reversed during the Post-Closure phase, a far-future duration, mainly through habitat rehabilitation and by allowing access.

Characterization of Likelihood and Confidence

The effect is considered likely (high). Confidence is rated as medium, since information provided on current hunting practices in the CHS within the Project area are not always detailed enough to identify specific effects, but mitigations for managing effects on wildlife species are well understood and effective.

Figure 8.5-10
Changes to Access in the LSA

amec foster wheeler



NOTES:
1. BASE MAP: BC Government GeoBC Data Distribution
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:50,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 1:50,000 — 0 — 1 Kilometers

KGHM INTERNATIONAL AJAX PROJECT

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Plant Gathering

The residual effects for SSN current plant gathering practices will occur during the Construction and Operation of the mine through to the Decommissioning and Closure and Post-Closure phases of the Project. Although, plant gathering occurs throughout the SSN traditional territory the following section will focus on current practices in or near the Project footprint where residual effects may occur, such as areas surrounding Jacko Lake, Peterson Creek and Goose Lake. Plant gathering areas in the Mine Site will be unavailable to the SSN during Construction and Operation. Clearing and construction of the Mine Site infrastructure may result in loss of habitat and access to plant gathering areas, particularly along Goose Lake Road. Road construction and use during Operation may results in loss of areas for plant gathering, and changes in habitat and abundance. Operation of the mine may result in dust deposition which may affect the quality of the plants and result in degradation of some plant habitat. SSN identified 125 traditional use plants as potentially occurring in the LSA. As reported in the rare plants VC, 114 of these traditional use plants were recorded as present within the LSA.

Changes in the Availability of Harvested Resources

The potential changes in the availability of plant resources for SSN is quantified through spatial analysis of habitat losses. The rare plants study areas were used to describe losses of habitat for the LSA, particularly in those portions where the losses will likely occur, primarily in the middle Peterson Creek catchment. Plants located in the upper and lower portions of the catchment should remain available as there are no losses of habitat anticipated in those areas. Of the 184 (56%) occurrences of Traditional Use plants within the LSA, 104 (56%) will be lost, while 45% of the Traditional Use plant occurrences will be lost from the RSA. Table 8.5-29 identifies the species of traditional use plants that will be lost as a result of overlap with the mine footprint.

Table 8.5-29. Losses of Traditional Use Plants within the Mine Footprint

Common Name	Number of Occurrences within Mine Footprint
Yarrow	20
Saskatoons	9
Kinnikinnick	0
Big sagebrush	14
Sedges	2
Red-osier Dogwood	5
Scouler's Hawkweed	0
Rocky Mountain Juniper	3
Lemonweed	10
Qweoewile / Large-fruited Desert-parsley	6
Ponderosa Pine	2
Douglas fir	22
Willows	4
Soapberries	4
Cattail	3
Total	**104**

With respect to grasslands, 35% (1,085 ha) of grassland habitat the LSA will be lost to the Mine Site during Construction and Operation phases of the Project.

Habitat loss will only occur once as a result of clearing and grubbing activities during Project Construction, and will be localized to the Project footprint. The current condition of the grasslands is considered "moderately altered", as are the grasslands in much of the surrounding landscape. The assessment of grasslands VC predicts that habitat loss is anticipated to have a Not Significant (moderate) effect on grasslands within the LSA. The duration of this loss will depend upon reclamation activities. Reestablishment of grasslands could take up to 25 years depending on soil conditions, seed mixes and project activities, but is reversible over the long-term.

The design of the Closure and Reclamation Plan considers implementation of a re-vegetation program to support the establishment of grasslands to pre-disturbance conditions. Grassland reclamation will primarily target the TSF surface and will include both native and agronomic forage species (this will support quick establishment and ground cover for erosion control, soil stabilization and weed control). The Closure and Reclamation Plan estimates a net gain of grasslands in the Post-Closure conditions. KAM is committed to implementing a collaborative approach to reclamation with the SSN which may include providing funding for ongoing reclamation research and incorporating SSN input into identification of plants for revegetation.

Operation of the mine may indirectly increase competition for plant resources from KAM employees and contractors. To mitigate these effects in SSN traditional territory, KAM will implement a strict policy banning the gathering of plants on site, or on shift, by any mine employees or contractors.

Changes in Access to Land and Resources

Access to plant gathering locations via Goose Lake Road will no longer be available for those portions of Goose Lake Road which will be closed. Goose Lake will be removed and will no longer be available for plant gathering activities although gathering in this area is currently limited due to private property and fencing. Access to Peterson Creek, within the footprint of the mine, will continue to be inaccessible for plant gathering as well as the areas of the proposed Mine Site.

During Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed which will affect access to parts of Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to the areas surrounding Jacko Lake.

During Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access as more time could be required to access plant gathering areas.

Given the nature of Project activities and likely disturbances generated by the Construction and Operation phases, it is assumed that SSN will no longer be able to gather in the Mine Site footprint until Post-Closure. This loss of land represents a 0.14% proportion of SSN traditional territory.

Changes in the Experience of Using Lands and Resources

The Construction, Operation, and Decommissioning and Closure phases of the Project may produce a change in the experience of using lands and resources for plant gathering. These are described below.

- Project-related noise disturbances during Construction, Operation, and Decommissioning and Closure may diminish the experience. Project related noise will be noticeable in the Jacko Lake area. Increased levels of traffic and related noise associated with the Project could also potentially diminish the experience of plant gathering. The expected levels of noise at Jacko Lake during sheet piling activities taking place during the Construction phase will be the highest, representing the worst case scenario. The sheet piling activities are expected to be audible and will occur during the day, only for a period of approximately 2 months. The predicted level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" plant harvesting in the Jacko Lake area; however, the enjoyment of the experience may be affected (subjective to the user for no longer than two months). Lower levels of noise will continue to be noticeable during the remaining Construction phase, once sheet piling activities are completed.
- Dust during Construction of the Project may result in a decrease in the quality of the experience. During Construction, Operation, and Decommissioning and Closure, air quality deterioration particulate matter (i.e., dust) has the potential to affect the experience of gathering if dust generation by fugitive point sources is noticeable.
- Visual disturbances caused by Project infrastructure or activities. There will be a moderate degree of visual effect during Construction and Operation from Jacko Lake (including the boat launch), Goose Lake Road (East and West), the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. However, some changes to the visual landscape will be permanent. Mitigation involves re-contouring and re-vegetation to blend the new features with the natural landscape.

Changes to the Quality of Resources

SSN have expressed concern about potential changes to the quality of resources- in this case, contamination of plants for human consumption. The Project will generate dust fall in the LSA.

The risk to human health associated with the ingestion of country foods, including plants, has been assessed under the human health VC (Section 10.4). Mitigation measures specific to human health were not recommended. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

In addition to the mitigation proposed above, KAM also proposes establishment of a committee with the SSN to facilitate implementation of mitigation and monitoring. The committee will foster SSN's participation in evaluating the effectiveness of the mitigation proposed on an ongoing basis.

Characterization of Residual Effects on SSN

The residual effect on plant gathering for the SSN is adverse and is rated as Not Significant (moderate). The reason for this rating is the loss of 56% of Traditional Use plant occurrences as well as 35% of grassland habitat in the LSA, which includes areas associated with Pípsell. Access to traditional plant gathering sites identified in Pípsell, such as Goose Lake and Peterson Creek, will be altered. This results in a medium magnitude rating due to detectable changes from baseline conditions and an impediment in the ability to gather traditional use plants. Context was rated to be high, because of the importance of this area (Pípsell) to the SSN, therefore a low resiliency to additional changes to the area. Access to Jacko Lake will be maintained relatively similar to current conditions but will be affected during Operation. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation and through facilitation of access, resulting in the disturbance having a far-future duration.

Characterization of Likelihood and Confidence

The effect is considered likely (high). Confidence in this rating is medium since information provided on current gathering practices in the CHS within the Project area are not always detailed enough to identify specific effects, but mitigation for managing effects on plant species are well understood and effective.

Ceremonial or Other Cultural Uses

The Construction, Operation, and Decommissioning and Closure phases of the Project will have a residual effect on the use of ceremonial sites. The SSN identified ceremonial sites and uses in the vicinity of the Project.

The SSN are concerned about effects to ceremonial and other cultural uses of the land specifically in the areas of Pípsell. These sites are:

- The Hunting Blind Complex;
- Jacko Lake (including the vicinity of Jacko Lake where a Prayer Tree is identified by SSN but will not be affected by Project activities);
- Jacko Creek;
- Peterson Creek; and
- Goose Lake.

The effects on ceremonial sites/uses will occur during the various project phases: the Construction and operation of the mine through to the Decommissioning and Closure and Post-Closure phases of the Project. Although, ceremonial sites are present throughout the SSN traditional territory the following section will focus on sites within or near the Project footprint where residual effects may occur. Ceremonial uses in the Mine Site will be unavailable to the SSN during Construction and Operation, including Goose Lake. Clearing and construction to develop the Mine Site infrastructure may result in losses or changes to areas including unique features of those areas (e.g. the Hunting Blind Complex, prayer trees, Goose Lake). Road construction and use during Operation may results in sensorial disturbances as well.

Changes in the Availability of Ceremonial and Other Cultural Sites

Hunting Blind Complex. The Hunting Blind Complex will change as a result of the Project. Archaeological site EdRc-25 (noted to be a possible Hunting Blind in the archeological sites VC) will be directly affected by Project activities during the Construction phase. The SSN have noted that archaeological site EdRc-25 is not the same as the Hunting Blind Complex which is a larger size and includes features outside of what is demarcated in EdRc-25.As EdRc-25 and the Hunting Blind Complex are within the proposed mine pit, avoidance of the site is not feasible. Additional investigation of this site is recommended in the Archaeological Sites VC, suggesting the investigation focus on determining the antiquity and function of the site, understanding the cultural values associated with the site and how these could be related to possible mitigation options. A final mitigation strategy for this site will be determined through discussion between KAM, SSN, and the Archaeology Branch, the Ministry of Forests, Lands and Natural Resource Operations. Additional mitigation measures could include consultation and reconstruction of the petroforms at another location that can be accessed by the SSN. KAM will continue to engage the SSN in identifying mitigation for ceremonial uses. This may include but is not limited to relocating features of the Hunting Blind Complex to a suitable location identified by the SSN, documenting the Hunting Blind Complex using 3D imagery, preparation of a documentary or scaled 3D model of the Hunting Blind Complex for educational purposes, and funding for heritage education or other relevant programming.

Areas north of Jacko Lake. The Project infrastructure will not overprint the prayer tree identified in the vicinity of Jacko Lake as no effects are anticipated to this portion of Jacko Lake. However, Construction and Operation of the Project will result in the removal of the northeast arm of Jacko Lake which comprises 6% of the total area of Jacko Lake at full pool and approximately 12% of the Jacko lake littoral area. During Operation, use of the northeast arm of Jacko Lake will be lost. This portion of the lake will no longer be available to the SSN for ceremonial use, should they be using it for ceremonial purposes.

Jacko Creek. Jacko Creek will remain available to the SSN as the Project is not anticipated to affect availability of this area for ceremonial uses.

Peterson Creek. The section of Peterson Creek that runs through the Mine Site will no longer be available for ceremonial use by the SSN, as it will be overprinted by Project components. However, Jacko Creek will remain available to the SSN as the Project is not anticipated to affect availability of these areas for ceremonial uses. Downstream Peterson Creek, an identified value to the SSN in part because of the presence of fish spawning locations, will also continue to be available to the SSN for ceremonial use.

Goose Lake. Goose Lake was identified as having a cultural value to the SSN; however, no other information was available at the time of writing. Goose Lake will be overprinted by the Tailings Storage Facility and will no longer be available for ceremonial or cultural use by the SSN. Current access to this area is limited due to private property and fencing (as illustrated in Figure 8.5-1).

Changes in Access to Ceremonial and Other Cultural Sites

Access to ceremonial or cultural use locations via Goose Lake Road will no longer be available for those portions of Goose Lake Road which will be closed.

Access to middle Peterson Creek, within the footprint of the mine, will continue to be inaccessible for ceremonial or cultural uses as well as the areas of the proposed Mine Site. However, access to portions of Peterson Creek outside of the mine footprint will remain for the SSN including lower Peterson Creek as well as Jacko Creek.

Current access to where the Prayer Tree in the vicinity of Jacko Lake is located, is only available via boat as there is no public road access to this area. Project activities will not change access via boat. However, during Construction and Operation, safety zones will be enforced around the open pit during blasting periods and will include restricted access to some areas that may be used for ceremonial purposes. Blasting is expected to be undertaken once per day near 12:00 pm. This would create a window of approximately two hours during which SSN users will be unable to engage in activities within the specified blasting buffer area. Time is required before the blasting to clear the blasting buffer area of people and after the blasting to ensure that the blasting has been completed satisfactorily and that there are no hazards to people. According to the current mine plan, it is expected that during the first ten years of operations this blasting buffer could extend across the eastern half of the lake (Figure 8.5-5). KAM will have appropriate signage indicating blasting times and will communicate with Aboriginal Groups regarding when blasting is likely to occur and demarcate those areas. KAM will also facilitate continued public access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to the areas surrounding Jacko Lake.

During Construction, Operation, and Decommissioning and Closure, increased traffic generated by the Project could affect access to ceremonial or other cultural sites as more time could be required to access ceremonial or cultural use areas.

Changes in the Experience of Using Ceremonial and Cultural Sites

The Construction, Operation, and Decommissioning and Closure phases of the Project may produce a change in the experience of using lands and resources for ceremonial purposes. These are described below.

- Project-related noise disturbances during Construction, Operation, and Decommissioning and Closure may diminish the experience. Project related noise will be noticeable in the Jacko Lake area. Increased levels of traffic and related noise associated with the Project could also potentially diminish the experience of ceremonial or other cultural uses. The expected levels of noise at Jacko Lake during sheet piling activities taking place during the Construction phase will be the highest, representing the worst case scenario. The sheet piling activities are expected to be audible and will occur during the day, only for a period of approximately 2 months. The predicted level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" ceremonial or other cultural uses in the Jacko Lake area; however, the enjoyment of the experience may be affected (subjective to the user for no longer than two months). Lower levels of noise will continue to be noticeable during the remaining Construction phase, once sheet piling activities are completed.
- Dust during Construction of the Project may result in a decrease in the quality of the experience. During Construction, Operation, and Decommissioning and Closure, air quality

deterioration particulate matter (i.e., dust) has the potential to affect the experience of ceremonial land uses if dust generation by fugitive point sources is noticeable.

- Visual disturbances caused by Project infrastructure or activities. There will be a moderate degree of visual effect during Construction and Operation from Jacko Lake (including the boat launch), Goose Lake Road (East and West), portions of Peterson Creek, the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. However, some changes to the visual landscape will be permanent. Mitigation involves re-contouring and re-vegetation to blend the new features with the natural landscape.

The effects on the quality of a site for ceremonial uses are discussed by using the changes in the experience indicator.

Characterization of Residual Effects on SSN

The residual effect on ceremonial or other cultural uses for the SSN is adverse and rated as Not Significant (moderate). The development of the rating of residual effects for this indicator was weighted equally for availability, access and experience. This rating was determined based on losses of the availability, access and experience of sites associated with Pípsell including the Hunting Blind Complex, Goose Lake, Peterson Creek and minor losses to areas surrounding Jacko Lake. The experience of using some areas for ceremonial or other cultural uses may be altered by sensorial disturbances (noise and visual disturbances). The loss of these components of Pípsell as well alterations in access to these sites and experience in using the sites resulted in a medium magnitude rating due to the changes from baseline conditions and impediments in the ability to use the sites for ceremonial or other cultural uses. Context is rated high because of the high importance of this area (Pípsell) to SSN given the presence of unique features such as the Hunting Blind Complex. Access to Jacko Creek and Jacko Lake will be maintained relatively similar to current conditions but Jacko Lake will be affected by blasting during Operation. The residual effect occurs in the LSA and can be partially reversed during the Post-Closure phase, a far-future duration, mainly through habitat rehabilitation and because sensorial disturbances will cease once closure measure are fully executed.

Characterization of Likelihood and Confidence

The effect is considered likely (high). Confidence in this rating is medium since information provided on current ceremonial or cultural practices in the CHS within the Project area are not always detailed enough to identify specific locations and related effects.

Summary of Residual Effects Assessment and Significance

The assessment concludes that the residual effects of the Project on CULRTP are Not Significant varying from minor to moderate. The probability associated with residual effects is high and the confidence in the determination of significance is medium for all indicators. Table 8.5-30 provides a summary of the significance determination and the likelihood and confidence associated with the assessment.

Table 8.5-30. Summary of the Significance Determination for SSN

Residual Effect	Significance of Adverse Residual Effects	Likelihood and Confidence	
		Probability	Confidence
Disruption of Fishing Use	Not Significant (minor)	High	Medium
Disruption of Hunting Use	Not Significant (moderate)	High	Medium
Disruption of Plant Gathering	Not Significant (moderate)	High	Medium
Disruption of Ceremonial Use	Not significant (moderate)	High	Medium

8.5.6.4 Assessment of Residual Effects: Other Aboriginal Groups

Although AIB, LNIB and WP/CIB have expressed concerns about Project effects on harvesting and other traditional land uses, to date, there is a limited understanding of specific fishing, hunting, trapping, plant gathering locations or other cultural uses within the CULRTP LSA for these groups. The MNBC identified Jacko Lake and Goose Lake as areas where harvesting occurs.

As described earlier, the Project is located within the traditional territories of the Nlaka'pamux Nation and the Secwépemc Nation. The AIB and LNIB are part of the Nlaka'pamux Nation and have noted their members continue to carry out traditional practices throughout the Nlaka'pamux Nation traditional territory. WP/CIB is part of the Secwépemc Nation, and their members likely conduct traditional activities within the Secwépemc Nation traditional territory. For this assessment it is assumed that the AIB, LNIB and WP/CIB members are continue to conduct CULRTP throughout the LSA. Based on consultation and other secondary sources, it is likely that preferred harvesting locations are located closer to each Aboriginal Groups' reserves (see Section 8.5.2.3).

MNBC identified that their citizens conduct land use activities within the Project area (Jacko Lake and Goose Lake). For an assessment of residual effects, it is assumed that Métis citizens conduct CULRTP throughout the LSA.

Tables 8.5-31 to 8.5-34 present the characterization of residual effects, significance, likelihood, and confidence on CULRTP for AIB, LNIB, WP/CIB, and MNBC. The determination of significance is conservative in that it assumes all Aboriginal Groups may be using the LSA for CULRTP, although to a lesser degree than the SSN. At the time of writing, there was limited evidence of the practice of CULRTP within the LSA, as described in the following sections.

Fishing

The Thompson River has been identified as an important area for fish harvesting for WP/CIB (in particular the North Thompson River). AIB also noted that members harvest salmon in the Thompson River. Effects on fishing for traditional purposes are not anticipated in Thompson River or Kamloops Lake. Changes in fish habitat or fish populations are not expected and the sensorial disturbance generated by the Project will not be noticeable in these areas. During consultation activities, AIB Chief and Council indicated that there is limited, if any, TLU by AIB members around the Project area (AIB, pers. comm., 2014).

Table 8.5-31. Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources for Traditional Purposes for AIB

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use	Negligible	Long-term	Regular	Local	Reversible long-term	n/a	Low	Not Significant (Negligible)	Low	Medium
Disruption of Hunting Use	Negligible	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (Negligible)	Low	Medium
Disruption of Plant Gathering	Negligible	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (Negligible)	Low	Medium

[1] *Effect applies to availability, access, quality and experience of the Aboriginal Use.*

Table 8.5-32. Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources for Traditional Purposes for LNIB

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use	Minor	Long-term	Regular	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium
Disruption of Hunting Use	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium
Disruption of Plant Gathering	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium

[1] *Effect applies to availability, access, quality and experience of the Aboriginal Use.*

Table 8.5-33. Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources for Traditional Purposes for WP/CIB

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use	Minor	Long-term	Regular	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium
Disruption of Hunting Use	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium
Disruption of Plant Gathering	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	Low	Medium

[1] *Effect applies to availability, access, quality and experience of the Aboriginal Use.*

Table 8.5-34. Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources for Traditional Purposes for MNBC

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use	Minor	Long-term	Regular	Local	Reversible long-term	n/a	Low	Not Significant (minor)	High	Medium
Disruption of Hunting Use	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	High	Medium
Disruption of Plant Gathering	Minor	Long-term	Continuous	Local	Reversible long-term	n/a	Low	Not Significant (minor)	High	Medium

[1] *Effect applies to availability, access, quality and experience of the Aboriginal Use.*

LNIB indicated that they continue to fish within their traditional territory, although no specific locations within the LSA were provided. Baseline information indicates that LNIB members consider Spences Bridge, where the Thompson and Nicola Rivers meet, an important location for salmon fishing. This area is not anticipated to be affected given it is over 100 KM downstream of the Project.

Jacko Lake has been identified as a fishing area for MNBC members and a discussion about the residual effects on fishing in Jacko Lake is provided below.

Changes in the Availability of Harvested Resources

Construction and Operation of the Project will result in some losses of fish habitat in Jacko Lake. During Operation, fish habitat in the northeast arm of Jacko Lake will be lost. The area that will be removed comprises 6% of the total area of Jacko Lake at full pool and approximately 12% of the Jacko lake littoral area. The northeast dyke will displace the volume of water currently contained in the northeast arm throughout the rest of Jacko Lake and result in an incremental increase in littoral habitat with the increased water level. The assessment of the fish habitat and populations VC does not predict effects on the availability of rainbow trout for fishery in Jacko Lake. The VC also predicts no effects or loss of productivity in Jacko Lake as a result of ground vibrations generated by blasting. It is expected that availability of rainbow trout for fishing in Jacko Lake will not be affected.

Additional habitat losses are also expected within Peterson Creek downstream of the Project associated with flow reductions, although there is no evidence of Aboriginal Groups use of this area at the time of writing.

Fish habitat compensation and offsetting will aim to address serious harm to fish associated with direct habitat loss in Jacko Lake and Peterson Creek. Overall, after mitigation and compensation measures, it is expected that there will be gains in fish habitat, as a result of offsetting measures mainly around Inks Lake. It is expected that a net fish habitat gain of over 8.00 ha will be achieved, providing a greater availability of harvestable fish for use by Aboriginal Groups. The effectiveness of the offsetting plan is expected to be high.

The introduction of workers potentially fishing in Jacko Lake will be mitigated through implementing no fishing policies at site for workers and contractors.

Changes in Access to Land and Resources

The Project could cause changes in access to areas of Jacko Lake and Peterson Creek, should Aboriginal Groups use these areas.

During Construction and Operation, safety zones, enforced around the open pit during blasting periods, will include restricted access to fishing areas in Jacko Lake. Blasting is expected to be undertaken once per day near 12:00 pm. This would create a window of approximately two hours during which Aboriginal Groups harvesters will be unable to engage in activities within the specified blasting buffer area. KAM will have appropriate signage indicating blasting times and will communicate with Aboriginal Groups regarding when blasting is likely to occur and demarcate those areas.

During Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed which will affect access to Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to Jacko Lake. The potential increase in accessing time to fishing sites due to Project traffic will be mitigated by implementing the Transportation Management Plan.

Portions of Peterson Creek within the mine footprint will continue to be inaccessible for Aboriginal harvesters, should they harvest in those locations.

Changes in the Experience of Using Lands and Resources (Sensory Disturbances)

Some residual effects are expected in the experience of fishing for traditional purposes within the LSA.

Project related noise (e.g., from blasting, traffic, etc.) will be noticeable in the Jacko Lake area and could diminish the experience of fishing. The highest noise impact in Jacko Lake is expected during sheet piling activities, during the Construction phase and represents the worst case scenario for noise. Sheet piling activities will occur during the day for a period of about two months and are expected to be noticeable. The predicted noise level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" fishing in Jacko Lake; however, the enjoyment of the experience may be affected (subjective to the user for no longer than two months). Lower levels of noise will continue to be noticeable during the remaining Construction phase, once sheet piling activities are completed.

There will be a moderate degree of visual effect during Construction and Operation at Jacko Lake (including the boat launch). It is anticipated that the main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. The Peterson Creek water pond will be visible and may act as a barrier to users trying to access middle Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. Figure 8.5-8 shows the current baseline and estimated visual effects during Post-Closure from a viewpoint located at Jacko Lake.

Changes to the Quality of Resources

Mitigation measures specific to human health were not recommended in the human health VC. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

Characterization of Residual Effects on AIB

The residual effects on current AIB fishing practices are predicted to be negligible. Current TLU activities, including fishing, within the LSA are limited, as indicated by AIB representatives. The Project affects a relatively small area (north east arm of Jacko Lake and middle Peterson Creek which is already affected by past projects and activities) of the overall Peterson Creek catchment, and will not impede fishing in other areas of the LSA. A compensation and offsetting plan will be implemented that proposes to develop fish habitat in Inks Lake (within the LSA). Access to Jacko

Lake will be maintained similar to current conditions. Context is considered low, because preferred fishing sites identified by AIB are outside the LSA and RSA and will not be affected by the Project (i.e., Thompson River). The geographical extent of the effect is limited to the LSA, is long-term, and can be reversed during the Post-Closure phase. There is low probability that residual effects to AIB fishing practices occur since fishing activities within the LSA are anticipated to be limited.

Characterization of Residual Effects on LNIB

The residual effects on LNIB current fishing for traditional purposes are rated as minor. Project effects are limited to a small area of the overall Peterson Creek catchment (north east arm of Jacko Lake and middle Peterson Creek which is already affected by past projects and activities), and will not impede fishing in other areas of the catchment (i.e. upper portions of Peterson Creek) or LSA (i.e. Lower Peterson Creek). A compensation and offsetting plan will be implemented that proposes to develop fish habitat in Inks Lake (within the LSA). Access to Jacko Lake will be maintained similar to current conditions.

The effect is assessed to have low context as consultation activities conducted to date, have not indicated that Jacko Lake or Peterson Creek are preferred fish harvesting locations for the LNIB.

Preferred fishing sites identified by LNIB are outside the LSA and RSA and will not be affected by the Project (i.e., Spences Bridge, at the confluence of the Thompson and Nicola Rivers). The geographical extent of the effect is limited to the LSA, is long-term and can be reversed during the Post-Closure phase. There is low probability that residual effects to LNIB fishing occur since fishing activities within the LSA are assumed to be limited.

Characterization of Residual Effects on WP/CIB

The residual effects on WP/CIB current fishing practices are predicted to be minor. Fishing activities by WP/CIB within the LSA are expected to be limited. Baseline information indicates that fishing is more likely to occur in the North Thompson River, outside the LSA and RSA. In addition, Project effects are limited to a small area of the overall Peterson Creek catchment (north east arm of Jacko Lake and middle Peterson Creek which is already affected by past projects and activities), and will not impede fishing in other areas of the catchment (i.e. upper portions of Peterson Creek) or LSA (i.e. Lower Peterson Creek). A compensation and offsetting plan will be implemented that proposes to develop fish habitat in Inks Lake (within the LSA). Access to Jacko Lake will be maintained similar to current conditions.

Context is considered low, because there are additional fishing locations within the traditional territory. Preferred fishing sites are outside the LSA and RSA and will not be affected by the Project (i.e., North Thompson River). The geographical extent of the effect is limited to the LSA, is long-term and can be reversed during the Post-Closure phase. There is low probability that residual effects to WP/CIB fishing occur since fishing activities within the LSA are anticipated to be limited.

Characterization of Residual Effects on MNBC

MNBC has identified Jacko Lake as a fishing location for some members. The residual effect on current MNBC fishing practices is rated as Not Significant (minor). Project effects are limited to a small area of the overall Peterson Creek catchment (north east arm of Jacko Lake, and middle

Peterson Creek which is already affected by past projects and activities), and will not impede fishing in other areas of the catchment (i.e., upper portions of Peterson Creek) or LSA (i.e., Lower Peterson Creek). A compensation and offsetting plan will be implemented that proposes to develop fish habitat in Inks Lake (within the LSA). Access to Jacko Lake will be maintained similar to current conditions.

Context is considered low, because there are additional fishing locations in the region where MNBC members could continue fishing. The geographical extent of the effect is limited to the LSA, is long-term and can be reversed during the Post-Closure phase. There is low probability that residual effects to WP/CIB fishing occur since fishing activities within the LSA are anticipated to be limited.

Residual Effects Significance

Overall the residual effect on current fishing practices for AIB is considered Not Significant (negligible) due to the negligible magnitude, local extent, reversible nature of the effect, and low context.

The residual effects for LNIB, WP/CIB and MNBC are adverse and rated as Not Significant (minor) due to the minor magnitude, local extent, reversible nature of the effect, and low context.

Project effects are limited to a small area of the overall Peterson Creek catchment, and will not impede fishing in other areas of the LSA. A compensation and offsetting plan will be implemented that proposes to increase fish availability and habitat in Inks Lake (within the LSA). Access to Jacko Lake will be maintained similar to current conditions. Additional relevant fishing locations have been identified outside the LSA and RSA where Aboriginal Groups could continue practicing harvesting activities.

Characterization of Likelihood and Confidence

There is a low likelihood that residual effects will occur for AIB, LNIB and WP/CIB, since fishing activities within the LSA are anticipated to be limited. There is evidence that preferred fishing sites for these Aboriginal Groups may be located outside the LSA. Confidence in this prediction is medium since predicted effects on harvestable resources and mitigation measures are well understood, but, data on specific locations of resource harvesting areas used by Aboriginal Groups within the LSA is limited.

The residual effect on MNBC is considered likely (high). Confidence is rated as medium, since information provided on current fishing practices within the Project area are not detailed enough to identify specific effects, but mitigations for managing effects on harvestable resources are well understood and effective.

Hunting

Limited information about hunting locations within the LSA was provided by AIB, LNIB, WP/CIB or MNBC. AIB noted hunting of moose, deer, and grouse occurs in the areas near Ashcroft. These areas will not be affected by the Project. During consultation, AIB Chief and Council indicated that there is limited, if any, TLU by AIB members around the Project area (AIB, pers. comm., 2014).

WP/CIB members continue to harvest deer, moose, and elk, which likely occur in areas surrounding Whispering Pines IR #4 and the area west of the North Thompson River. MNBC have identified that they hunt mule deer, white-tail deer, moose, grouse, and migratory birds in the Kamloops area, although no specific hunting locations were provided. Métis citizens also raised concerns about potential effects to badgers in the Project area.

LNIB noted that they continue to hunt within the traditional territory. No specific hunting locations were provided within the LSA, but the LNIB expressed concerns about potential effects to hunting activities around Lac Le Jeune area. This area is approximately 15 km from the Project and effects are not anticipated.

Although no specific hunting locations were identified in the LSA, the following section will describe on residual effects on hunting in locations in the LSA where residual effects may occur; and assumes some level of hunting may occur in Jacko Lake, Peterson Creek and Goose Lake.

Changes in the Availability of Harvested Resources

Changes in the availability of hunting resources in the LSA are quantified through spatial analysis of habitat losses presented in Table 8.5-35.

Table 8.5-35. Changes in the Availability of Harvested Resources

Species	Changes in the Availability of Wildlife Habitat
Moose	No critical moose habitat was identified in the LSA although it is present in the RSA. Since suitable habitat within the LSA is limited to small patches of forested and riparian areas, moose are not expected to have an interaction with the Project.
Bear	Bear habitat is not anticipated to occur throughout the majority of the Project area and it was not selected as indicator species.
Beaver	The Project Footprint overlaps mainly terrestrial habitats such as grasslands that are not used by beavers. However, there is evidence of the use of Peterson Creek by beavers.
Deer	33 ha out of 449 ha of critical deer winter range will be lost in the LSA. In total there is over 1,600 ha of critical deer winter range present in the RSA.
American Badger	1,163 ha of suitable badger habitat will be lost in the LSA. In total there is over 4,620 ha of suitable badger habitat present in the RSA. 13 out of the 26 identified badger dig sites in the LSA will be lost.
Sharp-tailed Grouse	1,085 ha of suitable grouse growing habitat will be lost in the LSA. Within the RSA, there is over 3,875 ha of suitable grouse growing habitat. 401 ha of suitable grouse winter habitat will be lost in the LSA. Within the RSA, there is over 1,395 ha of suitable grouse winter habitat.

In addition to these direct habitat losses, noise from Project Construction and Operation may affect 3-10% of suitable wildlife habitat (deer, American badger, and sharp-tailed grouse) within the LSA. These effects are expected to reduce over the length of the Project given wildlife habituation to routine disturbances.

Wildlife mortality also has the potential to affect the availability of harvested resources for Aboriginal hunters. To mitigate these effects, KAM is enforcing speed limits and will utilize wildlife signage. Other strategies include ensuring vehicles yield to wildlife observed along Project roads; reporting wildlife sightings to supervisory personnel as soon as possible; and reporting wildlife

incidents (e.g., traffic accidents) to supervisory personnel immediately. With mitigation, residual effects to direct mortality for wildlife are not anticipated to affect wildlife availability for Aboriginal harvesters.

The potential increased competition for hunted resources from the presence of KAM employees and contractors will be mitigated by implementing a strict no guns and hunting policy banning these activities on site by any mine employees or contractors.

Changes in Access to Land and Resources

Access to hunting locations via Goose Lake Road will no longer be available for those portions of Goose Lake Road which will be closed (6.8 km loss out of 12.8 km total length; Figure 8.5-7). Goose Lake will be removed and will no longer be available for hunting activities although hunting in this area is currently limited due to private property and fencing. After Decommissioning and Closure, portions of the footprint of the mine will continue to be inaccessible for hunting. In the Post-Closure phases, KAM will support a permit system to allow Aboriginal users accessing ranch or grazing leases owned by KAM.

During Construction, Operation, and Decommissioning and Closure, roads within the Mine Site will be closed which will affect access to Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to the areas surrounding Jacko Lake.

The potential increase in time to access hunting locations due to Project traffic will be mitigated by implementing the Transportation Management Plan.

Changes in the Experience of Using Lands and Resources

Project-related noise (e.g., from blasting, traffic, etc.) will be noticeable in the Jacko Lake area and may diminish the hunting experience. The highest noise impact in Jacko Lake is expected during the construction phase due to sheet piling activities and represents the worst case scenario. Sheet piling activities are expected to be audible and will occur during the day for a period of approximately two months. The predicted noise level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" hunting in the Jacko Lake area; however, the enjoyment of the experience may be temporarily affected (subjective to the user for no longer than two months).

There will be a moderate degree of visual effect caused by the Project during Construction and Operation at Jacko Lake (including the boat launch), Goose Lake Road (East and West), the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. However, some changes to the visual landscape will be permanent. Mitigation involves re-contouring and re-vegetation to blend the new features with the natural landscape.

Emission and dispersion of dust and other contaminants from project activities have the potential to affect air quality, and affect the quality of the experience of hunting in the LSA. Project-related

activities are not predicted to alter human health risks associated with inhalation exposures to CACs and metals beyond what currently exists.

Changes to the Quality of Resources

No increased health risks are expected due to wildlife consumption. Mitigation measures specific to human health were not recommended in the human health VC. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

Characterization of Residual Effects on AIB

The residual effect that will remain after mitigation on AIB current hunting for traditional purposes is predicted to be negligible. Current TLU activities, including hunting, within the LSA are presumed to be limited, as indicated by AIB representatives. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although hunting in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. Context is considered low, because there are additional hunting locations within their traditional territory outside the LSA. In particular, preferred hunting sites identified by AIB are outside the LSA and RSA (i.e., areas near Ashcroft) and will not be affected. The geographical extent of the effect is limited to the LSA and can be reversed during the Post-Closure phase mainly through habitat reclamation. There is low probability that residual effects to AIB hunting occur since hunting activities within the LSA are expected to be limited.

Characterization of Residual Effects on LNIB

The residual effects on LNIB current hunting for traditional purposes are predicted to be minor. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although hunting in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. The effect is assessed to have low context as there is no indication that the Project area is an important hunting location for LNIB, and there are additional hunting locations within their traditional territory that are expected to be preferred (i.e., Lac Le Jeune). The geographical extent of the effect is limited to the LSA and can be reversed during the Post-Closure phase mainly through habitat reclamation. There is low probability that residual effects to LNIB hunting occur since hunting activities within the LSA are anticipated to be limited.

Characterization of Residual Effects on WP/CIB

The residual effect that will remain after mitigation on WP/CIB current hunting for traditional purposes is predicted to be minor. Hunting activities by WP/CIB within the LSA are expected to be limited. Baseline information indicates that hunting is more likely to occur in areas surrounding Whispering Pines IR #4 and in areas west of the Thompson River, outside the LSA and RSA. Hunting in areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek) is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. Context is considered low, because there are additional

hunting locations within their traditional territory that are preferred by WP/CIB. The residual effects are limited to the LSA and can be reversed during the Post-Closure phase mainly through habitat reclamation. There is low probability that effect to WP/CIB hunting occur since hunting activities by WP/CIB within the LSA are expected to be limited.

Characterization of Residual Effects on MNBC

Residual effects on MNBC hunting is of minor magnitude. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although hunting in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through Construction

of an alternative access road. Context is rated low, because there are additional hunting areas within the region and the Province where MNBC citizens could continue practicing harvesting activities. The residual effect occurs in the LSA and can be reversed during the Post-Closure phase mainly through habitat reclamation. The effect is considered likely (high).

Residual Effects Significance

Overall the residual effect on current hunting practices for AIB is rated as Not Significant (negligible) due to the negligible magnitude, local extent, reversible nature of the adverse effect, and low context.

Residual effects on LNIB, WP/CIB and MNBC are adverse and rated as Not Significant (minor) due to the minor magnitude, local extent, reversible nature of the effect, and low context.

Access to Jacko Lake will be maintained through construction of an alternative access road. Additional relevant hunting locations have been identified outside the LSA and RSA where Aboriginal Groups could continue practicing harvesting activities.

Characterization of Likelihood and Confidence

There is a low likelihood that residual effects will occur for AIB, LNIB and WP/CIB, since hunting activities within the LSA are anticipated to be limited. There is evidence that preferred hunting sites for these Aboriginal Groups may be located outside the LSA. Confidence is rated as medium, since information provided on current hunting practices by Aboriginal Groups within the Project area is limited or not detailed enough to identify specific effects, but mitigations for managing effects on wildlife species are well understood and effective.

The residual effect on MNBC is considered likely (high). Confidence is rated as medium, since information provided on current hunting practices within the Project area are not detailed enough to identify specific effects, but mitigations for managing effects on wildlife species are well understood and effective.

Plant Gathering

No specific information about gathering locations within the LSA was provided by AIB, LNIB, or WP/CIB. MNBC identified Goose Lake as a plant gathering area for some members. Gathering of berries appears to be an important activity for WP/CIB members, which likely occurs in areas

surrounding Whispering Pines IR #4 and the area west of the North Thompson River. LNIB noted that members continue to gather berries and mushrooms, but specific location were not identified at the time of writing. AIB identified that they gather Hoosham, Indian celery, potatoes, and onions in the areas around Ashcroft. These areas will not be affected by the Project. During consultation activities, AIB Chief and Council indicated that there is limited, if any, TLU by AIB members around the Project area (AIB, pers. comm., 2014).

Although no specific gathering locations within the LSA were identified besides Goose Lake, the following section will focus on potential effects on gathering practices in or near the Project footprint where residual effects may occur; in areas surrounding Jacko Lake, Peterson Creek and Goose Lake. The following assessment considers the traditional use plants identified by the SSN and documented as present in the rare plants VC LSA (Section 6.8).

Changes in the Availability of Harvested Resources

The potential changes in the availability of plant resources for Aboriginal Groups are quantified through spatial analysis of habitat losses. The rare plants study areas were used to describe losses of habitat for the LSA, particularly in those portions where the losses will likely occur, primarily in the middle Peterson Creek catchment. Plants located in the upper and lower portions of the catchment should remain available as there are no losses of habitat anticipated in those areas. One hundred and four of the 184 (56%) occurrences of Traditional Use plants within the LSA will be lost, while 45% of the Traditional Use plant occurrences will be lost from the RSA. Table 8.5-21 identifies the species of traditional use plants that will be lost as a result of overlap with the mine footprint

With respect to grasslands, 35% (1,085 ha) of grassland habitat will be lost in the LSA during Construction and Operation phases of the Project. Though reclamation is expected to reclaim grassland habitat, a Not Significant (moderate) residual effect associated with habitat loss is anticipated in the grasslands VC. The duration of this effect will last beyond the length of the Project, as revegetation and recolonization of these areas will not occur instantaneously, but rather, over several years. However, no residual effects of grassland habitat alteration are anticipated given the implementation of the invasive species management plan and the fact that grasslands are already considered altered in the Project area.

The design of the Closure and Reclamation Plan considers implementation of a re-vegetation program to support the establishment of grasslands to pre-disturbance conditions. Grassland reclamation will primarily target the TSF surface and will include both native and agronomic forage species (this will support quick establishment and ground cover for erosion control, soil stabilization and weed control). The Closure and Reclamation Plan estimates a net gain of grasslands in the Post-Closure conditions.

Operation of the mine may indirectly increase competition for plant resources from KAM employees and contractors. To mitigate these effects, KAM will implement a strict no plant gathering policy banning these activities on site by any mine employees or contractors.

Changes in Access to Land and Resources

Access to plant gathering locations via Goose Lake Road will no longer be available for those portions of Goose Lake Road which will be closed (Figure 8.5-7). Goose Lake will be removed and will no longer be available for plant gathering activities although gathering in this area is currently limited due to private property and fencing. Access to Peterson Creek, within the footprint of the mine, will continue to be inaccessible for plant gathering as well as the areas of the proposed Mine Site.

During Construction, Operation, and Closure, roads within the Mine Site will be closed which will affect access to parts of Jacko Lake. However, KAM will aim to maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project. KAM will also construct an additional parking lot area to facilitate continued access to the areas surrounding Jacko Lake.

The potential increase in accessing time to hunting locations due to Project traffic will be mitigated by implementing the Transportation Management Plan.

Changes in the Experience of Using Lands and Resources

Some residual effects are expected in the experience of conducting gathering for traditional purposes within the LSA.

Project-related noise (e.g., from blasting, traffic, etc.) will be noticeable in the Jacko Lake area and may dimish the gathering experience. The highest noise impact in Jacko Lake is expected during the construction phase due to sheet piling activities and this represents the worst case scenario for noise. Sheet piling activities are expected to be audible and will occur during the day for a period of approximately two months. The predicted noise level is over 75 dBA Leq daytime at the eastern part of the lake. The sheet piling activities will not "disallow" gathering in the Jacko Lake area; however, the enjoyment of the experience may be temporarily affected (subjective to the user for no longer than two months).

There will be a moderate degree of visual effect caused by the Project during Construction and Operation at Jacko Lake (including the boat launch), Goose Lake Road (East and West), the Lac Le Jeune Road #1 and Haul Road, Inks Lake, and Coal Hill. It is anticipated that main project components such as the mine rock storage facilities and the TSF will be noticeable from locations such as Jacko Lake and lower Peterson Creek. Visual disturbances will reduce to slight in some areas during the Post-Closure phase. However, some changes to the visual landscape will be permanent. Mitigation involves re-contouring and re-vegetation to blend the new features with the natural landscape.

Changes to the Quality of Resources

The risk to human health associated with the ingestion of country foods, including plants, has been assessed under the human health VC (Section 10.4) Mitigation measures specific to human health were not recommended. Mitigation measures to control air and dust emissions outlined in the air quality effects assessment (Section 10.1) and mitigation measures to control surface water and groundwater discharges outlined in the water quality effects assessment (Section 6.3) will reduce Project emissions to levels that are protective of human health.

Characterization of Residual Effects on AIB

The residual effect on plant gathering for the AIB is rated as negligible in magnitude. Current TLU activities, including gathering, within the LSA are limited, as indicated by AIB representatives. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although gathering in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation. Context is considered low, because there are additional gathering locations within their traditional territory outside the LSA. In particular, preferred gathering sites identified by AIB are outside the LSA and RSA (i.e. areas around Ashcroft). The effect is local, long-term in duration and reversible.

Characterization of Residual Effects on LNIB

The residual effect on plant gathering for the LNIB is considered minor in magnitude. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although gathering in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation. The effect is assessed to have low context as there is no indication that the Project area is an important gathering location for LNIB, and there are additional gathering locations within their traditional territory that are expected to be preferred. The effect is local, long-term in duration and reversible.

Characterization of Residual Effects on WP/CIB

The residual effect on WP/CIB current plant gathering is predicted to be minor. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek), although gathering in these areas is currently limited due to private property and fencing. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation. Context is considered low, because there are additional gathering locations within their traditional territory that are preferred by WP/CIB. Baseline information indicates that gathering is more likely to occur in areas surrounding Whispering Pines IR #4 and in areas west of the Thompson River, outside the LSA and RSA. The residual effect is limited to the LSA, is long term in duration and reversible.

Characterization of Residual Effects on MNBC

Residual effects on MNBC current plant gathering is of minor magnitude. The Project will limit access to areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek). Gathering in these areas is currently limited due to private property and fencing, although MNBC note that Goose Lake continues to be a gathering location for some citizens. KAM will aim to maintain access to Jacko Lake through construction of an alternative access road. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation. Context is rated low, because there are additional gathering areas within the region where MNBC members could continue practicing gathering activities. The residual effect is limited to the LSA, is long term in duration and reversible.

Residual Effects Significance

Overall the residual effect on current gathering practices for AIB is adverse and rated as Not Significant (negligible) due to the negligible magnitude, local extent, reversible nature of the effect, and low context.

The residual effects for LNIB, WP/CIB and MNBC are adverse and rated as Not Significant (minor) due to the minor magnitude, local extent, reversible nature of the effect, and low context.

Gathering in areas within the Project footprint (e.g., Goose Lake, Middle Peterson Creek) is currently limited due to private property and fencing. Access to Jacko Lake will be maintained through construction of an alternative access road. The losses in the ability to gather plants will be mitigated during the Post-Closure phase with re-vegetation. Additional relevant gathering locations have been identified outside the LSA and RSA where aboriginal Groups could continue practicing harvesting activities.

Characterization of Likelihood and Confidence

There is a low likelihood that residual effects will occur for AIB, LNIB and WP/CIB, since gathering activities within the LSA are anticipated to be limited. There is evidence that preferred gathering sites for these Aboriginal Groups are located outside the LSA. Confidence is rated as medium, since information provided on current hunting practices by Aboriginal Groups within the Project area is limited or not detailed enough to identify specific effects, but mitigations for managing effects on harvested resources are well understood and effective.

The residual effect on MNBC is considered likely (high). Confidence is rated as medium, since information provided on current gathering practices within the Project area are not detailed enough to identify specific effects, but mitigations for managing effects on harvested resources are well understood and effective.

Ceremonial Use

No ceremonial sites and uses in the vicinity of the Project have been identified by AIB, LNIB, WP/CIB or MNBC and therefore no determination of significance was conducted. Consultation is ongoing between KAM and the Aboriginal Groups, which may yield additional information on the use of lands and resources that may potentially be affected by the Project. Where appropriate, additional information made available by Aboriginal Groups will be considered in on-going Project development planning.

Summary of Residual Effects Assessment and Significance

The assessment concludes that the residual effects of the Project on CULRTP for AIB are Not Significant (negligible). Residual effects for LNIB, WP/CIB and MNBC are Not Significant (minor). The probability associated with residual effects is low for AIB, LNIB, WP/CIB, and high for MNBC; the confidence in the determination of significance is medium for all indicators for all Aboriginal Groups. Table 8.5-36 to Table 8.5-39 provide a summary of the significance determination and the likelihood and confidence associated with the assessment for each Aboriginal Group.

Table 8.5-36. Summary of the Significance Determination for AIB

Residual Effect	Significance of Adverse Residual Effects	Likelihood and Confidence	
		Probability	Confidence
Disruption of Fishing Use	Not Significant (negligible)	Low	Medium
Disruption of Hunting Use	Not Significant (negligible)	Low	Medium
Disruption of Plant Gathering	Not Significant (negligible)	Low	Medium

Table 8.5-37. Summary of the Significance Determination for LNIB

Residual Effect	Significance of Adverse Residual Effects	Likelihood and Confidence	
		Probability	Confidence
Disruption of Fishing Use	Not Significant (minor)	Low	Medium
Disruption of Hunting Use	Not Significant (minor)	Low	Medium
Disruption of Plant Gathering	Not Significant (minor)	Low	Medium

Table 8.5-38. Summary of the Significance Determination for WP/CIB

Residual Effect	Significance of Adverse Residual Effects	Likelihood and Confidence	
		Probability	Confidence
Disruption of Fishing Use	Not Significant (minor)	Low	Medium
Disruption of Hunting Use	Not Significant (minor)	Low	Medium
Disruption of Plant Gathering	Not Significant (minor)	Low	Medium

Table 8.5-39. Summary of the Significance Determination for MNBC

Residual Effect	Significance of Adverse Residual Effects	Likelihood and Confidence	
		Probability	Confidence
Disruption of Fishing Use	Not Significant (minor)	High	Medium
Disruption of Hunting Use	Not Significant (minor)	High	Medium
Disruption of Plant Gathering	Not Significant (minor)	High	Medium

8.5.7 Cumulative Effects Assessment

8.5.7.1 Introduction

This section describes the assessment of cumulative effects associated with CULRTP. Cumulative effects result from interactions between Project-related residual effects and incremental effects from other reasonably foreseeable projects and activities in the RSA. The CEA also considers effects from past and present projects and activities in the RSA. This section will also describe mitigation and determine the significance of the cumulative effects of the Project in combination with other Projects and activities.

As described, the CULRTP assessment indicates the Project will likely result in residual effects for fishing, hunting, plant gathering, and ceremonial uses within the LSA. Potential cumulative effects

on CULRTP must be considered when the residual effect is determined to be other than Not Significant (negligible) and it overlaps, temporarily or spatially, with known or likely residual effects from past, present, or reasonably foreseeable projects within the established RSA.

The cumulative effects assessment follows the methodology outlined in Section 5.1.6 (Cumulative Effects Assessment). The approach used for assessing cumulative effects is conservative because it assumes that the areas identified by Aboriginal Groups within the Peterson Creek catchment were fully available for fishing, hunting, gathering and ceremonial use in the past. Other projects and activities may impact on the on-going ability of Aboriginal Groups to engage in CULRTP within the RSA. In order to be included, a project or activity must have the potential to act cumulatively with the residual effects of the Project for CULRTP, spatially or temporally. The spatial boundary considered for the assessment of cumulative effects is the RSA. The temporal boundaries correspond to the temporal boundaries defined for the Project as presented in Section 8.5.3.2.

Activities that could potentially interact with the residual effects on CULRTP include:

- mineral exploration and mining;
- forestry-related activities (cut blocks, woodlots);
- agriculture and grazing;
- community infrastructure;
- transportation and access;
- non-traditional hunting, fishing, trapping and guide outfitting; and
- other recreational activities.

There are four indicators for residual effects that will be carried forward in the cumulative effects assessment for CULRTP because they have the potential to interact with other projects and activities present in the RSA (Table 8.5-40).

Table 8.5-40. Residual Effects on CULRTP Carried Forward for Cumulative Effects Assessment

Indicator Experiencing Residual Effect	Significance Rating
Disruption of Fishing Uses	Not Significant (minor)
Disruption of Hunting Uses	Not Significant (minor to moderate)
Disruption of Plant Gathering	Not Significant (minor to moderate)
Disruption of Ceremonial Uses (SSN only)	Not Significant (moderate)

8.5.7.2 Identification of Other Actions that May Affect Current Use of Land and Resources for Traditional Purposes

Historically, the RSA was inhabited by the Secwépemc and Nlaka'pamux peoples. The Aboriginal Groups present in this area lived off the land and would move from food source to food source, to fish, hunt, and gather. The areas of the RSA and the LSA provided plants for food, technological uses, and ceremonial uses, including root plants, berries, stems or shoots, seeds, nuts, mushrooms,

and tree lichens. The arrival of Europeans in the 1800s had a substantive effect on the ability of Secwépemc and Nlaka'pamux peoples to continue peaceful control over their lands.

In 2014, during Chief Ronald Ignace's testimony for the Trans Mountain Pipeline National Energy Board hearing, he noted the Secwépemc traditional territory covers between 150,000 and 180,000 km^2. Within the traditional territory, developments such as road infrastructure, pipelines, and forestry have severely impacted the land and resources (SSN Affidavits, 2011). This corresponds with the results of cumulative effects assessment which illustrates the effects caused as a result of agricultural, infrastructure and mining.

Since the late 1800s, the RSA and surrounding area has seen the development of the transcontinental railroad, rapid population growth, and infrastructural developments, including bridges and highways. The growth of the timber and agricultural industry also caused disturbances to the practice of CULRTP within the RSA. Ranching (including cattle grazing) also developed, and is currently ongoing immediately within and adjacent to the Project.

Forestry and mining activities have been ongoing in the area for over 100 years, with more sustained activities occurring since the 1970s. The proposed mine infrastructure will occupy 1,705 ha of land. Approximately 225 ha or 13% of this land has been classified as disturbed by previous activities including open pit mining conducted by Teck Cominco during the 1990s, agricultural activities and road developments. Table 8.5-41 provides the screening rationale of other actions for inclusion in the CEA for CULRTP.

8.5.7.3 Interactions between Residual Project Effects and Other Project or Activity Effects

The assessment of effects of the Project concluded that there will be no significant residual effects on fishing, hunting, plant harvesting or ceremonial uses as indicated in Table 8.5-42. The residual effects rated as Not Significant (Negligible, Minor, or Moderate) of the Project have the potential to interact with effects of past, present and reasonable foreseeable future projects and activities within the LSA and RSA. The main interaction is through the additional disturbance that the Project will generate to aquatic and terrestrial habitats that have already been affected mainly by agricultural activities (i.e., 56% of the LSA and 58% of the RSA), past and present mining operations – including the Project (i.e., 24% of the LSA and 12% of the RSA) and the development of infrastructure such as roads, transmission lines, and pipeline corridors (8% of the LSA and 7% of the RSA). These activities have affected the availability of resources, access and the experience of land use for traditional purposes.

To a minor degree, forestry and recreational activities have created additional disturbances to the natural habitat, but approximately 100 km of recreational trails present in the RSA have opened the door to recreational hunters who compete for the same resources that are harvested by Aboriginal Groups, such as deer and moose. In summary, and including the effects of the Project, the total disturbance from past, present and reasonably foreseeable future activities account for 90% of the LSA and 84% of the RSA. Figure 8.5-11 and Figure 8.5-12 illustrate the presence of other project and activities within the LSA and RSA and the magnitude of their interventions in the area.

8.5.7.4 Proposed Mitigation Measures

The following measures are proposed to avoid, reduce or otherwise mitigate the cumulative effects of the Project on CULRTP.

- **Ajax Closure and Reclamation Plan.** The Closure and Reclamation Plan recognizes the land in the LSA and RSA have pre-mining uses, which include agriculture, wildlife, traditional land use and recreational values. Although the post-mining landscape will not be identical to the pre-mining landscape, the reclamation plan aims to replicate pre-mining ecosystems by re-establishing the original ecological diversity of landforms (slope, aspect and elevation), soil thickness/moisture regimes and vegetation communities. Most of the Project footprint is located within the Agricultural Land Reserve (ALR). Operation of the Project will require a temporary ALR exemption. KAM intends to return the reclaimed Mine Site to the ALR so it can operate as a viable ranching operation. Reclamation strategies will focus on providing equivalent grazing capacity compared to pre-mining conditions. Recognizing the importance of grasslands to the SSN and other Aboriginal Groups, the Closure and Reclamation Plan also proposes revegetation that will result in the post-mining landscape having similar grassland areas to the pre-mining land. KAM is committed to implementing a collaborative approach to reclamation with the Aboriginal Groups which may include providing funding for ongoing reclamation research and incorporating Aboriginal Groups input into identification of plants for revegetation. In addition, KAM proposes to establish a committee with the SSN to facilitate implementation of mitigation and monitoring. The committee will foster SSN's participation in evaluating the effectiveness of the mitigation proposed on an ongoing basis.
- **Collaborate with local government and Aboriginal Groups.** KAM will collaborate with local government agencies and Aboriginal Groups to identify strategies to minimize cumulative effects on Aboriginal land users. The strategies may include support for land use planning to minimize disruption and displacement of land use activities and will incorporate input provided by Aboriginal Groups.

8.5.7.5 Evaluation of Significance of Residual Cumulative Effects

The cumulative effects on CULRTP are determined due to disruption of fishing, hunting, plant gathering, and ceremonial uses are determined to be significant for hunting, plant gathering and ceremonial uses and Not Significant (moderate) for fishing.

The Project contributes to cumulative effects due to additional land disturbances that the development of the mine infrastructure will generate but the main contributing factor for the cumulative effects are the agricultural activities which cover 56% and 58% of the LSA and RSA respectively. It is expected that the overall levels of land disturbance would reach 90% in the LSA and 84% in the RSA, which would be partially mitigated once the Project reaches its Decommissioning and Closure stage and re-vegetation is implemented to achieve Post-Closure land use objectives. However, after implementation of mitigation, it is expected that the level of disturbance in the terrestrial habitat will remain at above 80% levels (Table 8.5-43).

Table 8.5-41. Screening of Other Actions for Inclusion in the CEA for Current Use of Lands and Resources for Traditional Purposes

Category	Project or Activity within the Local Study Area	Length (km)	Surface Area (ha)	Total (ha)	Project or Activity within the Regional Study Area	Length (km)	Surface Area (ha)	Total (ha)
Agriculture	Agricultural Land Reserve (ALR)			4,110	Agricultural Land Reserve (ALR)			9,088
	5 Active Range Tenures		304		6 Active Range Tenures		8,264	
	RAN077241 (FREDERICK PAIN)				*RAN077241 (FREDERICK PAIN)*			
					RAN077359 (OLD ROPER FIELD RANCH LTD.)			
	RAN077352 (JOCKO CREEK LAND AND TIMBER LTD)				*RAN077352 (JOCKO CREEK LAND AND TIMBER LTD)*			
	RAN077353 (BRIAN CIANCONE)				*RAN077353 (BRIAN CIANCONE)*			
	RAN077360 (SUGARLOAF RANCHES LIMITED)				*RAN077360 (SUGARLOAF RANCHES LIMITED)*			
	RAN077545 (GEORGE LITTLE)				*RAN077545 (GEORGE LITTLE)*			
	10 Retired Range Tenures		419		11 Retired Range Tenures		16,259	
	4 Crown Tenures with Grazing Purpose		467		6 Crown Tenures with Grazing Purpose		843	
	864895				864895			
					870651			
					864884			
	864716				864716			
	871803				871803			
	861198				861198			
Infrastructure	Coquihalla Highway			28	Coquihalla Highway			110
	Lac Le Jeune Road			71	Lac Le Jeune Road			90
	Kinder Morgan Pipeline			26	Kinder Morgan Pipeline			93
	Kinder Morgan Pipeline Reroute			93	Kinder Morgan Pipeline Reroute			90
	Existing Transmission Line ROW			37	Existing Transmission Line ROW			62
	Other Road ROW			281	Other Road ROW			512
	Railway ROW			1.0	Railway ROW			4.1
	1 Crown Tenure with General Industrial Purpose			1.6	1 Crown Tenure with General Industrial Purpose			1.6
	2 Crown Tenure with Transportation Purpose			23	3 Crown Tenure with Transportation Purpose			24
	14 Crown Tenure with Utility Purpose			13	18 Crown Tenure with Utility Purpose			26
					1 Crown Tenure with Windpower Purpose			2
	103 Water Management Licenses	27		27	156 Water Management Licenses	48		
Forestry	1 Active Forest Cutblocks			7	17 Active Forest Cutblocks			176
	1 Future Cutblocks			12	59 Future Cutblocks			404
					16 Retired Forest Cutblocks			241
				18	Logging Road			128
	1 Active Woodlot		19		2 Active Woodlots		2,014	
	K2E				*K2E*			
	W0382				*W0382*			

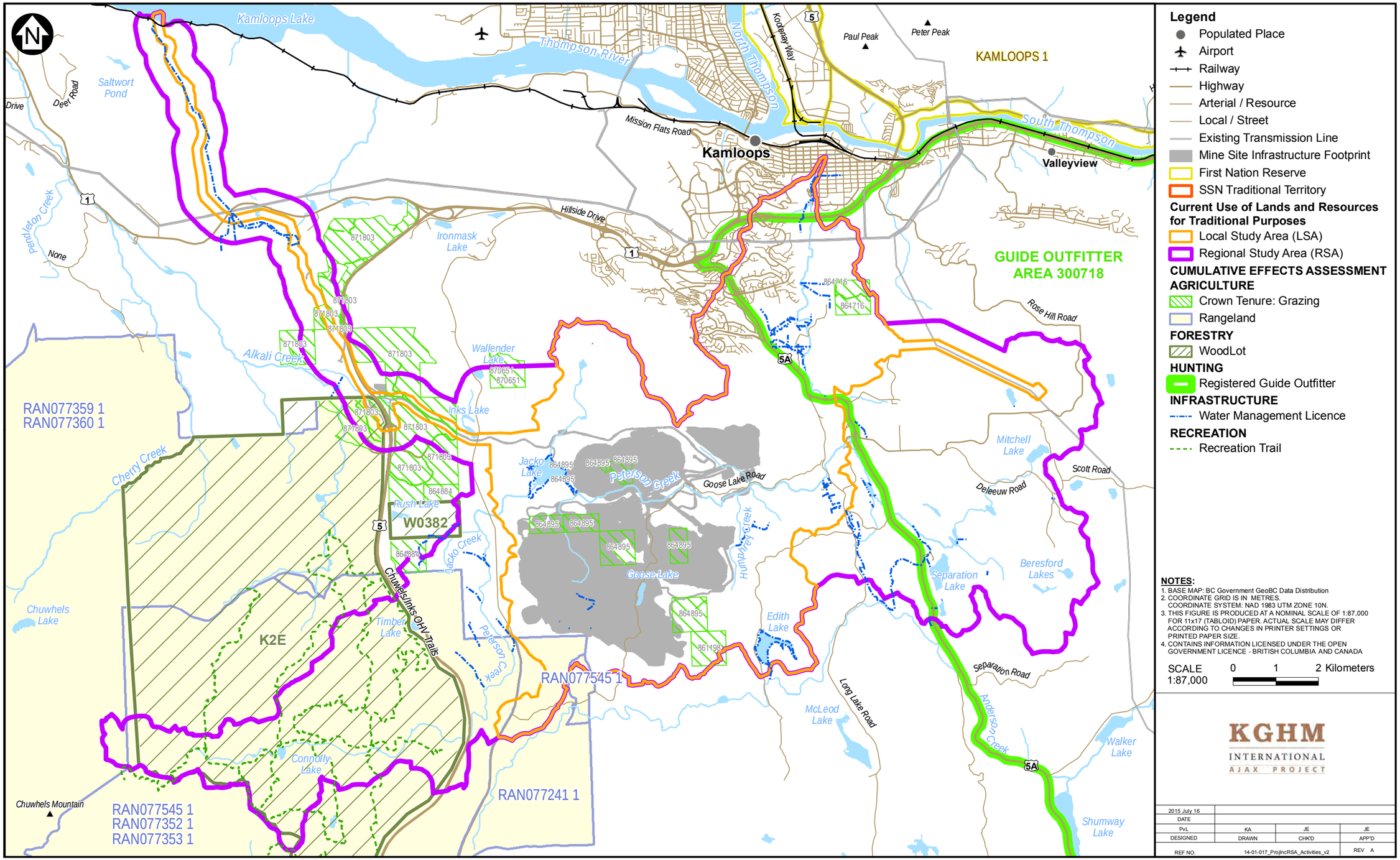
(continued)

Table 8.5-41. Screening of Other Actions for Inclusion in the CEA for Current Use of Lands and Resources for Traditional Purposes (completed)

Category	Project or Activity within the Local Study Area	Length (km)	Surface Area (ha)	Total (ha)	Project or Activity within the Regional Study Area	Length (km)	Surface Area (ha)	otal (ha)
Hunting	4 Registered Traplines		7,166		4 Registered Traplines		15,559	
	TR0319T001 (overlaps LSA and RSA)				*TR0319T001*			
	TR0320T001 (overlaps LSA and RSA)				*TR0320T001*			
	TR0320T003 (overlaps LSA and RSA)				*TR0320T003*			
	TR0319T002 (overlaps LSA and RSA)				*TR0319T002*			
	1 Active Guide Outfitter				1 Active Guide Outfitter			
	300718 (FINDLAY, Neil T.)		1,171		*300718 (FINDLAY, Neil T.)*		4,202	
Mining	New Afton Mine			15	New Afton Mine			200
	Old Ajax Mine			n/a	Old Ajax Mine			n/a
	New Ajax Mine			1,705	New Ajax Mine			1,705
	61 Mineral Tenures		6,074		125 Mineral Tenures		13,472	
Recreation	1 Active Recreation Trail				1 Active Recreation Trail			
	Chuwels/Inks OHV Trails				*Chuwels/Inks OHV Trails*	32		32
	1 Retired Recreation Trail				1 Retired Recreation Trail			
	Lac Le Jeune Snowmobile Trail				*Lac Le Jeune Snowmobile Trail*	76		76
	1 Active Recreation Site				1 Active Recreation Site			
	Edith Lake			3	*Edith Lake*			3
TOTAL				6,471				13,066

[1] *It has been assumed that linear developments affect 10 m wide ROW.*
[2] *The footprint of the Old Ajax Mine is 100% embedded within the Project footprint, therefore it is not considered in the calculations to avoid double counting.*

Figure 8.5-11
Cumulative Effects Assessment - Other Activities within Licenses and Tenures



Legend

- Populated Place
- Airport
- Railway
- Highway
- Arterial / Resource
- Local / Street
- Existing Transmission Line
- Mine Site Infrastructure Footprint
- First Nation Reserve
- SSN Traditional Territory

Current Use of Lands and Resources for Traditional Purposes

- Local Study Area (LSA)
- Regional Study Area (RSA)

CUMULATIVE EFFECTS ASSESSMENT

AGRICULTURE

- Crown Tenure: Grazing
- Rangeland

FORESTRY

- WoodLot

HUNTING

- Registered Guide Outfitter

INFRASTRUCTURE

- Water Management Licence

RECREATION

- Recreation Trail

NOTES:

1. BASE MAP: BC Government GeoBC Data Distribution
2. COORDINATE GRID IS IN METRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:87,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

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KGHM INTERNATIONAL AJAX PROJECT

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Figure 8.5-12
Cumulative Effects Assessment - Quantifiable Effects within the CULRTP RSA

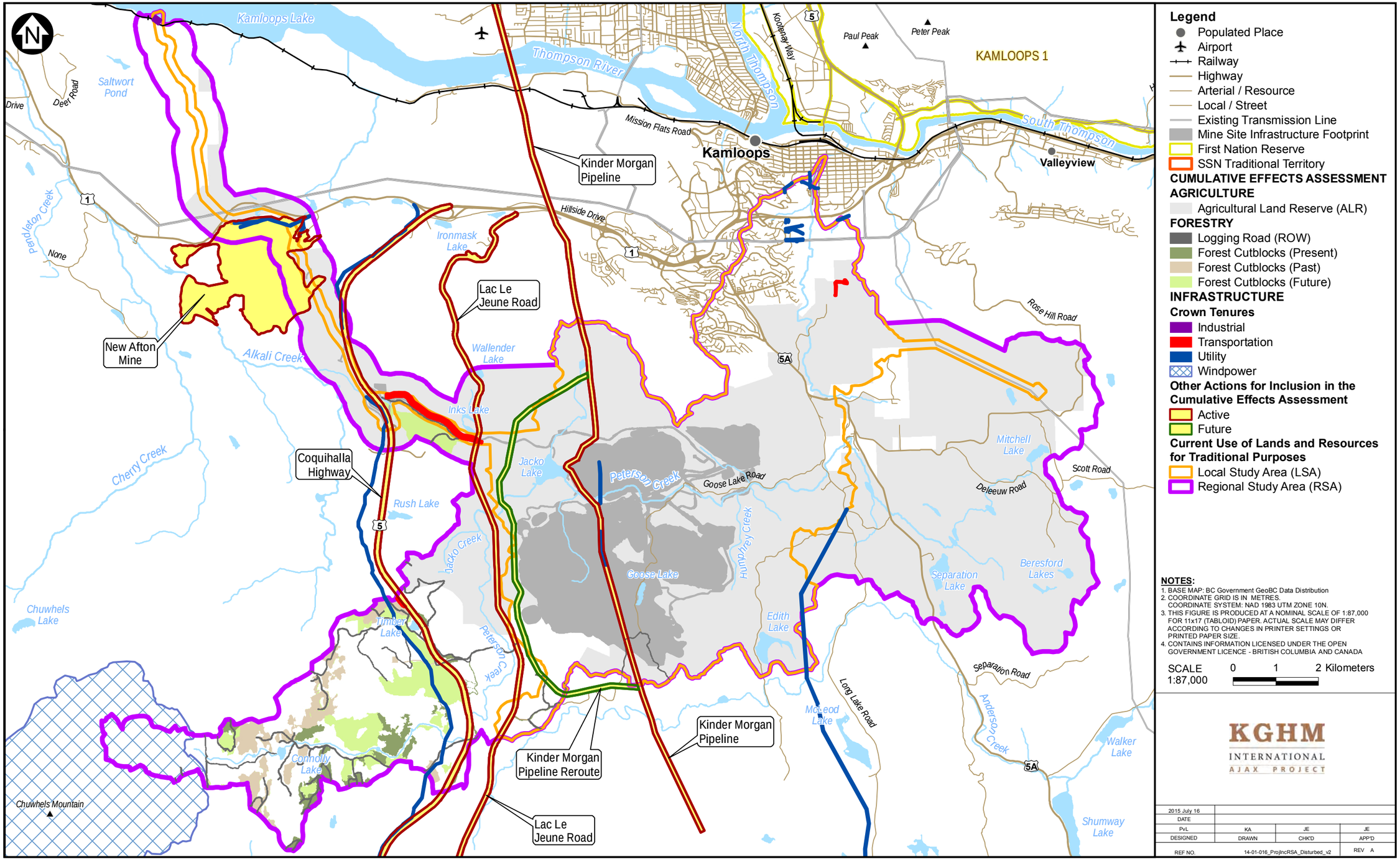


Table 8.5-42. Cumulative Effects Interactions Matrix for Current use of Land and Resources for Traditional Purposes

Other Projects/Residual Effects	Residual Effect on Fishing	Residual Effect on Hunting	Residual Effect on Plant Gathering	Residual Effect on Ceremonial Use	Areas Disturbed in the LSA		Areas Disturbed in the RSA	
					(ha)	(%)	(ha)	(%)
Agriculture	Y	Y	Y	Y	4,031	56%	9,014	58%
Infrastructure	Y	Y	Y	Y	601	8%	1,013	7%
Forestry	Y	Y	Y	Y	37	1%	949	6%
Hunting	N	Y	N	N	0	0%	0	0%
Mining	Y	Y	Y	Y	1,720	24%	1,905	12%
Recreation	Y	Y	Y	Y	3	0%	111	1%
Total Disturbance					6,392	90%	12,992	84%
Total Area					7,166	100%	15,558	100%

Table 8.5-43. Summary of Cumulative Effects Mitigation Measures and Residual Effects on Current Use of Land and Resources for Traditional Purposes

Ajax Project Activity	Other Human Action Activity	Description of Potential Cumulative Effect	Description of Mitigation Measure(s)	Description of Residual Cumulative Effect
Clearing of vegetation, stripping of topsoil and deposition of mine waste	Agriculture Infrastructure Forestry Hunting Mining Recreation	Terrestrial and aquatic habitats in approximately 90% of the LSA and 84% of the RSA are affected by projects and activities, which disrupts the fishing, hunting, plant gathering and ceremonial uses of the land for traditional purposes	Mine Closure and Rehabilitation	With the implementation of the mine Decommissioning and Closure and reclamation plan, the overall habitat disturbance will be reduced, but the levels of disturbance will remain at more than 80% for both the LSA and RSA

Given that the upper west sub-catchments of Peterson Creek has been subject to a lesser degree of disturbance compared to other areas of the catchment and that fishing opportunities remain available in this area, the cumulative effect on fishing is considered to be of a lesser magnitude compared to terrestrial uses such as hunting, plant gathering and ceremonial use.

The effects on the land and resource use from past, present and reasonably foreseeable future projects and activities in addition to the expected residual effects of the Project generate cumulative effects which vary between Not Significant (moderate) to significant as presented in Table 8.5-44 below. It is important to note that without the Project, there are already significant cumulative effects from past and present activities on CULRTP. Approximately 84% of the RSA and 90% of the LSA land use has been affected by past and present projects and activities. The Project represents a minor contribution to the cumulative effects that are already present in the RSA.

Mitigation proposed by the Project, particularly the re-vegetation measures that will be implemented during the Decommissioning and Closure phase will reduce overall disturbance, but it is expected that these levels will remain above 80% in both the LSA and RSA following Decommissioning and Closure of the Project.

8.5.8 Conclusion

Table 8.5-45 provides a summary of Project residual effects, mitigation and significance for current use. With respect to the current use indicators (fishing, hunting, and plant gathering), residual effects are anticipated for all Project phases and for all Aboriginal Groups, and range from Not Significant (negligible) to Not Significant (moderate). The rankings are based mainly on habitat losses, alterations to availability, and changes to access to Traditional Use resources and sites. Residual effects for the Ceremonial and Other Cultural Uses indicator were only determined for SSN due to the loss and alteration of sites associated with Pípsell.

Table 8.5-44. Summary of Cumulative Residual Effects, and Significance for Current Use of Land and Resources for Traditional Purposes

Residual Effect	Cumulative Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Fishing Use[1]	Moderate	Long term	Continuous	Regional	Reversible long-term	n/a	High	Not Significant (moderate)	High	Medium
Disruption of Hunting Use[1]	Major	Long term	Continuous	Regional	Reversible long-term	n/a	High	Significant	High	Medium
Adverse changes to Plant Gathering Areas[1]	Major	Long term	Continuous	Regional	Reversible long-term	n/a	High	Significant	High	Medium
Adverse changes to Cultural/Ceremonial Use Areas [1]	Major	Long term	Continuous	Regional	Reversible long-term	n/a	High	Significant	High	Medium

[1] *Effect applies to availability, access, quality, and experience of the Aboriginal use.*

Table 8.5-45. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Land and Resource Use

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Disruption of Fishing Uses	All	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Not Significant (Negligible to Minor)	Not Significant (Moderate)
Disruption of Hunting Uses	All	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Not Significant (Negligible to Moderate)	Significant
Disruption of Plant Gathering	All	Closure and Reclamation Plan, Invasive Species Management Plan, No plant gathering policy, Transportation Management Plan	Not Significant (Negligible to Moderate)	Significant
Disruption of Ceremonial Uses (SSN only)	All	Closure and Reclamation Plan	Not Significant (Moderate)	Significant

Cumulative effects were also identified for all current use indicators, ranging from Not Significant (moderate) to Significant, with the Significant rating for Ceremonial Uses relating only to SSN. These rankings are driven by the degree of present disturbance to current use resources and sites in the LSA. Key mitigation measures include implementation of Management plans including the Fish Habitat Mitigation and Offsetting Plan, the Transportation Management Plan and the Closure and Reclamation Plan as well as the implementation of No Fishing, Hunting, and Plant Gathering Policies.

Given the location of the ore deposits and the resulting design of the open pits and waste rock storage areas, as well as the lack of feasible alternatives for mining of the ore deposit, some localized effects on the environment and associated CULRTP are unavoidable and are a necessary outcome of developing the Project. KAM has undertaken substantial redesign to minimize effects from the Project, as well as development of mitigation and management plans to further reduce and manage adverse effects. Nonetheless, there will be unavoidable residual effects on CULRTP. KAM will continue to make efforts to involve the SSN in closure and reclamation planning.

8.6 OUTDOOR RECREATION

8.6.1 Rationale

During Project-related consultation, a number of different social topics were raised for consideration as Valued Components (VCs). In order to be identified as VCs for the application there must be a perceived likelihood that the VC will be affected by the Project. Scoping of social VCs took into account issues and concerns raised during Project consultation with the public and stakeholders (see Sections 4.6 and 4.7), discussions with the British Columbia Environmental Assessment Office (BC EAO) and other government agencies, and the experience of other recent projects in British Columbia (BC). Interactions with the Project Working Group (WG), comprised of representatives from federal, provincial, regional and local governments, as well as Aboriginal Groups, also helped frame the VCs.

This section includes a description of the scoping process used to identify Outdoor Recreation in the assessment. Scoping is fundamental to focusing the Application for an Environmental Assessment Certificate/Environmental Impact Statement for a Comprehensive Study (Application/EIS) on issues where there is the greatest potential to cause significant adverse effects. Valued components are components of the natural and human environment that are considered to be of scientific, ecological, economic, social, cultural, or heritage importance (CEA Agency 2006; BC EAO 2013). Valued components are scoped into the environmental assessment based on issues raised during consultation with Aboriginal communities, government agencies, the public, and stakeholders. Consideration of certain VCs may also be a legislated requirement, or known to be a concern as a result of previous project experience.

Table 8.6-1 summarizes the rationale for including Outdoor Recreation in the Application/EIS. Specific concerns about Outdoor Recreation effects identified by local residents and the public supported

Table 8.6-1. Summary of Rationale and Justification for Outdoor Recreation as a VC

Valued Components	Identified by*				Rationale for Inclusion
	AG	G	P/S	SK	
Outdoor Recreation	X	X	X	X	Concerns related to potential for lost or compromised recreational activities, including changes or loss of access to recreational areas, and changes to the quality of recreational experience as a result of environmental effects of the Project.

**AG = Aboriginal Group; G = Guideline Requirement; P/S = Public/Stakeholder; SK = Scientific/Professional Knowledge*

This topic has been separated from other aspects of Land and Resource Use (see Section 8.4) because of specific concerns identified by local residents and the public. These concerns relate to the potential that recreational activities or areas may be lost to the Project, or compromised by Project effects (e.g., noise, air quality, visual impact).

Outdoor Recreation includes a variety of outdoor pursuits, such as fishing, hunting, hiking, biking, cross-country skiing, and other activities. Areas of particular interest include Jacko Lake, Inks Lake, Goose Lake and Goose Lake Road. Other recreational areas potentially affected by the Project are also considered, including use of public/municipal parks and private lands.

Key concerns raised during consultation and therefore considered in this section include potential effects related to:

- **Access to recreational areas:** The Project will result in the removal of some land from current use to accommodate Project infrastructure. These areas will no longer be accessible to the public or other land users. For example, a 6km portion of the Goose Lake Road will be fully incorporated into the Tailings Storage Facility (TSF). While this section will no longer be accessible for recreational purposes, the east and west terminus points will continue to be accessible. Access restrictions may also limit the use of, or transit through, areas currently used for recreation. Importantly, much of the land that will be affected from a recreational use perspective is currently private land. Recreational activities undertaken there are typically informal and may take place with or without the permission of landowners.
- **Changes in recreation experience:** Concerns have been raised that the Project and its activities may contribute to a reduction in the overall quality of the experience for recreation users in the vicinity of the Project. These concerns encompass air quality, noise and vibration, visual impacts and other features may reduce the overall quality of the experience for recreation users in the vicinity of the Project (e.g., increased Project traffic, potential hazards, and safety concerns).
- **Changes in resources:** Recreational activities may experience indirect effects associated with fish and wildlife resources. If there are potential changes in the distribution, abundance and quality of these resources, then the success of recreational fishing and hunting may be adversely affected.

The assessment of effects to Outdoor Recreation is related primarily to potential effects on recreation users and pursuits in the vicinity of the Project. The information developed from other VCs is used to support the analysis of this VC as summarized in Figure 8.6-1. For example, research and findings from Fish and Fish Habitat (Section 6.7) help to inform potential effects on recreational fishing.

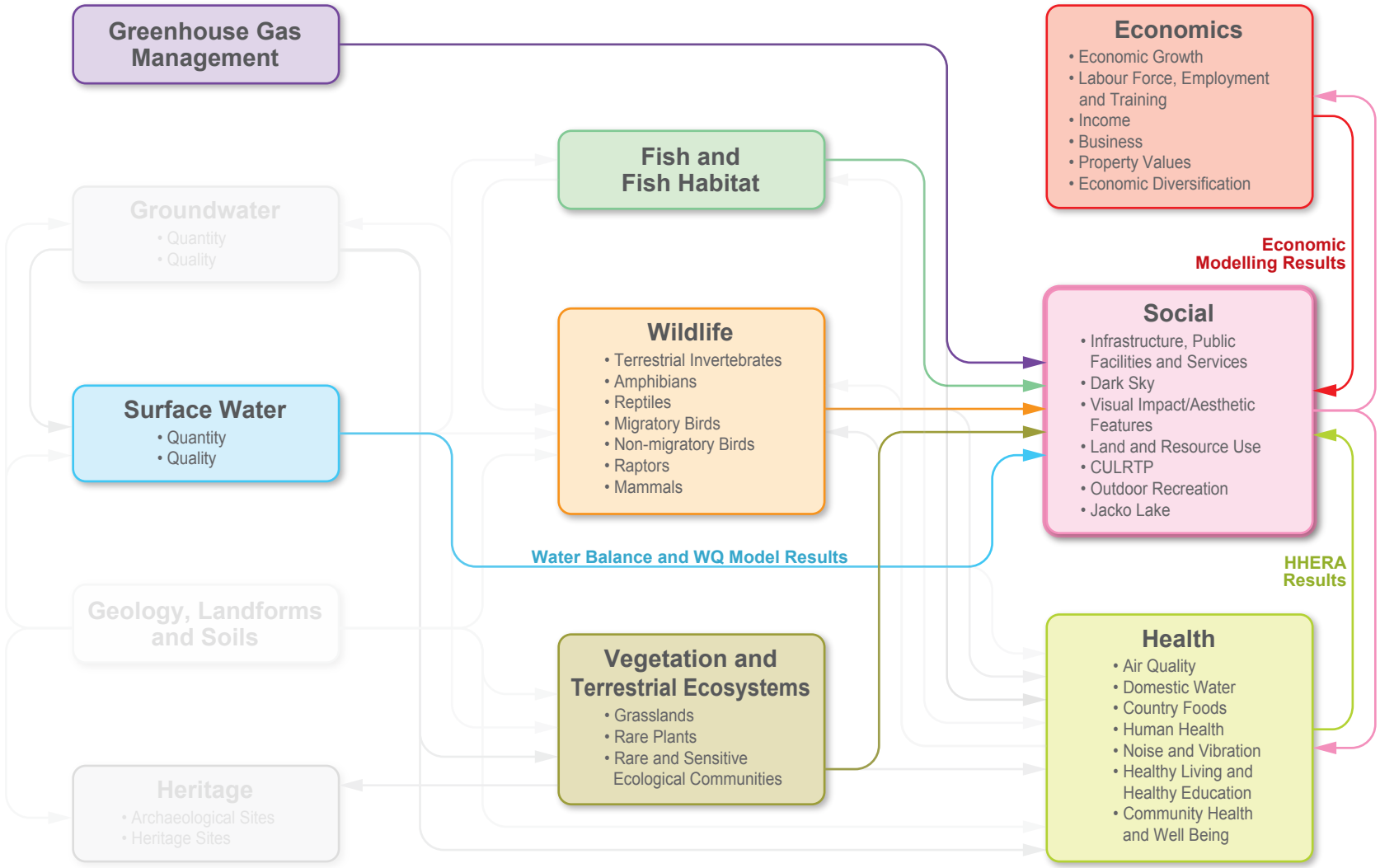
8.6.2 Background

8.6.2.1 Regional Overview

The Project is located in the Thompson-Nicola Regional District (TNRD), an area in the British Columbia interior that includes both urban and rural landscapes. The TNRD describes itself in saying the area "offers the best of both worlds. Urban life within vibrant communities, and outlying rural regions that showcase the region's beauty – pristine but rugged mountains, rolling grasslands, lush evergreen forests and both historic and modern areas all within approximately 45,000 square kilometers" (TNRD 2013). This combination of characteristics results in a diversity of land and resource uses to consider with respect to the Project.

The proposed Mine Site is the location of historic mining activity and the immediate vicinity of the Project is also currently used for agriculture and ranching.

Figure 8.6-1
Inputs to Social Valued Components



The Project is in the traditional territories of several Aboriginal Groups, including the Tk'emlúps te Secwépemc and Skeetchestn Indian Bands (represented by the Stk'emlupsemc te Secwépemc Nation [SSN]), the Lower Nicola Indian Band and the Ashcroft Indian Band (from the Nlaka'pamux Nation), the Whispering Pines/Clinton Indian Band (from the Secwépemc Nation) and the Métis Nation of British Columbia. Section 12 and Section 8.5 provide a full description of historical and current land uses by Aboriginal people.

8.6.2.2 Historical Activities

The region surrounding the Project has a long history of human activity that contributes to the current baseline condition. Kamloops derives its name from the Secwépemc word "Tk'emlúps", which refers to the meeting of the North and South Thompson rivers. The area was first inhabited by approximately 3,000 members of the Shuswap tribe, part of the Interior Salish Nation. As noted in Section 12, archaeology indicates that the area was used by Aboriginal people for hunting ungulates such as elk, moose and deer. Until the mid-1800s, the area supported large elk herds that SSN harvested for meat, hides, antlers, bones and teeth (used for tools).

Prior to the arrival of Europeans in the twentieth century, Aboriginal Groups report that rainbow trout were fished from Jacko Lake. Since the lake was typically ice-free by mid-April, Aboriginal Groups identify it as an early source of fish for people. Other fishing locations were common on the North, South, and Main Thompson River where salmon fishing was practiced. Jacko Lake was also a preferred area for harvesting traditional medicinal plants, in addition to root plants and soapberries (Ignace 2014). Section 8.5 (Current Use of Lands and Resources for Traditional Purposes) provides more insight into the importance of the area to SSN. Additionally, the Supporting Topic - Jacko Lake, section 8.7, serves to aggregate summaries for all VCs that have potential pathways of effect from the Project on Jacko Lake. The intent of the section's summaries is to provide a snapshot of residual effects, mitigations and the determination of significance for each of the relevant VCs.

Fur trading began in the area in the early 1800s, and fur trading posts were located in various locations in what is now Kamloops. By the mid-1800s, elk forage ranges in this area were subject to grazing by large herds of horses (and subsequently cattle). British Columbia officially became part of Canada in 1871. Construction of the transcontinental railroad was completed in 1885, encouraging the growth of a small village on the shore of the Thompson River. The population around the city of Kamloops grew rapidly, approaching about 500 people by the turn of the 20th century. During this time the city was incorporated and established a public works system. Key economic drivers included the timber industry and agriculture (vegetables, orchards). The City's population grew steadily with the exception of two periods, during the Depression and after the Second World War. After this period, the population began to grow again, and much of the land that had formerly been used for agricultural purposes in the valley was used for residential development. Ranching (including cattle grazing) also developed, and is currently ongoing immediately within and adjacent to the Project. Mining activities have also served as a key economic driver since the early 1900s.

Recreational opportunities within and outside of the City have developed over time and in many cases have been tied to land use associated with mining and ranching. These opportunities are important to Kamloops residents, including those in relatively close proximity to the Project site. The Mine Site and surrounding area is a popular area for outdoor enthusiasts including anglers, mountain bikers, hikers,

birdwatchers and orienteering groups, and others. These activities take place on both Crown and private lands where permission from landowners (e.g., ranchers) may be required.

The SSN has a long history of using the area for resource harvesting activities, including hunting, fishing, and plant gathering. Jacko Lake, which is free of ice earlier in the season than many lakes in the area, is noted by the SSN to have played an important part in the SSN's seasonal round as it was one of the first locations where fish, an important source of protein could be harvested. The area around Jacko Lake has also traditionally been an important place for gathering traditional plants. As land use in the area has shifted, with increased agricultural activities and urbanization, SSN members have noted that their use of the lands around the Project have grown increasingly limited. Despite the restrictions (e.g., fencing, gates) that have been put into place, SSN members still use the area. Some members note that they request permission from current landowners, including ranchers, to hunt on private property.

The importance of outdoor recreation to the broader planning and development of the City of Kamloops is noted within the Quality of Life section of the Kamplan (2004). Key aspects described in the plan include:

- a large number of natural parks, including the 749 hectare Kenna Cartwright Nature Park on Mount Dufferin (approximately 5 km north of the Project);
- major sport complexes including McArthur Island Sports Complex, Hillside Stadium/ Canada Games Pool and Interior Savings Centre;
- a variety of mountain biking opportunities; and
- branding of the city as the "Tournament Capital of Canada".

The City developed the following goals related to parks and recreation:

- to ensure that all citizens of Kamloops have adequate opportunities for personal growth in their leisure, thereby enriching the life of individuals and the community;
- to protect, preserve and enhance the environment for enrichment of the community and the enjoyment of all people;
- to ensure the public parkland of all types is distributed throughout the community in an equitable manner to meet the community's needs;
- to develop and maintain an aesthetically appealing environment; and
- to support the development of a strong community image (City of Kamloops 2004).

8.6.2.3 Baseline Studies

The intent of the baseline research undertaken for this VC was to:

- identify and describe the recreational opportunities currently taking place, including the relative popularity of the activity including trends (i.e., participation levels), and any associated seasonality; and

- identify and describe interactions between recreational opportunities and other activities that have historically been undertaken in the vicinity of the Project and/or are currently undertaken, including mining and other industrial activities.

Baseline studies were undertaken from 2011 through to 2015, and included consideration of primary and secondary data sources. Study areas are described in Section 8.6.3.1.

Data Sources

Data sources for the baseline included literature review and interviews with individuals that have relevant experience and interests. At least one key person interview was carried out with each of the following stakeholder groups:

- KGHM Ajax Mining Inc. (KAM);
- Venture Kamloops;
- local recreation associations and enthusiasts;
- local residents (e.g., ranchers) with knowledge on recreational opportunities taking place in the vicinity of the Project;
- local fishing outfitters;
- the Cultural Heritage Study (Ignace 2014);
- City of Kamloops; and
- the TNRD.

Consultation activities undertaken with the Aboriginal Groups during the Pre-Application period included capacity building and funding, TK/TLU studies, community meetings, site tours, and meetings with Aboriginal group representatives (see Section 4.7). Multiple attempts have been made to engage each Aboriginal group to seek the primary baseline data required for the Application/EIS including the circulation of baseline documentation for review and comment. The information gathered through this engagement has been incorporated in the Application/EIS, along secondary data from publically available documents from Aboriginal Groups, including websites and annual reports. In some cases, the requested information was not available from Aboriginal Groups at the time of writing or from secondary sources. Where appropriate, additional information made available by Aboriginal Groups will be considered in Project development plans.

Methods

The approach to understanding baseline conditions was to use a combination of literature sources, complemented by the insights and experience of those in the Local Study Area (LSA) and Regional Study Area (RSA) with knowledge. Where data were available, maps were produced to describe baseline conditions.

Characterization of Outdoor Recreation Baseline Condition

The following outdoor recreation activities were identified as potentially occurring in the LSA and/or RSA, and were included in the baseline study:

- parks and protected areas;
- hunting;
- trapping;
- fishing;
- mountain biking;
- hiking;
- birdwatching;
- astronomical observation;
- off-road vehicle use;
- navigation of boats and other aquatic vessels;
- general road-use (cycling, hiking);
- camping;
- ice-racing;
- cross-country skiing;
- snow-shoeing; and
- snowboarding.

The existing conditions, areas and levels of use for these activities are summarized below. The level of detail of baseline information on these activities was highly variable depending on the activity and location of interest. The primary focus on the discussion is on areas in the vicinity of the Project (i.e., LSA) that are mostly likely to be directly or indirectly affected by the Project.

Parks, Protected Areas and Recreation

In general, parks, ecological reserves, and protected areas contain many nationally and internationally important natural and cultural values. Establishing these areas ensures that these values are afforded legal protection (BC Parks 2011a). Parks are managed and protected for important conservation values and are committed to the preservation of their natural habitat, ultimately for public use, enjoyment, and inspiration (BC Parks 2011a).

A Wildlife Management Area (WMA) is a conservation area requiring a special level of protection and management. This designation for an area may be given due to the area's wildlife/habitat values being of regional, provincial or national importance. Special management zones for wildlife, fish and their habitats may have been identified in a local or regional strategic land use plan (BC Parks British Columbia Parks 2011c).

An Ecological Reserve is an area selected to preserve representative and special natural ecosystems, plant and animal species, features, and phenomena (BC Parks 2011a.). Ecological Reserves provide the highest level of protection for the maintenance of physical and biological diversity while allowing for research and educational activities (BC Parks 2011b).

Appendix 7.1-A (Socio-economic Baseline) provides summary information for all the provincial parks, ecological reserves, WMAs and historical sites within 30 km of the potential mine site listed on the British Columbia Parks website. The information listed includes the name, size, year created, type, and attractions of each recreation site and is listed by increasing distance from the potential mine site. Several sites are located between approximately 10 km and 20 km from the Project, including McConnell Lake Park, Lac du Bois Grasslands Protected Area, Tranquille Wildlife Management Area, Greenstone Mountain Provincial Park, Lac Le Jeune Park, Tranquille Ecological Reserve and Walloper Lake Park (Figure 8.6-2). There are no sites less than 10 km away from the Project.

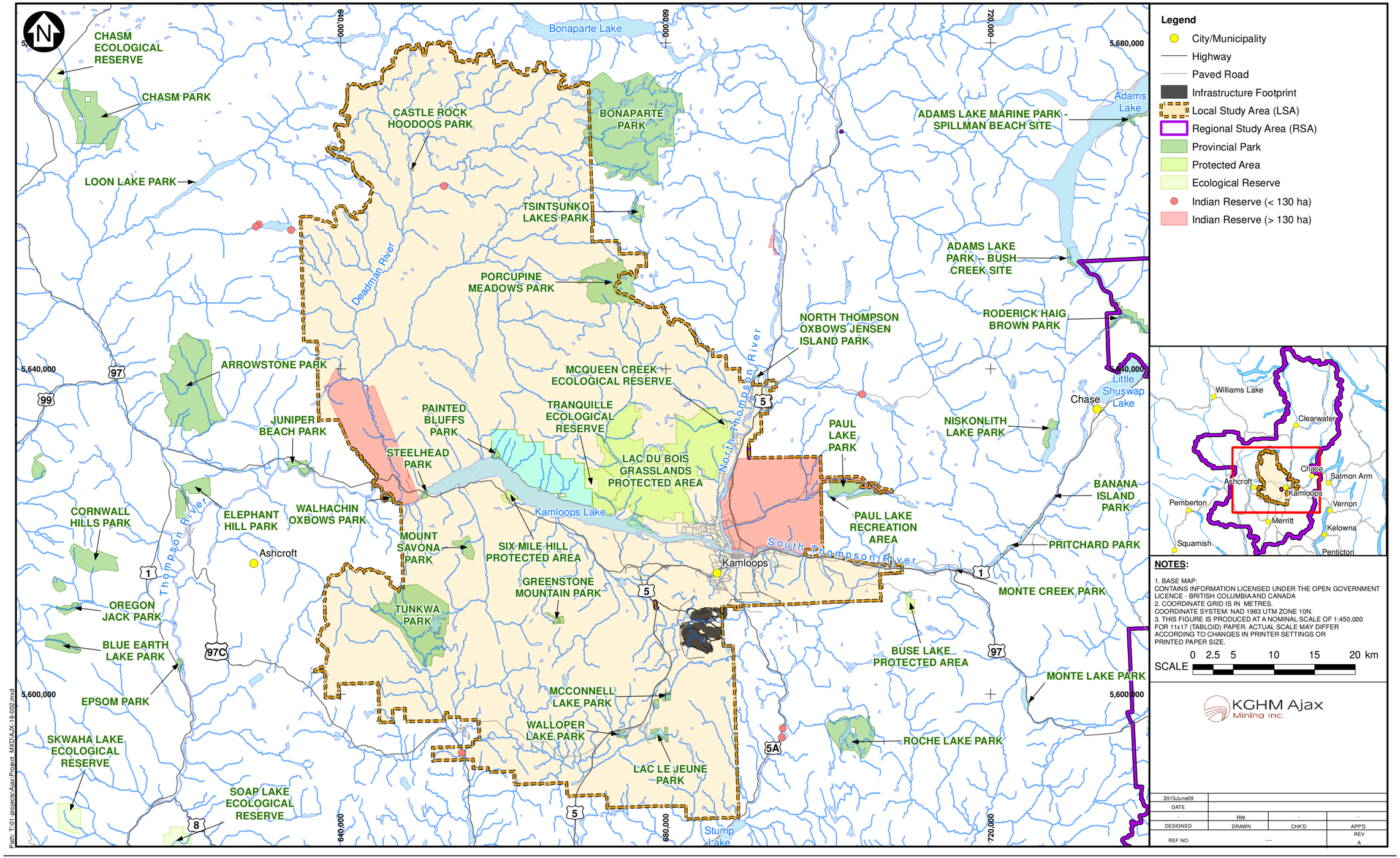
Outdoor recreation opportunities taking place within these areas include fishing, hiking, canoeing, swimming, snow shoeing, cross-country skiing, ice fishing, wildlife viewing, bird-watching, cycling, horseback riding, snowmobiling, boating, interpretive programming, orienteering, ice-skating, picnicking, hunting, photography and rock collecting. Some of these activities also take place within the LSA.

Hunting and Trapping

Hunting and trapping in British Columbia are regulated by the Ministry of Forests, Lands, and Natural Resource Operations. The Ajax Project is located within Resource Management Region 3, which covers Kamloops and much of the RSA. Region 3 comprises 30 management units, each with specific season and species harvesting regulations. The Project is located within management unit 3-19, which extends south from the City of Kamloops, is bounded in the west by Gruichon Creek, to the north by Kamloops Lake, and extends south to Merritt (BC Ministry of Forests, Lands and Natural Resource Operations 2012). Hunting within the LSA is limited by private property, as the majority of the land is privately owned and hunters must have permission from the owners.

Management unit 3-19 has hunting seasons for mule deer, whitetail deer, moose, wolf, black bear, coyote, cougar, bobcat, lynx, raccoon, snowshoe hare, Colombian ground squirrel, grouse (blue, ruffed, and spruce), pheasant, mourning dove, coots, common snipe, ducks, and geese. The Greenstone Mountain Burn within management unit 3-19 (located west of the Coquihalla highway, approximately 15 km from the Project) is closed to motor vehicle access for hunting purposes except for Duffy Lake Road, Beaton Lake Road, and Greenstone Mountain Road (BC Ministry of Forests, Lands and Natural Resource Operations 2012).

Figure 8.6-2
Parks, Protected Areas, and Ecological Reserves near the Project



NOTES:

1. BASE MAP:
CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:450,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

SCALE 0 2.5 5 10 15 20 km

KGHM Ajax Mining Inc.

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The most popular game hunted in the area are deer and moose. Hunters and residents in the area have noted that the area within the LSA between the Coquihalla Highway (Highway 5) and Lac le Jeune Road is an important area for both white-tail and mule deer populations. The area is thought to be critical for over-wintering mule deer populations and important for calving of white-tail deer. (Ajax KPI Program 2011-2012). Interview participants also noted that some bird hunting occurs in the area. Within the LSA, Blue and Ruffed Grouse are hunted around Sugarloaf Mountain and Coal Hill, and ducks and geese are hunted on pockets of water in the area (Ajax KPI Program 2011-2012).

Section 8.5 (Current Use of Lands and Resources for Traditional Purposes) provides insight into the importance of the area to SSN. Hunting has been identified as a current use of the lands and resources for traditional purposes in the area where the Project is located. Recently, an SSN member has been identified as being the registered trapline (TR0319T001) owner for territory on Greenstone Mountain which is an area where moose, deer, cougars, bobcats, and lynx are harvested. This is a large trapline extending to the east of Greenstone Mountain where it is crossed by existing Projects and activities (e.g. New Afton Mine, Highway 5). The trapline will also be crossed by the freshwater pipeline that will bring water from Kamloops Lake to the Mine Site. This pipeline will follow, as possible, existing roads and disturbed areas as it will run in parallel to an existing pipeline currently operated by New Afton Mine. The registered trapline holder purchased the trapline 2 years ago and has noted in discussion that had yet to be used. This is consistent with a review of harvest data from the BC Trappers Association and the Ministry of Forestry, Lands and Natural Resource Operation identifying the last harvest on this trapline in 2001. KAM will continue to consult with the registered trapline holder, however there are no anticipated effects on the current use of this trapline. To date, no current trapping activity has been identified by Aboriginal Groups within the Mine Site and Pipsèll. There is a registered trapline overlapping with the mine site but it is not held by an SSN member.

Trapping in the LSA is limited as it is prohibited to trap on private property without written permission of the property owner and a valid trapping licence. Trappers must be the registered holder of a trapline for an area, or otherwise authorized by regulation or permit. Species that can be trapped in management unit 3-19 (and their respective bag limits) include black bear (2), wolf (3), coyote (no bag limit), cougar (2), bobcat (1), lynx (1), racoon (no bag limit), snowshoe hare (10 daily), and ground squirrel (no bag limit).

The Project falls entirely within the trapline unit TR0320T001. Figure 3-10: Trapline Unit TR0320T001 in Appendix 7.1-A (Socio-economic Baseline) shows where this trapline is in relation to the Project. Data regarding fur returns exists from 1986 through 2008, after which reporting is voluntary and it is not known if trapping activities have continued. Numerous attempts to contact the registered trapline owner were not successful although KAM remains amenable to discussions with the owner. This trapline unit is adjacent to several other trapline units: TR0319T001, TR0319T002, and TR0320T003. Two of these traplines were listed as inactive in 2010: TR0319T001, which has an eastern border that runs along the Coquihalla Highway just west of the Project site, and TR0320T003, which is south and east of the Project site around Stake Lake, Walloper Lake and Lac le Jeune (Cebuliak pers. comm. 2012).

Trapping data from traplines TR0320T001 and TR0319T001 is provided in Appendix 7.1-A (Socio-economic Baseline). The data indicates that muskrat, weasel, coyote, and squirrel are the most commonly trapped animals in the area around the Project site. Details regarding trapping income for TR0319T001 for 2008 are also provided by type of pelt. The total harvest in that year amounted to just over $350.

Fishing

Section 8.5 (Current Use of Lands and Resources for Traditional Purposes) provides insight into the importance of the area to SSN. This includes fishing, which has been identified as a current use of the lands and resources for traditional purposes in the area where the Project is located.

Freshwater fishing in British Columbia is regulated by the BC Ministry of Forests, Lands, and Natural Resource Operations. The regional divisions and management units are the same as those used for wildlife, described in the hunting section preceding this section. Resource management Region 3 has a spring closure in effect from January 1 to June 30. Jacko Lake is an exception as it is closed between November 1 and March 31. There are 306 lakes used for fishing in Region 3. The lakes closest to the Project are Jacko Lake, Edith Lake (both located within the LSA), and McConnell Lake, and Stake Lake (located in the RSA) (Freshwater Fishing Society of BC 2012b).

Jacko Lake is located approximately 1 km south of the Kamloops southern boundary and about 2 km east of Lac Le Jeune Road. It is within the LSA and adjacent to the proposed Open Pit. Jacko Lake is located on private land and is accessed through a private easement before connecting to a government-owned road. The Supporting Topic - Jacko Lake, section 8.7, serves to aggregate summaries for all VCs that have potential pathways of effect from the Project on Jacko Lake. The intent of the section's summaries is to provide a snapshot of residual effects, mitigations and the determination of significance for each of the relevant VCs.

Edith Lake is also another popular fishing lake in the vicinity of the Project. It is located about 1.5 km southeast of the Project and is accessed via Edith Lake road.

Angling is currently the most common recreational use of Jacko Lake, which has been stocked with trout annually by the Ministry of Environment since 1954. The fishing season on the lake typically runs from the beginning of April, when the ice has melted, to November. There is no ice fishing allowed. Jacko Lake is well-known as one of the premier fly-fishing lakes in the region and draws anglers from Kamloops and other parts of the province (Knight Piésold 2015). Characteristics that draw anglers to Jacko Lake include:

- **Close proximity:** the lake is a ten-minute drive from Kamloops;
- **Productivity:** one of 10 small lakes in the TNRD capable of consistently growing trout over 10 lbs;
- **Ease of access:** There is a boat launch and secure access;
- **Variety of methods:** It is possible to fish from the shore and from boats;
- **Length of season:** Due to the lake's lower elevation, the lake has a longer ice-free season relative to other lakes in the area; and

- **Aesthetics:** The lake is relatively unique because it is one of the few low-elevation grassland lakes that has not suffered from recent degradation due to the loss of pine trees from the mountain pine beetle.

According to the Ministry of Forests, Lands, and Natural Resource Operations (FLNRO), Jacko Lake is one of the top 20 lakes in the TNRD for top angler effort with a mean of 4,094 days between 2008 and 2010 (FLNRO 2015). An angler day is defined as one fisherman fishing a body of water for any amount of time on a given day. FLNRO cautions against this data presenting the whole picture of Jacko Lake's popularity since data do not include the months of April and November which are typically very busy on Jacko Lake (FLNRO 2015). In light of the lake's lower elevation and proximity to Kamloops, it has a longer fishing season and is more easily accessible than other lakes in the TNRD (FLNRO 2015).

Mountain Biking, Hiking, and Birdwatching

There are numerous bike and mountain bike trails throughout the city and in the hills around the City, as well as the popular Kamloops Bike Ranch in Juniper Hills. Cyclists use the Lac Le Jeune Road regularly during the summer. Within the LSA, mountain biking takes place northwest of the Project around Coal Hill, on the Inks Lake trail system (west of the Project between Lac Le Jeune Road and the Coquihalla highway); and on the hillsides behind Pineview Valley, Frontage Road, and the Iron Mask Industrial Park. Most of the existing trails outside of City parks are not officially designated for public use and typically occur on private lands where there are grazing leases/licenses in place.

There are hiking and mountain biking trails in the grasslands south of Aberdeen as well, including the Coal Hill trail. A memorandum of understanding was recently developed between the KPCC (Kamloops Performance Cycling Centre), business (led by KAM) and the municipal and provincial governments for the proposed Pineview Recreational Trails Pilot Project regarding mountain bike trails. This is a collaborative initiative between cycling-focused not-for-profit organizations, business and government, and is intended to set a framework for interactions (reviewed on an annual basis) between ranchers and recreationalists for seasonal access of private and public ranchlands southwest of the Pineview Valley neighbourhood. By working with the ranching community, regulators and enthusiasts, and access agreement has been developed that protects ranching interests while accommodating seasonal access to grazing areas once cattle have vacated the area.

There is very little mountain biking at the immediate Project site because it is largely privately owned ranch land, and there are numerous fences restricting passage. However, Inks Lake, Goose Lake Road, Goose Lake, Sugarloaf Mountain, and Jacko Lake, as well as the land between the Mine Site and the Aberdeen neighbourhood, are popular walking, hiking, and birdwatching areas. Residents may also engage in nature photography at these locations.

Astronomical Observation

The Kamloops Astronomical Society (KAS) is an astronomy club which promotes interest and participation in astronomy. The Society holds scheduled observing sessions at their observatory in the Stake Lake recreation area, located on the south western shore of Stake Lake, approximately 12 kilometers south-southwest of the Project. Additional information can be found under the Dark Sky VC (Section 8.2).

Off-road Vehicle Use

The Greater Kamloops Motorcycle Association (GKMA) maintains more than 400 km of off-road trails in the Inks Lake, Greenstone Mountain, and Chewhels Mountain riding areas. Authorization to maintain these trails was initially granted to the GKMA under the Forest Practices Code, and additional trails were later authorized under the Forest and Range Practices Act. The off-road vehicle trail system closest to the Project has a staging area at the Inks Lake turn-off located west of the Project on the west side of the Coquihalla Highway. The trail system stretches in a long corridor to Greenstone Mountain, to Savona, and out towards Logan Lake along the Coquihalla. There is very little legal off-road vehicle travel on the east side of the Coquihalla Highway in the vicinity of the Project Site because that land is largely private property. Sugarloaf Ranch and FLNRO are working cooperatively to develop a trail system within privately held grazing leases to the west of the Coquihalla Highway to ensure access for off-road vehicles is available but regulated to specific trail systems to ensure passage to the larger trail network beyond the grazing leases and private lands.

The GKMA use these recreational trails to generate income for their non-profit society, which allows them to give back to the community through trail signage, education, ecosystem restoration projects, and garbage clean-up, among other things.

Navigation of Boats and Other Aquatic Vessels

Interviews suggest that Kamloops Lake (located within the RSA) which is where the Project's water intake will be sited, is not used extensively for navigational purposes. The Project water intake is expected to be situated below the surface of the lake and use existing infrastructure so as to avoid potential challenges related to navigability. There are boat launches at Savona, Steelhead Provincial Park, and marina facilities at Tobiano (Tourism Kamloops 2015). Because the Project water intake will utilize existing infrastructure and does not affect boat navigation on Kamloops Lake in any Project phase, this potential effect is not considered further in the assessment.

Jacko Lake is a navigable body of water by small boat, although both the inlet and outlet channels are narrow and shallow. A boat ramp area is located on the north shore of Jacko Lake and some changes to navigability are expected from the loss of the northeast arm of the lake. Edith Lake is considered a navigable lake for small boats and has three boat launches. Petersen Creek is not considered navigable due to its width, intermittent dry periods and the presence of Bridal Veil Falls at its eastern reaches. Goose Lake is not considered a navigable lake. Goose Lake is located on private land, is very shallow (up to 1 m) and is limited with respect to inflow/outflow.

Cross-country Skiing, Snowshoeing, Snowboarding and Ice-racing

Within the RSA, Stake Lake Cross Country Ski trails are a popular local trail system, and are maintained and managed by the Overlander Club on the east side of Lac le Jeune Road near Stake Lake. The trails are approximately 30 km south-southwest of the Project. The site includes 60 km of cross-country skiing and snowshoeing trails (including lights for night-skiing), a day lodge, and various shelters and supporting facilities. The KAS is located in close proximity to these activities.

Approximately 60 km northwest of the Project (by road) within the RSA, Sun Peaks Resort is an all-season resort community offering downhill and cross-country skiing and snowboarding in the winter, and golf and other activities in the summer.

Within the LSA, ice-racing takes place on Inks Lake. This activity typically involves racing specially fitted motocross bikes across the lake when frozen. Within the RSA, ice-racing also takes place at Stake Lake.

8.6.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment is conducted. They encompass the areas within, and times during which, the Project is expected to interact with the VCs, as well as the constraints that may be placed on the assessment of those interactions due to political, social, and economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). The definition of these assessment boundaries is an integral part in scoping for Outdoor Recreation, and encompasses possible direct, indirect, and induced effects of the Project on Outdoor Recreation, as well as the trends in processes that may be relevant.

8.6.3.1 Spatial Boundaries

The spatial boundaries used in this study were chosen to reflect the relative geographic location for the outdoor recreation opportunities of concern since this is indicative of the nature and magnitude of the potential effect. For example, recreational activities closer to the Project (such as fishers accessing Jacko Lake) are more likely to be affected than those further away (such as off-road vehicles accessing trails to the west of Highway 5).

Local Study Area

The Local Study Area (LSA) for the Outdoor Recreation VC includes areas where physical activity occurs nearest the Project (e.g., Inks Lake, Jacko Lake, Goose Lake Road, Coal Hill) or where Project presence or activities may have direct impact on the pursuit of these activities. The LSA is bounded by Highway 5 in the west and Highway 5A in the east (see Figure 8.6-3). The northern and southern boundaries of the LSA are defined by the LSA for the Visual Impacts VC (Section 8.3) as these are the distances at which someone could view large Project components. The Outdoor Recreation LSA is the same as for the Healthy Living and Health Education VC and includes much of the LSAs for Air Quality and Noise and Vibration, all of which influence the Outdoor Recreation VC.

Regional Study Area

The Regional Study Area (RSA) for the Outdoor Recreation VC includes other recreation sites in the local area that could be affected by Project components or activities. It also contains other potential recreation sites and opportunities that could be utilized by residents of the City of Kamloops and other communities. These include Chuwels Mountain, Greenstone Mountain, and municipal parks in Kamloops (e.g., Kenna Cartwright Park). The Outdoor Recreation VC RSA (see Figure 8.6-4) is bounded to the west by Kamloops Lake and Dominic Lake Road and Paska Lake Road west of Greenstone Mountain. The east boundary is Hwy 5A and the Kamplan boundaries. The southern boundary is the southern boundary of TNRD-J between Hwy 5 and Hwy 5A and reflects the likely extent of influence of the Project on outdoor recreation activities. To the north, the RSA is bounded by the north shore of Kamloops Lake and the South Thompson River.

8.6.3.2 Temporal Boundaries

The assessment of potential Project effects on Outdoor Recreation will encompass Construction, Operation, Decommissioning and Closure, and Post Closure phases.

- **Construction**: 2 years;
- **Operation**: 23 years;
- **Decommissioning and Closure**: 5 years (includes project decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- **Post Closure**: 5+ years (includes ongoing reclamation activities and post-closure monitoring).

8.6.3.3 Administrative Boundaries

Administrative boundaries for the assessment include, where relevant, those associated with the wildlife management regions or units, trapline boundaries and the TNRD.

8.6.3.4 Technical Boundaries

Technical boundaries have not influenced the determination of the study areas for assessment of effects on Outdoor Recreation.

8.6.4 Potential Effects of the Project and Proposed Mitigation for Outdoor Recreation

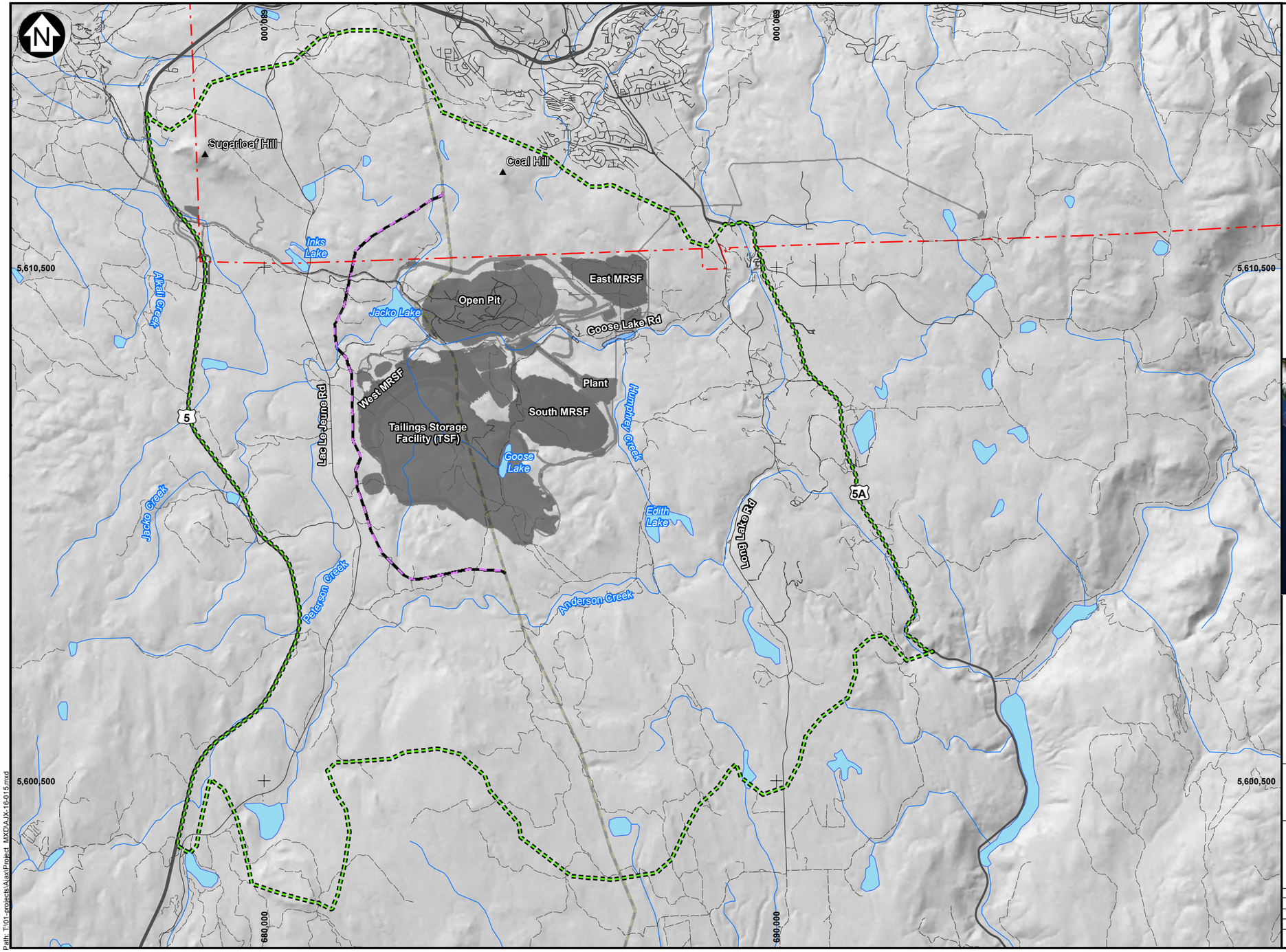
There exists the potential for adverse effects on outdoor recreation due to changes that could result from the Project. The nature of these potential effects is influenced by the specific recreational activity and its location in relation to the Project. Potential effects on outdoor recreation are not always considered to result from single Project components or activities. For example, contract employment and taxation are less relevant to potential outdoor recreation effects than Project traffic.

8.6.4.1 Identifying Potential Effects on Outdoor Recreation

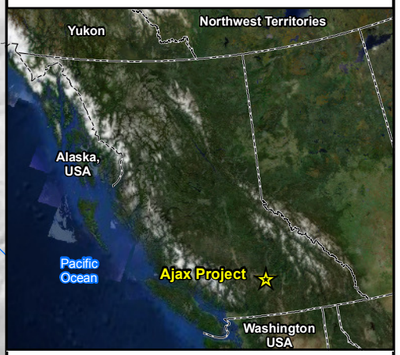
This assessment considers the potential for lost or compromised recreational opportunities and resources in the immediate vicinity of the Project (the LSA) and in the broader area (the RSA). During the public engagement process, concerns were expressed about various potential effects on outdoor recreation, including physical changes and qualitative effects on recreational experiences. The concern for physical changes is understood as the potential for the Project to reduce the amount of space available for recreation or to change the way the area looks within the vicinity of the Project. The concern for qualitative effects on recreational experiences is understood as concern for the Project to result in changes to air quality, increased noise, or light affecting recreationalists. Additional insights were gained from key person interviews with individuals and groups that have knowledge on the topic.

Figure 8.6-3
Local Study Area

InterGroup CONSULTANTS



- Landmark
- Highway
- Paved Road
- Gravel Road
- Rough Road
- Recreational
- Kinder Morgan Pipeline - Current
- Kinder Morgan Pipeline - Rerouted
- Local Study Area
- Proposed Structures
- City of Kamloops



NOTES:

1. BASE MAP: TOPOGRAPHIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:80,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4 . INSET: COPYRIGHT:© 2013 ESRI, I-CUBED, GEOEYE

SCALE 0 0.5 1 1.5 Kilometres

KGHM

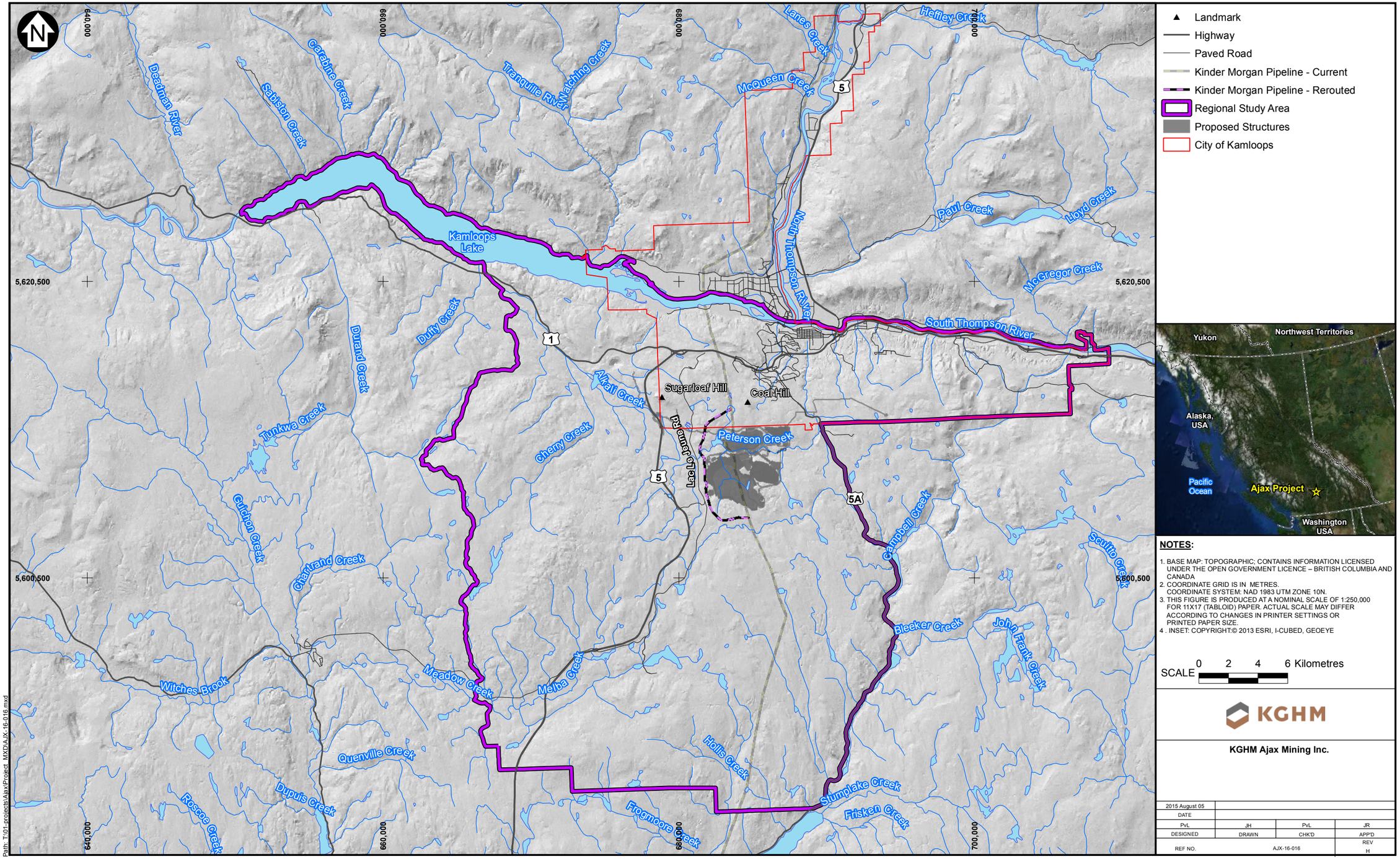
KGHM Ajax Mining Inc.

2015 August 05			
DATE			
PvL	JH	PvL	JR
DESIGNED	DRAWN	CHK'D	APP'D
REF NO.	AJX-16-015		REV H

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Figure 8.6-4
Regional Study Area

InterGroup CONSULTANTS



NOTES:

1. BASE MAP: TOPOGRAPHIC; CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA AND CANADA
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
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KGHM Ajax Mining Inc.

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KAM is committed to actively encouraging healthy living lifestyles for workers employed at the Project and to support broader community initiatives promoting outdoor recreation. A description of the information and education programs encouraging healthy living for workers is provided in Section 2.7 (Project Benefits) and in Section 10.6 (Healthy Living and Health Education). As these programs are not expected to result in an adverse effect, they are not considered further in this chapter. Project infrastructure and activities may also affect the ability of Aboriginal Groups to engage in traditional harvesting activities, such as fishing, plant gathering, and hunting and trapping. The effects to traditional activities by Aboriginal Groups are assessed in Section 8.5 (Current Use of Land and Resources for Traditional Purposes).

Potential effects on Outdoor Recreation could be related to the removal of, or changes to, land and access; diminished outdoor recreation experience; or changes to specific resources that are associated with that experience. Examples are provided below.

- Changes in (or removal of) access for recreational opportunities, including:
  - Loss of Goose Lake to accommodate the Tailings Storage Facility;
  - Closure of an approximately 6 km portion of Goose Lake Road in between its west and east terminus points.
  - Removal of the north east arm of Jacko Lake.
  - Controlled access to Jacko Lake during blasting activities;
  - Controlled access to private land in the Project area for recreational purposes (hunting, trapping, mountain biking, hiking, birdwatching, off-road vehicle use); and
  - Changes to water navigation as a result of Project presence or activities.
- Diminished outdoor recreation experience (including perceived effects) as a result of potential effects related to dust and air quality, noise and vibration, visual impacts and aesthetic features, dark sky (related to astronomical observation), traffic; and over-utilization (addition of more fishers on Jacko Lake and other locations). These effects could potentially be realized for hunting, trapping, fishing, mountain biking, hiking, birdwatching, astronomical observation, cross-country skiing, snow-shoeing and snowboarding.
- Reduced availability of natural resources, including:
  - Fish (i.e., for fishing activities)
  - Wildlife (i.e., for hunting and birdwatching activities)

There are no provincial parks or protected areas within the LSA (Figure 8.6-2). Within the larger RSA (Figure 8.6-4) parks include McConnell Lake Park, Lac Le Jeune Park, Walloper Lake Park, and Greenstone Mountain Park. The Project is not expected to affect either access to or diminish the experience of provincial parks in the vicinity of the Project; therefore, parks are not considered further in the assessment.

As noted in Section 8.1 (Infrastructure, Public Facilities, and Services), the Project is not expected to have adverse effects on municipal recreation facilities, which are all located in the RSA for this VC. Table 8.6-2 identifies a negligible-to-low interaction ("L") in relation to the water intake on Kamloops Lake. Since the water intake will utilize existing in place infrastructure and will not

require any new construction or infrastructure within Kamloops Lake, no potential effect to boat navigation on Kamloops Lake is identified and the effect is not carried further in the assessment.

The interaction matrix presented in Table 8.6-2 associates the Project activities and components with the potential for adverse effects on outdoor recreation[1]. In accordance with the methodology described in Section 5.1, only adverse interactions that are characterized as "M" moderate or "H" high are carried forward to the effects assessment on this VC. As a result, all three of the identified effects are considered further for the Construction, Operation, and Decommissioning and Closure phases. Minimal activities will occur during Post Closure, during which time the mine site and surrounding area will be reclaimed and, where possible, returned to a natural stated. Effects on outdoor recreation during Post Closure are expected to be negligible to minor and are not assessed further.

Table 8.6-2. Identifying Potential Project Interactions on Outdoor Recreation

Project Activities		Potential Effects on Outdoor Recreation		
		Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources
Construction	Clearing and Grubbing	M	M	M
	Earthworks	M	M	M
	Overburden/Topsoil Stockpile	M	M	M
	Laydown Areas and Storage Yards	M	M	M
	Project Lighting	O	M	O
	Site Security and Fencing	M	M	M
	Fuel Storage and Filling Area	M	M	M
	Hazardous Wastes Transport, Storage, and Disposal	M	M	M
	Construction Wastes Transport, Storage, and Disposal	M	M	M
	Sewage Infrastructure and Disposal	M	M	M
	Public Road Realignment, Use, and Maintenance	M	M	M
	Site Road Construction, Use and Maintenance	M	M	M
	Haul Truck Road Construction, Use, and Maintenance	M	M	M
	Site Buildings and Process Plant	M	M	M
	Explosives Magazine and Storage Facilities	M	M	M
	Open Pit Development	M	M	M
	Drilling and Blasting	M	M	M
	Crushing Mine Rock	L	M	M
	Loading, Hauling, and Deposition of Mine Rock	M	M	M
	Temporary Ore Stockpile	M	M	M

[1] Additional detail regarding potential interactions can be viewed in Section 6.7.4.1 (Identifying Potential Effects on Fish Populations and Fish Habitat), Section 8.4.4.1 (Identifying Potential Effects on Visual Impact/Aesthetic Features), Section 10.1.4.1 (Identifying Potential Effects on Air Quality), and Section 10.5.4.1 (Identifying Potential Effects on Noise and Vibration). Other sections will be referenced where appropriate.

Project Activities		Potential Effects on Outdoor Recreation		
		Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources
Construction *(cont'd)*	Tailing Storage Facility Development	H	M	M
	Power Transmission, Distribution	M	M	M
	Natural Gas Line	M	M	M
	Pipeline Utility Corridor (Potable Water, Sewage, and Site Water)	M	M	M
	Water Intake from Kamloops Lake	L	L	L
	Fire Suppression Infrastructure	M	M	M
	Contact Water	L	L	L
	Non-contact Water	L	L	L
	Haul Truck Road	M	M	M
	Water Management Dams	M	M	M
	Mine Staffing (Direct Employment)	O	L	O
	Contracted Employment	O	L	O
	Taxation	O	O	O
Operation	Open Pit Development	M	M	M
	Drilling and Blasting	M	M	M
	Hauling Mine Rock and Ore from Pit	L	L	L
	Crushing and Conveying Ore	L	L	L
	Temporary Ore Stockpile	M	M	M
	Development of Mine Rock Management Facilities	M	M	M
	Stripping, Loading, Hauling, Deposition, and Contouring of Topsoil and Overburden	M	M	M
	Revegetation through Progressive Reclamation	M	M	M
	Process Plant Operation	M	M	M
	Deposition to Tailing Storage Facility	M	M	M
	Site Road Use and Maintenance (Materials, Personnel, Supplies)	M	M	M
	Concentrate Transport and Storage	M	M	M
	Explosives Magazine and Storage Facilities	M	M	M
	Fire Suppression Infrastructure	M	M	M
	Fuel Storage and Filling Area	M	M	M
	Hazardous Wastes Transport, Storage, and Disposal	M	M	M
	General Wastes Transport, Storage, and Disposal	M	M	M
	Sewage Infrastructure and Disposal	M	M	M
	Laydown Areas and Storage Yards	M	M	M
	Power Transmission, Distribution	M	M	M

Project Activities		Potential Effects on Outdoor Recreation		
		Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources
Operation *(cont'd)*	Project Lighting	O	M	O
	Site Access, Security and Fencing	L	L	L
	Water Intake from Kamloops Lake	L	L	L
	Contact Water	L	L	L
	Non-contact Water	L	L	L
	Potable Water Treatment and Use	L	L	L
	Haul Truck Road	M	M	M
	Mine Staffing (Direct Employment)	O	L	L
	Contracted Employment	O	L	L
	Taxation	O	O	O
Decommissioning and Closure	Dismantling of Ancillary Buildings	M	M	M
	Pit Lake Planning	M	O	O
	Site Road/Bridge Decommissioning	M	M	M
	Tailing Storage Facility Decommissioning and Reclamation	M	M	M
	Mine Rock Management Facilities Reclamation	M	M	M
	Fuel Storage and Filling Area	M	M	M
	Hazardous Wastes Transport, Storage, and Disposal	M	M	M
	General Wastes Transport, Storage, and Disposal	M	M	M
	Sewage Infrastructure and Disposal	M	M	M
	Laydown Areas and Storage Yards	M	M	M
	Power Transmission, Distribution	M	M	M
	Project Lighting	O	M	O
	Site Access, Security and Fencing	L	L	L
	Contact Water	L	L	L
	Non-contact Water	L	L	L
	Potable Water Treatment and Use	L	L	L
	Haul Truck Road	M	M	M
	Road use to the Project (Materials, Personnel, Supplies)	M	M	M
	Mine Staffing (Direct Employment)	O	L	L
	Contracted Employment	O	L	L
	Taxation	O	O	O
Post Closure	General Site Inspections and Maintenance	L	L	L
	Contact Water	L	L	L
	Non-contact Water	L	L	L

	Project Activities	Potential Effects on Outdoor Recreation		
		Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources
Post Closure	Road use to the Project (Materials, Personnel, Supplies)	L	L	L
	Mine Staffing (Direct Employment)	L	L	L
	Contracted Employment	L	L	L

Notes:

O	*No interaction anticipated.*
L	*Negligible to minor interaction expected; implementation of best practices, standard mitigation and management measures; no monitoring required, no further consideration warranted.*
M	*Potential moderate interaction requiring unique active management/monitoring/mitigation; warrants further consideration.*
H	*Key interaction; warrants further consideration.*

8.6.4.2 Effects on Outdoor Recreation

Pathways of effect from the Project to Outdoor Recreation will vary depending on the type of effect identified, the activity, and the location under consideration. The effects assessed for this VC are:

- Removal or changes in access for recreational opportunities;
- Diminished outdoor recreation experience; and
- Reduced availability of natural resources.

The discussion of effects considers the following pathways: Project components and activities including traffic (which could result in changes to access and/or the quality of experience); environmental changes including air quality, noise and vibration, visual impacts and aesthetic features, and sky darkness (which could affect the quality of experience); labour force and population growth (which could lead to increased numbers of people using recreational areas); and changes to harvestable resources (including fish and wildlife). Table 8.6-3 lists these topics, with reference to other relevant sections of the Application/EIS, and identifies how these pathways may affect Outdoor Recreation.

Table 8.6-3. Potential Pathways of Effects on Outdoor Recreation

Potential Pathway	Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources (fish, wildlife)
Traffic (Appendix 8.1-A)	X	X	
Labour force and population growth (Section 7.2)		X	
Air quality (Section 10.1)		X	
Noise and vibration (Section 10.5)		X	
Visual impacts and aesthetic features (Section 8.3)		X	
Fish and fish habitat (Section 6.7)			X

Potential Pathway	Changes in Access for Recreational Opportunities	Diminished Outdoor Recreation Experience	Reduced Availability of Natural Resources (fish, wildlife)
Wildlife (Section 6.17)			X
Dark Sky (Section 8.2)		X	

Changes in Access for Recreational Opportunities

Project Components/Activities

The presence of the Project will remove certain areas and landscape features from public use and restrict access to other areas (temporarily or permanently) for safety or operational reasons. These changes may affect the ability of individuals to access certain sites and engage in outdoor recreational activities. Project components and activities that may remove or change access to recreational opportunities include:

- Loss of Goose Lake to accommodate the Tailings Storage Facility;
- use of the Goose Lake Road: Closure of an approximately 6 km portion of Goose Lake Road in between its west and east terminus points;
- removal of the north east arm of Jacko Lake;
- controlled access to Jacko Lake during blasting activities;
- controlled access to private land in the Project area for recreational purposes (hunting, trapping, mountain biking, hiking, birdwatching, off-road vehicle use); and
- changes to water navigation as a result of Project presence or activities.

Table 8.6-4 summarizes key Project activities/components and associated restrictions to specific recreational activities.

Table 8.6-4. Summary of Project Activities and Recreation Restrictions

Project Restriction	Project Phase	Recreation Activity	Potential Effect on Recreational Activities
Removal of Goose Lake	All phases	Hiking, Birdwatching, Orienteering	Private lake no longer available for recreation purposes.
Closure of Goose Lake Road	All phases	Biking, Hiking, Birdwatching	A 6 km portion of the 24 km Goose Lake Road will be closed to the public near its east and west terminals. As a result, this stretch of the road will no longer be accessible.
Increased Traffic	Construction and Operation	Biking, Birdwatching, Hiking, Other activities	Increased Project-related traffic in the LSA, particularly during initial construction phase, could affect the ability to pursue and enjoy recreational activities.

Project Restriction	Project Phase	Recreation Activity	Potential Effect on Recreational Activities
Partial Impoundment of Jacko Lake	Construction, Operation, Decommissioning and Closure	Fishing, Boating	Loss of fishing area and area for boating as a result of partial impoundment.
Loss of hunting areas	Construction, Operation, Decommissioning and Closure	Hunting	Privately held properties that become part of the Project footprint may no longer be available for hunting
Temporary Access Restrictions	Construction and approximately first 8 years of Operations Phase	Fishing, Hunting, Hiking, Biking	Expected daily blasting activities will require approximately a two hour window during which the public will not have access to or use of the specified blasting buffer area. For approximately the first 13 years, this blasting buffer could extend across the eastern half of Jacko Lake. This potential effect is limited to the months of April through October since access to Jacko is not maintained outside of that time period.

Goose Lake will no longer be available for recreation purposes and a 6 km portion of Goose Lake Road will be closed to the public and no longer be accessible. Goose Lake is on private property (owned by KAM) and there is no indication that this lake has been frequently used for recreation. The removal of a portion of Goose Lake Road may displace some outdoor recreational activities such as biking and running. There are other alternative sites, however, in terms of both on- and off-road biking and running. Kamloops is home to the Kamloops Mountain Bike Ranch, which is located between Juniper Ridge and Valleyview. KAM has also partnered with mountain biking groups to sponsor the Pineview Recreational Pilot Project (Kamloops Performance Cycling Centre et. al, 2014). There are numerous parks throughout the City (see Figure 10.6-3 and Figure 10.6-4), many of which have running trails that could be used instead of Goose Lake Road.

Access to Edith Lake and Edith Lake Road will not change as a result of Project activities and therefore is not considered further in the assessment.

Access to Jacko Lake for recreationalists and Aboriginal Groups will be altered as a result of the Project, including permanent loss of the northeastern arm of the lake, as well as temporary and intermittent access restrictions (e.g. to accommodate daily blasting activities).

Diminished Outdoor Recreation Experience

The quality of the outdoor recreation experience (i.e., how enjoyable or appealing activities are) may be influenced by environmental changes arising from the Project, such as:

- air quality;
- noise and vibration;

- visual impacts;
- sky darkness (for astronomical observation);
- traffic; and
- over-utilization (e.g. increased numbers of people using an area).

In addition to the effects predicted in other sections of the Application/EIS, the quality of the recreation experience may also be affected by perceived effects; i.e., if people believe there is an effect on air quality (for example) they may enjoy recreation in the area less, even if no measurable change in air quality results. The potential for a diminished outdoor recreation experience (including perceived effects) is therefore related to potential effects related to dust and air quality, noise and vibration, visual impacts, dark sky, traffic, and over-utilization. These effects could potentially be realized for hunting, trapping, fishing, mountain biking, hiking, birdwatching, astronomical observation, cross-country skiing, snow-shoeing and snowboarding.

Air Quality

The Project is expected to affect air quality during the Construction, Operations and, to a lesser extent, Decommissioning and Closure phases. It is during these phases that Project activities are expected to result in moderate and key interactions with the Air Quality VC. Air quality could potentially adversely affect outdoor recreation during these phases.

During public consultations, comments were made that air quality concerns, perceived or otherwise, could potentially affect the ability of individuals to engage in outdoor recreation activities. Air quality concerns have been raised by residents of Kamloops and the LSA. The Thompson Valley is subject to temperature inversions, which can confine pollutants to a layer in the airshed that is closer to the surface. Pollutants will tend to accumulate in these areas (City of Kamloops 2012).

Air quality is assessed in detail in Chapter 10.1 and related appendices, including a Technical Data Report (Appendix 10.1-A) and includes background air quality values and dispersion modelling of a selection of substances of interest for the scenarios:

- Base Case, which includes modelling an inventory of emissions within the Kamloops airshed (e.g., industrial emissions, heating emissions) and the addition of background air quality values;
- Project Case, which is separated into Construction and Operation and includes only Project-related emissions); and
- Application Case, which is also separated into Construction and Operation cases and is the sum of the Base Case and appropriate Project Case scenario.

In connection with Air Quality, there are exceedances during the Construction and Operations phases, although these exceedances are infrequent. These occur during the Construction Phase for 24-hour total suspended particulate matter (TSP) and 24-hour PM_{10} at the northeast plant boundary (Figure H-15 in Appendix 10.1-A, Air Quality Technical Data Report). The exceedance of 24-hour average TSP is expected one day of the year in January, while the exceedance of 24-hour average PM_{10} is anticipated six

days of the year in December and January. These exceedances will tend to occur in the winter, when dispersion is frequently poorer than in the summer months (Appendix 10.1-A).

During the Operation Phase, there are three criteria air contaminants that exceed applicable regulatory objectives at the northeast plant boundary: 24-hour average TSP, 24-hour average PM_{10}, and 24-hour average $PM_{2.5}$. Similar to the Construction Phase, these exceedances are expected to occur infrequently, and during the winter months when dispersion is poor. The 24-hour TSP exceedance occurs 16 days a year, the 24-hour average PM_{10} exceedance occurs 34 days of the year, and the 24-hour $PM_{2.5}$ exceedance occurs three days of the year. Isopleths for the exceedances can be found on Figures I-13, I-15, and I-16 in Appendix 10.1-A, Air Quality Technical Data Report (Appendix 10.1-A).

In light of the location and low frequency of exceedances, it is unlikely that they will substantially alter the outdoor recreation experiences available in the LSA (e.g., Jacko Lake) and within 5 km of the Project boundaries (e.g., Coal Hill and Sugarloaf Hill). Similarly, there are other locations for outdoor recreational activities, such as Kenna Cartwright Park (for walking or hiking) that are easy to access. Therefore, it is unlikely that changes in air quality attributable to the Project will result in a diminished outdoor recreational experience.

Noise and Vibration

The Project will produce increased noise and vibration within the Project Footprint during the Construction and Operation phases as a result of Project-related activities. Noise and vibration could potentially affect outdoor recreation in the LSA as it could result in a diminished experience for those engaged in recreational activities. Recreationalists will not be permitted within the Project footprint during the Construction, Operation, and Decommissioning and Closure phases of the Project.

Project components that will have noise emissions include stationary equipment within plant facilities, haul road and access road traffic, mobile equipment activities, and construction works. The vibration assessment considers blast-induced ground and air vibrations' effects on aquatic life, human habitats, and structures (including the Jacko Lake boat launch). Modelling results indicate that both noise and vibration effects will be most noticeable during the Construction Phase and will occur generally within the Project Footprint and mine access road, between the mine site and Inks Lake Interchange.

According to the effects assessment on noise (see Section 10.5, Noise and Vibration), there will be an exceedance of the 6.5% highly annoyed (%HA) metric at the Jacko Lake Prayer Tree (ID# TLU#9), which is located on the north side of Jacko Lake, during the Construction Phase during piling activities (Section 10.5). Piling activities will only occur during the day and for a period of about two months. During the Operations Phase, there is no exceedance of this metric for other sites where recreational activities occur, such as Inks Lake and Goose Lake Road.

For vibration, which is also assessed in Section 10.5, Noise and Vibration, blasting is anticipated to exceed the human annoyance threshold of 5 mm/s for ground vibration and 115 linear decibel level at the Jacko Lake Fish Habitat Area #1 and #2 and the Jacko Lake Prayer Tree. As blasting moves away

from the western boundary of the Open Pit, the vibrations at Jacko Lake-related receptors will decrease.

Neither the noise nor the vibration from Project activities will necessarily preclude engaging in recreational activities at affected locations, such as Jacko Lake, but they may reduce participant enjoyment. While people may experience reduced enjoyment within 2 km of the Project footprint, there are other opportunities to engage in similar activities (e.g., fishing) and other, easily accessible locations. For example, Edith Lake, which is at a higher elevation and therefore does not open until after Jacko Lake, is still within about 5 km of the City of Kamloops southern boundary and approximately 10 km from the Aberdeen Neighbourhood. The Project may displace some physical activity but it is not expected to substantially reduce it.

Visual Impact

Assessment of potential effects on Visual Impact and Aesthetic Features VC (Section 8.3) considers potential changes to visual quality (including changes to views and the visibility of Project components and activities from various viewpoints), as well as shading (including the amounts and patterns of shade created by the Project). It is expected that visual quality from certain locations will be affected by various Project components and activities over the life of the Project, including most notably the TSF and mine rock storage facilities. Viewpoints for the analysis were selected through consultation with the City of Kamloops, members of the public and the Technical Working Group. Additional viewpoints were determined by KAM and BC MFLNRO.

Although recreation activities take place broadly throughout the LSA and RSA, of particular interest to the Outdoor Recreation VC assessment were the viewpoints in the vicinity of Jacko Lake, Lac le Jeune Road, Coal Hill (1.5 km away from the northern Project), Edith Lake (about 2 km away from Project infrastructure). It is within this area where effects to Outdoor Recreation are most likely given the recreational activities (e.g., mountain biking, fishing and hiking) that take place there. Some of these sites will have a view of Project infrastructure that may affect the enjoyment of recreational activities. During the Operations Phase, Jacko Lake, the Jacko Lake boat launch, and Coal Hill are expected to experience a moderate degree of visual effect, while the viewpoint from Edith Lake Road is expected to experience a substantial degree of visual effect (Section 8.3, Visual Impact and Aesthetic Features).

Similar to noise and vibration, the visual impacts of Project infrastructure, especially during the Construction and Operations phases, may alter recreational experiences but it will not prevent people from engaging in them at sites like Coal Hill, Inks Lake, and Jacko Lake. The activities that generally take place at these locations, e.g., angling, hiking, and mountain biking, can occur at other accessible locations in and around the City of Kamloops. In the case of Jacko Lake recreational activities specifically, effects would be limited to the period from April to October since access is not maintained outside of that time period and ice fishing is prohibited. The Project may displace some physical activity but it is not expected to substantially reduce it.

Dark Sky

Assessment of potential effects on Dark Sky is considered in Section 8.2 (Dark Sky). Dark Sky was considered because of concerns that the Project's effect on Dark Sky would reduce the effectiveness

of astronomical observation by the KAS at the Stake Lake Observatory. The Project will affect Dark Sky during the Construction Phase and Operations Phase. Although most construction activities are planned to occur during daytime hours, activities might extend into dark when days are short or when continuation of construction is required; in these situations, and in low-light circumstances, lighting will be required. During the Operations Phase, the process plant will operate 24 hours per day. Buildings, access roads, haul roads, bridges and other work areas will require appropriate illumination and the potential for both spill light and sky glow is greater. With mitigation, including implementation of a lighting mitigation and management plan, the residual effect of the Project on Sky Glow is expected to be not significant.

Traffic

Assessment of potential effects on traffic are reviewed in detail in Appendix 8.1-A (Ajax Mine Traffic Impact Assessment). Concerns were identified about increased Project-related traffic in the LSA affecting the ability to pursue and enjoy recreational activities. This was raised specifically with the development of the Inks Lake Interchange, when Project traffic will be routed along Lac Le Jeune Road during the Construction period. People using Lac Le Jeune Road for cycling or other activities during the summer months could be presented with increased larger vehicle traffic volumes. During the Operations Phase, Project traffic will be restricted to the Ajax Mine Access Road from the Inks Lake Interchange, maintaining public use of Lac Le Jeune Road.

Over-Utilization

The Construction Phase will require a large workforce of up to 1,800 workers, although these are not expected to all be on-site at the same time. During the Operations Phase, total potential employment opportunities range between 400 and 500 in an average year, while an additional 480 people will be employed through indirect and induced employment (see Section 7.2, Labour Force, Employment and Training). It is reasonable to expect that workers may choose to engage in outdoor recreation opportunities in the vicinity of the Project simply given its close proximity to these opportunities. For instance, employees may choose to fish at Jacko Lake before or after their shift. They may access Inks Lake, Coal Hill, Sugarloaf and other locations as well for recreational purposes.

The presence of the Project workforce and resulting increased population could result in a diminished experience during the months when access is permitted as a result of the increased number of people engaged in similar recreational activities. Key person interview participants noted that the attraction of many of the outdoor recreation opportunities related to the relative quiet and solitude associated with them (e.g., fishing on Jacko Lake, birdwatching along Goose Lake Road). It is possible that for some, this experience could be diminished as a result of a larger number of people engaging in these activities at the same time.

It is anticipated that some Project employees will access Jacko Lake for recreation, especially fishing opportunities. An estimated increase in angling due to the construction workforce increasing angling pressure by approximately 17 anglers annually could place additional pressure on the fishery and reduce the overall experience (See Section 6.7, Fish Populations and Fish Habitat).

Reduced Availability of Natural Resources

For fishing and harvesting, changes to resources both in terms of distribution and quality may deter individuals from participating in physical activities near the Project that involve these resources. The reduced availability of natural resources may include: fish (i.e., for fishing activities) and wildlife (i.e., for hunting and birdwatching activities).

Fish and Fish Habitat

Section 6.7 (Fish Populations and Fish Habitat) provides a detailed assessment of potential Project effects on fish and fish habitat. For the purpose of the Outdoor Recreation VC, the primary interest is in understanding potential effects related to fish in recreational lakes in the immediate vicinity of the Project (Jacko Lake, Edith Lake, Goose Lake). For Edith Lake, there are no expected Project-related affects to fish or fish habitat. There are no provincial records of fish in Goose Lake, however Goose Lake is within the Project footprint and will not be accessible to recreationalists for the duration of the Project.

Effects to fish mortality in Jacko Lake include mortality associated with changes in pressure from installation the sheet pile dam for the open pit development, and direct loss of habitat in the north east arm of Jacko Lake from Open Pit development (Section 6.7). As Jacko Lake is stocked annually, there should be no change in fish abundance in Jacko Lake. Regarding the quality of fish, the Human Health and Ecological Risk Assessment concludes that with mitigation measures to control air and dust emissions and to control surface water discharges, no residual effects on human health are expected for Aboriginal populations or other people who may catch and consume fish from Jacko Lake or other water bodies (Section 10.4).

Wildlife

Sections 6.8 to Section 6.17 provide detailed assessments of potential Project effects on vegetation and wildlife. For the purpose of the Outdoor Recreation VC, the key primary interest is in understanding potential effects related to hunting and trapping. With respect to hunting, potential effects on mule deer related to habitat loss, vehicular mortality, attractants, and hunting are anticipated to be low. With respect to game birds (e.g., ruffed grouse) potential effects that were assessed included habitat loss, habitat alteration, sensory disturbance, disruption of movement, and direct mortality. After mitigation, these effects are not expected to be significant. Hunting will not be permissible within the Mine Site and will continue to be limited within the Local Study Area because of land ownership and for the safe operation of the Project. The majority of the land is privately owned, so hunters must have permission from the owners to access the area.

The loss and displacement of some species due to Project infrastructure and activities, will affect areas where some people engage in hunting, trapping, and fishing. In connection with hunting and fishing, these activities can be engaged in at other accessible locations within the RSA. Shifting trapping activities may be more difficult as a trapper would need to find an available trapline. The Project may displace some recreational activity but it is not expected to substantially reduce it. As described in the baseline studies (Section 8.6.2.3), there is no recent record, information or indication of trapping activity within trapline unit TR0320T001 and KAM remains amenable to discussions with the trapline owner.

8.6.4.3 Mitigation Measures for Outdoor Recreation

Proposed mitigation measures related to Outdoor Recreation represent a combination of measures proposed by other disciplines and those more directly related to specific recreation activities and areas. Measures implemented to mitigate potential adverse effects to other VCs will similarly reduce associated effects on Outdoor Recreation activities. These include mitigation measures for Air Quality (Sections 10.1 and 11.6), Noise and Vibration (Sections 10.5 and 11.22), and Visual Impacts (Section 8.3).

Proposed mitigation measures are listed below according to how they relate to access to recreational areas, diminished outdoor recreation experience or the availability of natural resources.

Changes in Access for Recreation Opportunities

Access to Edith Lake and Edith Lake Road will not change as a result of Project activities and therefore is not considered further in the assessment. Goose Lake will no longer be available for recreation purposes and a 6 km portion of Goose Lake Road will be closed to the public and no longer be accessible.

Access to Jacko Lake for recreationalists and Aboriginal Groups will be altered as a result of the Project, including permanent loss of the northeastern arm of the lake, as well as temporary and intermittent access restrictions (e.g. to accommodate daily blasting activities). This effect will be managed by the implementation of an Access Management Plan (AMP), developed by KAM, which will address overall access to the site. The AMP's primary objective will be to maintain public safety and worker safety, while allowing for continued use and enjoyment of areas in proximity to the Project. The AMP will be implemented in consultation with stakeholder groups (e.g., the SSN, Jacko Lake users, ranchers) and others, and would include plans applicable for Construction, Operations, and Decommissioning and Closure Phases of the Project. The AMP is included in Section 11.21 and will:

- Identify specific areas and activities likely to be affected by the Project;
- Identify what continued land uses will be permitted and where those activities can occur;
- Identify what control measures might be necessary to ensure continued public and worker safety; and
- Commit KAM to timely and on-going communication with affected land and resource users to enable continued use of the area where safe and appropriate to do so.

The AMP will describe safety procedures related to blasting, including: establishing a consistent blasting window; deciding when and how activities on Jacko Lake should be suspended in advance of, during or after blasting; developing clear signage and posting at accessible entrance with relevant blasting information; control, preventing access to, and clearing, Jacko Lake within a specified time frame in advance of blasting; and ensuring the lake is visually cleared from multiple vantage points to ensure the lake safety buffer zone is not in use by anglers or boaters at those times.

KAM also intends, through both the AMP and Community Liaison Group, to work with local recreational and resource land users to identify areas where all forms of land and resource use can

continue to be enjoyed in the Project area. This could include, for example, facilitating ways in which hunters and private landowners, who must provide permission for hunting access, identify mutual opportunities, and developing initiatives to support new or improved opportunities for mountain biking, trail development, lake fishing, and other recreational activities.

Diminished Outdoor Recreation Experience

Measures to mitigate potential diminished outdoor recreation experience are largely contained within the mitigation measures developed for air quality, noise and vibration, and visual impact but also include specific measures to consult with recreational users and address concerns.

Air Quality

Mitigation measures include Project design components (conveyor from crusher to plant will be covered with an arch cover to reduce dust generation, install dust collectors (baghouses)) and Project Operations components (watering haul roads surfaces). A detailed discussion of mitigation measures for air quality can be found in Section 10.1 (Air Quality), the Air Quality and Dust Control Plan can be found in Section 11.6.

Noise and Vibration

Mitigation measures include project design components (conveyor from crusher to plant will be covered with an arched cover to reduce noise emissions, enclose heavy equipment inside buildings away from Kamloops, adapt blast designs to minimize vibration) and project operation components (conduct piling activities only during daytime period, develop a noise and vibration management plan, optimize blasting activities). A detailed discussion of mitigation measures for noise and vibration can be found in Section 10.5 (Noise and Vibration), and the Noise Management Plan can be found in Section 11.22.

Visual Impact and Aesthetic Features

A detailed discussion of mitigation measures for Visual Impact and Aesthetic Features can be found in Section 8.3. The following is a summary of mitigation measures through Project design, best management practices, adaptive management, monitoring, and offsetting or enhancement. Project design measures include implementation of good visual design principles during Project construction. For example, the design will avoid straight edges where possible and re-vegetation of Project components during construction will help address physical alterations and straight edges. Project infrastructure will also be designed where feasible to minimize its appearance. For example, the use of non-reflective materials for buildings and using natural-coloured paint where possible will help buildings and other infrastructure blend into the landscape. In addition to designing the Project to blend into the landscape more effectively, ongoing re-vegetation is planned to minimize the impact of larger Project components, such as the Mine Rock Storage Facilities. While they will have an effect on visual impacts and surrounding viewscapes as they are built up, ongoing re-vegetation will minimize the potential effect.

Traffic

Potential traffic effects related to Project activities will be mitigated through the implementation of the Transportation Management Plan (Section 11.20). During the Construction Phase, transportation to and from the mine site will be closely monitored and managed to ensure there is minimal interaction between mine traffic and general public traffic in the area. It is expected that these limitations would remain in force until the completion of the Inks Lake Interchange, after which mine traffic can be designated to use only the mine access road. During the Operations Phase, mine traffic will be separated from the public road use along Lac Le Jeune for safety and to facilitate access to recreational resources in the Project area to the west of the Project Footprint, including Jacko Lake.

Other Mitigation

KAM will establish, as part of an adaptive management plan, a angling/recreation working group made up of recreational users to identify potential issues and concerns associated with access management/traffic management in accessing the recreational facilities in the area, and provide opportunity to discuss changes in enjoyment of the area due to the construction and operations of the Project.

Reduced Availability of Natural Resources

Fish and Fish Habitat

Fish and fish habitat mitigation is discussed in detail in Section 6.7 (Fish Populations and Fish Habitat) and Section 11.25 (Fisheries and Aquatic Life Monitoring Plan) includes details on how the Project effects will be mitigated. Measures to mitigate potential changes in fish productivity and fish habitat include continued monitoring of fish populations, contaminants, and nuisance factors. KAM will seek ongoing interaction with anglers to help ensure issues are being addressed and intended mitigation outcomes are achieved. KAM will also work with fisheries regulators and other stakeholders (e.g. through the recreation/angling working group described above) to identify suitable opportunities for new or improved fishing areas.

Wildlife

Sections 6.8 to Section 6.17 describe measures that will be used to mitigate potential Project effects on wildlife and vegetation. This includes measures to minimize habitat loss effects for mule deer and game birds (e.g., ruffed grouse); as well as effects related to habitat alteration, sensory disturbance, disruption of movement and direct mortality for game birds.

8.6.5 Residual Effects and Their Significance

Residual effects are those Project effects that remain after mitigation is applied. This section describes the residual effects on the Outdoor Recreation VC.

8.6.5.1 Summary of Residual Effects

Although mitigation measures and Project design features will be implemented to minimize and manage the effects of the Project, residual effects are identified. To be conservative, the following three residual effects are predicted on the Outdoor Recreation VC:

- Changes in access to Jacko Lake, Goose Lake and Goose Lake Road;
- Diminished quality of outdoor recreation experience; and
- Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.

The focus of the assessment on Outdoor Recreation VC is on the Construction, Operations, and Decommissioning and Closure phases of the Project as this is when potential adverse Project effects are most likely to occur. Project activities are expected to be the most intense during Construction and Operations phases. During the Decommissioning and Closure Phase, the Project is still expected to interact with recreational opportunities as operations wind down, reclamation activities continue, and the project transitions to final closure activities including decommissioning and removal of Project infrastructure and facilities.

The mitigation measures and Project design features described in the Air Quality, Noise and Vibration, Visual Impacts and Aesthetic Features VCs are expected to reduce potential effects of the Project so they are Not Significant. In addition, KAM is committed to support ongoing consultation with recreationalists to identify and address concerns. Residual effects after mitigation for the Outdoor Recreation VC are described and summarized in Table 8.6-5.

8.6.5.2 Criteria for Characterization of Residual Effects

The criteria for characterizing residual effects to the Outdoor Recreation VC are described in Table 8.6-6. These criteria are based on the definitions presented in Section 5.2.5.2 with the exception of ecological context, which has been recast as social value to better suit the assessment of socio-economic VCs.

8.6.5.3 Characterization of Residual Effects

Residual effects are expected during the Construction, Operations, and Decommissioning and Closure phases of the Project. These are characterized in Table 8.6-7.

<u>Changes in Access to Jacko Lake, Goose Lake and Goose Lake Road</u>

Characterization of this residual effect is based primarily on review of secondary sources as well as professional judgement. Potential effects related to removal or changes in access to recreational opportunities as a result of the Project will occur throughout the Construction, Operations, and Decommissioning and Closure phases. In some instances, recreation area will no longer be available (Goose Lake and a 6 km portion of Goose Lake Road will be removed from recreational use, and the northeast arm of Jacko Lake will no longer be accessible to fishers).

Table 8.6-5. Summary of Residual Effects on Outdoor Recreation

Potential Effect	Project Phase (timing of effect)	Project Component/ Physical Activity	Description of Cause-Effect[1]	Description of Mitigation Measure(s)	Description of Residual Effect
Change in Access for Recreation Opportunities	• Construction • Operation • Decommissioning and Closure	All	Access to Jacko Lake for fishing and boating will be regularly and temporarily restricted to safely allow for blasting activities. Hunting will be prohibited at the Mine Site and on private land owned by KAM. Access to Goose Lake Road and Goose Lake will be permanently restricted by the development of the Mine Site.	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management. • Access Management Plan will include signage and communications regarding temporary closures of Jacko Lake. • Angler/recreation working group, and potential development of new or improved fishing, biking, trails, and/or other recreation areas.	Changes in access to Jacko Lake, Goose Lake, and Goose Lake Road
Diminished Outdoor Recreation Experience	• Construction • Operation • Decommissioning and Closure	All	Project presence and activities diminish the recreation experience.	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management; • Angler/recreation user working group.	Diminished quality of outdoor recreation experience
Reduced availability of natural resources	• Construction • Operation • Decommissioning and Closure	All	Project presence and activities reduces available resources for recreation opportunities	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features • Mitigation of fish and wildlife project effects. • Adaptive management. • Angler/recreation working group, and potential development of new or improved fishing areas.	Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.

[1] *"Cause-effect" refers to the relationship between the Project component/physical activity that is causing the change or effect in the condition of the VC.*

In other instances, there will be intermittent changes to access during the Operations Phase for Jacko Lake, particularly during the first 13 years of the Project as regular (e.g. daily) blasting will require temporary enforcement of access restrictions to the eastern portion of the lake. Effects on recreation would be limited to the period from April to October since access is restricted outside of that time period.

For the effect of removal or changes in access for recreational opportunities, the following ratings were assigned:

- **Magnitude**: The magnitude of the effect is expected to be medium, as the changes in access that would result from the Project differs substantially from the average value for baseline conditions. However, alternative recreation opportunities can be found throughout the LSA/RSA, and mitigation measures (including an Access Management Plan, angling/recreation working group, Transportation Management Plan) will be in place to offset the loss or alteration of these opportunities.
- **Duration:** The duration of the effect is expected to be medium term. Removal of specific recreation areas will be permanent but alternative opportunities exist, mitigation of contributing effects, and reclamation and remediation activities will be implemented.
- **Frequency:** The effect is expected to occur regularly over the life of the Project. While access to Goose Lake and a portion of Goose Lake Road will be continue into the future, the recreational opportunities associated with Goose Lake and Goose Lake Road is expected to be replaced with alternative recreation opportunities. Jacko Lake is expected to have periodic restrictions to access during particularly the first 13 years due to blasting.
- **Geographic Extent:** The effect is expected to be landscape as it will be limited to the Project footprint and areas adjacent to it.
- **Reversibility:** After the implementation of mitigation measures, it is expected that the effects associated with removal or changes in access of recreational opportunities will be reversible in the long-term. Mitigation of the closure of a portion the Goose Lake Road through alternative recreation opportunities is expected to be addressed within 20 years post-closure. The loss of the north arm of Jacko Lake will reduce the area of the lake that can be fished but it is expected to be stocked with at the same rate and the lake is a productive habitat. The overall effect of restricted access of the lake is expected to be reversible after Decommissioning and Closure is complete.
- **Resiliency:** The resiliency is considered high as there are a large number of similar recreational opportunities in the LSA and RSA, providing the population with many options to adapt to the removal or change in access for recreation opportunities.
- **Social Value:** The social value related to this effect is rated as medium. Outdoor Recreation is important to the population in general and the City of Kamloops and TNRD specifically. However, the region has many similar recreational opportunities available.

Table 8.6-6. Definitions of Characterization Criteria for Residual Effects on Outdoor Recreation

Magnitude	Duration	Frequency	Geographic Extent (Physical/Biophysical)	Reversibility	Resiliency	Social Value	Likelihood of Effects	
							Probability	Confidence Level
How severe will the effect be?	*How long will the effect last?*	*How often will the effect occur?*	*How far will the effect reach?*	*To what degree is the effect reversible?*	*How resilient is the receiving environment or population?*	*How influential is the effect on the broader socio-economic environment?*	*How likely is the effect to occur?*	*How certain is this analysis?*
Negligible: No or very little detectable change from baseline conditions.	**Short-term:** Effect lasts 1 to 5 years.	**Once:** Effect is confined to one discrete period in time during the life of the Project.	**Local:** Effect extends less than 500 m from infrastructure or activity.	**Reversible Short-term:** Effect can be reversed relatively quickly.	**Low:** The receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.	**Low:** The effect has limited ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**High:** It is highly likely that this effect will occur.	**High:** > 80% confidence. There is a good understanding of the cause-effect relationship and all necessary data are available for the Project area. There is a low degree of uncertainty and variation from the predicted effect is expected to be low.
Minor: Differs from the average value for baseline conditions to a small degree.	**Medium-term:** Effect lasts 6 to 25 years.	**Sporadic:** Effect an effect that occurs at sporadic or intermittent intervals during any phase of the Project.	**Landscape:** Effect is limited to the LSA.	**Reversible Long-term:** Effect can be reversed within 20 years of Post Closure.	**Neutral:** The receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.	**Medium:** The effect has some ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Medium:** This effect is likely, but may not occur.	**Medium:** 50 to 80% confidence. The cause-effect relationships are not fully understood, there are a number of unknown external variables, or data for the Project area are incomplete. There is a moderate degree of uncertainty; while results may vary, predictions are relatively confident.
Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation.	**Long-term:** Effect lasts between 26 and 50 years.	**Regular:** Effect occurs on a regular basis during the life span of the Project.	**Regional:** Effect extends across the broader region (RSA).	**Irreversible:** Effect cannot be reversed (i.e., is permanent).	**High:** The receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.	**High:** The effect has moderate ability to alter the economic base, social structure, community stability or the well-being of people in the study area.	**Low:** This effect is unlikely but could occur.	**Low:** < 50% confidence. The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project area are incomplete. High degree of uncertainty and final results may vary considerably.
Major: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation.	**Far Future:** Effect lasts more than 50 years.	**Continuous:** Effect occurs constantly during the life of the Project.	**Beyond Regional:** Effect extends beyond the regional scale, and may extend across or beyond the province.					

Table 8.6-7. Characterization of Residual Effects, Significance, Likelihood and Confidence on Outdoor Recreation

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Social Value		Probability	Confidence
Changes in access to Jacko Lake, Goose Lake and Goose Lake Road	Medium	Medium-term	Regular	Landscape	Reversible Long-term	High	Medium	Not Significant (moderate)	High	High
Diminished quality of outdoor recreation experience	Medium	Medium-term	Regular	Landscape	Reversible Long-term	High	Medium	Not Significant (moderate)	High	Medium
Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.	Minor	Medium-term	Sporadic	Landscape	Reversible Long-term	High	Low	Not Significant (minor)	Medium	High

Diminished Quality of Outdoor Recreation Experience

This residual effect is related to the diminished outdoor recreation experience that is predicted to occur throughout the Construction, Operations, and Decommissioning and Closure phases of the Project. The recreational experience—for various activities including fishing, biking, and hiking—may be affected by the Project through changes in air quality, noise and vibration, and visual impact, and has been rated as follows:

- **Magnitude**: The magnitude of the effect is expected to be minor/medium. Mitigation measures will be implemented to effectively manage adverse effects on air quality, noise and vibration, and visual impacts and aesthetic features. Other measures will include the development of an angler/recreation user working group and an AMP. These mitigation measures and the availability of alternative recreational opportunities in the LSA/RSA are expected to effectively mitigate the diminishment of the outdoor recreational experience associated with Project activities.
- **Duration:** The duration of the effect is expected to be medium-term. The effect the Project will have on recreation opportunities will extend beyond the construction and initial operation of the Project (more than five years), but mitigation of contributing effects, and planned reclamation and remediation activities that are proposed to commence during the Operations Phase are expected to fully mitigate effects related to diminished recreation experience within 25 years.
- **Frequency:** The effect is expected to occur regularly over the life of the Project. This is due to the variations in timing and location of the various outdoor recreation opportunities. Blasting activities are expected to occur regularly for a two-hour period during the first 13 years of the Project. Traffic and access disruption associated with the development of the Inks Lake Interchange will occur over a brief period of the Construction Phase. Noise and vibration effects will be felt during both the Construction and Operations Phases of the Project.
- **Geographic Extent:** The effect is expected to be landscape as it will be limited to the Project footprint and areas adjacent to it.
- **Reversibility:** After the implementation of mitigation measures, it is expected that the effects associated with diminishment of recreational opportunities will be reversible in the long-term. As Operations Phase activities wind down many of the activities that contribute to diminishing of the recreation experience will also cease. Project activities near to the north arm of Jacko Lake may diminish peoples' enjoyment of the Lake. However, noise effects associated with Operations Phase will be mitigated and the overall effect of quiet enjoyment of the lake is expected to be reversible after Decommissioning and Closure is complete.
- **Resiliency:** The resiliency is considered high as there are a large number of similar recreational opportunities in the LSA and RSA, providing the population with many options to adapt to new recreation opportunities and outdoor recreation experiences. The implementation of the Fish Habitat Offsetting plan at Inks Lake will add additional quality habitat for recreational enjoyment.

- **Social Value:** The social value related to this effect is rated as medium. Outdoor Recreation is important to the population in general and the City of Kamloops and TNRD specifically. However, the region has many similar recreational opportunities available.

Reduced Opportunities for Fishing and Hunting as a Result of Effects to Fish and Wildlife Resources

This residual effect is related to reduced opportunities for fishing (trout in Jacko Lake) and hunting (mule deer and game birds) resulting from the reduced availability of fish and wildlife resources that is predicted to occur during the Construction, Operations, and Decommissioning and Closure Phases of the Project.

- **Magnitude**: The magnitude of the effect is expected to be minor. The Project will reduce fish habitat on Jacko Lake and to result in some fish mortality due to vibration caused by piling. However, the lake will continue to be stocked and no reduction in overall fish productivity is expected. HHERA results indicate fish quality is not expected to change as a result of Project activities. With regards to wildlife populations, no significant effects are expected in relation to habitat loss and sensory disturbance.
- **Duration:** The duration of the effect is expected to be medium-term. Effects associated with the reduced availability of natural resources are expected are expected to be present beyond the first five years of the Project. With mitigation, adverse effects on wildlife populations associated with recreation activities such as hunting are not expected to be present after 25 years.
- **Frequency:** The effect is expected to be sporadic over the life of the Project due to variations in timing and location of outdoor recreational opportunities, and overlaps with specific Project activities (e.g., potential short-term changes in fish population during closure of northeast arm of Jacko Lake or construction activities, changes in distribution or abundance of game birds at specific times of construction or operations).
- **Geographic Extent:** The effect is expected to be landscape in extent as it will be limited to the Project footprint and areas adjacent to it.
- **Reversibility:** The effect is expected to be reversible in the long-term. As the Operation Phase ends the activities that could contribute to a reduction in the fishing/hunting/ trapping resources will also cease.
- **Resiliency:** The resiliency is considered high as there are other opportunities to fish available within the LSA and RSA, and other opportunities to hunt (with the requisite landowner permission) within the LSA and RSA.
- **Social Value:** The social value related to this effect is rated as low. Outdoor Recreation is important to the population in general and the City of Kamloops and TNRD specifically. However, the region has many similar recreational opportunities available to both fish and hunt and there is considerable availability of similar natural resources in the LSA and RSA.

8.6.5.4 Significance of Residual Effects

The residual effect of changes in access to Jacko Lake, Goose Lake and Goose Lake Road is expected to be **Not Significant (Moderate)**. Despite the loss of specific areas currently used for outdoor recreation purposes, proposed mitigations by KAM are expected to off-set the identified effects. Within the LSA and RSA there continue to be a substantial number of alternative recreational opportunities. The importance of Jacko Lake as a location for fishing is recognized, and there will be some restrictions on access to this lake over the life of the Project.

The residual effect of diminished quality of outdoor recreation experience is expected to be **Not Significant (Moderate)**. Individual outdoor recreationalists may experience a reduced quality of experience over the life of the Project. This would be most likely for fishers on Jacko Lake (e.g., as a result of blasting activities). Hikers and bikers accessing areas where some potential effects related to other VCs may occur (e.g., visual impacts along Edith Lake Road, Goose Lake Road, Coal Hill) will also likely experience a reduced quality to their experience. Assessed over the broad range of activities and locations; however, it is anticipated that mitigation measures and the opportunities presented in other locations will help to offset the potential effects.

The residual effect of reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources is expected to be **Not Significant (Minor)**. Jacko Lake will experience a reduction in fish habitat but with mitigation and continued stocking the fishery is not expected to be adversely affected. Wildlife within the Project Footprint and adjacent area will be displaced by the Project site, but hunting activities on adjacent private lands (not owned by KAM) are expected to continue subject to the landowners' permission. No Project-related effects to hunting are expected on Crown lands within the RSA.

8.6.5.5 Characterization of Likelihood and Confidence

The probability of the residual effect of changes in access to Jacko Lake, Goose Lake and Goose Lake Road is considered high. Development of the Project will necessitate the removal of Jacko Lake's northeast arm as well as Goose Lake, and the partial closure of Goose Lake Road. For the same reasons, confidence in the identified residual effect is rated as high.

The probability of the residual effect of diminished quality of outdoor recreation experience is rated as high, but is also dependent on the activity and location of interest. The combined effect of air quality, noise and vibration, visual impacts can be expected to lead to a diminished quality of experience for recreationalists. The confidence associated with the identified effect is rated as medium. Different recreation users will have varying degrees of acceptance with respect to the various effects that could reduce the experience for them. As noted also, the effect will vary depending on the location and activity taking place.

Probability of the residual effect of reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources is considered medium. Fish mortality in Jacko Lake is predicted to increase as a result of Construction and Operation Phase activities but the lake will continue to be monitored and stocked so there is not expected to be a reduction in fish population. Potential

displacement of certain species of animals of interest to hunters could also lead to reduced opportunities. Confidence associated with the identified effect is rated as high.

8.6.5.6 Summary of Residual Effects Assessment and Significance

Given the above characterization, the three predicted residual effects of the Project on the VC Outdoor Recreation are expected to be Not Significant. The effect of changes in access to Jacko Lake, Goose Lake and Goose Lake Road is considered **Not Significant (Moderate)** following mitigation measures including the development of an AMP during the Construction, Operations, and Decommissioning and Closure phases (Table 8.6.8)

Table 8.6-8. Summary of Residual Effects, Mitigation, and Significance on Outdoor Recreation

Residual Effects	Project Phase	Mitigation Measures	Significance
Changes in access to Jacko Lake, Goose Lake and Goose Lake Road	• Construction • Operations • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management. • Access Management Plan will include signage and communications regarding temporary closures of Jacko Lake. • Angler/recreation working group, and potential development of new or improved fishing, biking, trails, and/or other recreation areas.	Not Significant (Moderate)
Diminished quality of outdoor recreation experience	• Construction • Operations • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management; • Angler/recreation user working group.	Not Significant (Moderate)
Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.	• Construction • Operation • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features • Mitigation of fish and wildlife project effects. • Adaptive management. • Angler/recreation working group, and potential development of new or improved fishing areas.	Not Significant (Minor)

During the Construction, Operations and Decommissioning and Closure Phases, the Project is expected to have a **Not Significant (Moderate)** residual effect of diminished quality of outdoor recreation experience. Mitigation measures for other VCs, such as air quality, noise and vibration, and visual impacts and aesthetic features will minimize potential Project effects on outdoor recreational experience.

During the Construction, Operations and Decommissioning and Closure Phases, the residual effect of reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources is anticipated to be **Not Significant (Minor)**. Mitigation measures for other VCs, such as fish and wildlife, will minimize potential Project effects on hunting, trapping and fishing.

The three effects summarized above are carried forward to the cumulative effects assessment (CEA) in Section 8.6.6.

8.6.6 Cumulative Effects Assessment

8.6.6.1 Introduction

This section describes the potential incremental effects likely to result from the Project on the environment when the effects are combined with those from other past, present, or future projects and activities. The intent is to determine whether the residual effects of the Project could interact with the residual effects of other projects or activities thereby creating a greater effect on the Outdoor Recreation VC. In order for another Project or activity to be considered within the CEA, there must be reasonable potential for the Project or activity to result in a residual effect similar to the Project.

The residual effects of the Project on the Outdoor Recreation VC include:

- changes in access to Jacko Lake, Goose Lake and Goose Lake Road;
- diminished quality of outdoor recreation experience; and
- reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.

These residual effects are characterized by a number of different factors including specific Project components and activities, associated labour force and population, air quality, noise and vibration, visual impacts and aesthetic features, fish and fish habitat, wildlife and dark sky. In some cases the residual effects are direct (e.g., change in access due to closure of Goose Lake Road) while in others perception of potential effects plays a role (e.g., perceptions that changes air quality around Jacko Lake will make it unsafe to engage in recreational pursuits).

8.6.6.2 Identification of Other Actions that May Affect Outdoor Recreation

Chapter 5 (Assessment Methodology) describes the past, present, and reasonably foreseeable projects and activities that could interact with the effects of the Project. These projects are screened against the residual effects of the Project. For the Outdoor Recreation VC, the key concern from a cumulative effects perspective is whether these projects or activities will also remove access to recreational areas in the RSA and LSA, or contribute to sensory effects or changes to natural resources, within a similar time frame as the Project.

8.6.6.3 Interactions between Residual Project Effects and Other Project or Activity Effects

Table 8.6-9 screens the other projects and activities that could interact with the Project's effects on outdoor recreation. Only potential interactions ranked "M" or "H" are subject to further assessment as potential cumulative effects. .

Of the projects and activities screened for consideration to interact cumulatively with Project outdoor recreation residual effects, a key concern are projects or activities that interact with outdoor

recreation effects within the LSA and RSA during the same time frame. The Ajax Project Construction Phase is expected to be completed by 2019 and Operations Phase completed by approximately 2042. Of the projects and activities identified for consideration, only the proposed Trans Mountain Pipeline System has potential for cumulative effects.

Potential interactions with the Trans Mountain Kinder Morgan (TMPL) expansion are ranked as low. The pipeline will be rerouted as it currently runs adjacent to the proposed Open Pit. The proposed route alignment will run east of Lac Le Jeune Road and west of the GA (see Figure 8.6-3, Local Study Area). According to the Technical Update No. 2 filed with the National Energy Board by TMPL (2014), the reroute will affect 13 new parcels of land, 11 of which are owned by KAM, one of which is owned by the Crown, and one of which is privately held. At the time of the filing, the private landowner had not raised any concerns about the proposed reroute. KAM will continue to manage land use and activities around the construction of the TMPL if it is approved and constructed.

Potential interactions with the Outdoor Recreation VC include potential changes to access for recreational opportunities during the construction of the TMPL and potential diminishment of the outdoor recreational experience due to disruption during the construction of the TMPL. With regard to potential changes in access, the proposed TMPL route does not intersect known recreational sites or activities. Construction will be coordinated with KAM particularly in land parcels where KAM is the landowner. With regard to potential diminishment of the outdoor recreational experience during construction of the TMPL, while some disruption is expected as Construction progresses through the LSA, it is not expected to stop recreational activity of existing accessible sites.

Therefore no cumulative effects are anticipated.

8.6.6.4 Proposed Mitigation Measures

No cumulative effects anticipated.

8.6.6.5 Evaluation of Significance of Residual Cumulative Effects

No cumulative effects anticipated.

8.6.7 Conclusion

The presence of the Project will remove certain areas and landscape features from public use and restrict access to other areas (temporarily or permanently) for safety or operational reasons. These changes may affect the ability of individuals to access certain sites and engage in outdoor recreational activities. Changes include the removal of Goose Lake, the closure of a 6 km portion of Goose Lake Road, the removal of the northeast arm Jacko Lake and regular temporary restrictions of access to parts of Jacko Lake. This effect will be managed by the implementation of an AMP, developed by KAM, which will address overall access to the site. The AMP's primary objective will be to maintain public safety and worker safety, while allowing for continued use and enjoyment of areas in proximity to the Project.

Table 8.6-9. Ranking Potential for Residual Effects to Interact Cumulatively with Effects of Other Human Actions on Outdoor Recreation

Residual Effect	Industrial Projects/Activities													Natural Resources and Land Use			Tourism and Commercial Recreation Activities					Community Infrastructure			Transportation					
	Vidette Lake Mine	Afton Mine (Historical)	Iron Mask Mine	Bonaparte Mine	New Afton Mine (New Gold)	Highland Valley Copper Mine (Teck)	Domtar Kamloops Pulp Mill	Tolko-Hefley Creek Plywood and Veneer	LaFarge Cement Plant	Trans Mountain Pipeline System (Kinder Morgan)	Trans Mountain Pipeline System - Expansion (Kinder Morgan)	Harper Creek	Highland Valley Copper – Bethlehem Expansion	Kamloops Forest District	Agriculture	Ranching	Tranquille on the Lake	Lac Le Jeune Resort	Tobiano Golf Course	Recreational Hunting, Fishing, Foraging	Recreational Trails	City of Kamloops Wastewater Management	Water Treatment Centre	City Expansion and Growth	Lac le Jeune Road	Highway 1	Highway 5A	Highway 5 (Coquihalla Highway)	Kamloops Airport	Rail Yards and Lines (CP and CN)
Changes in access to Jacko Lake, Goose Lake and Goose Lake Road	O	O	O	O	O	O	O	O	O	O	L	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Diminished quality of outdoor recreation experience	O	O	O	O	O	O	O	O	O	O	L	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

KAM also intends, through the AMP and Community Liaison Group, to work with local recreational and resource land users to identify areas where all forms of land and resource use can continue to be enjoyed in the Project area. This could include, for example, facilitating engagement between hunters and private landowners, who must provide permission for hunting access, and identifying opportunities to develop new or improved fishing areas, trails, or other recreational resources. Following these mitigation and management measures, the residual effect on access to recreational opportunities is predicted to be Not Significant (Moderate) during the Construction, Operations, and Decommissioning and Closure phases.

The outdoor recreation experience (i.e., how enjoyable or appealing activities are) and the value attributed to it may be influenced by environmental changes arising from the Project, such as air quality, noise and vibration, visual impacts and aesthetic features, dark sky, traffic, and over-utilization. Mitigation measures for other VCs, such as air quality, noise and vibration, and visual impacts and aesthetic features will minimize potential Project effects on outdoor recreational experience, and KAM will also consult with recreational users and address concerns. KAM will establish, as part of an adaptive management plan, a recreation/angling working group made up of recreational users to proactively identify issues and concerns associated with access management/traffic management in accessing the recreational facilities in the area as well as providing opportunity to discuss changes in enjoyment of the area due to the construction and operations of the Project. The residual effect of diminished outdoor recreation experience is predicted to be Not Significant (Moderate) during the Construction, Operations, and Decommissioning and Closure phases.

For fishing and harvesting, changes to resources both in terms of distribution and quality may deter individuals from participating in physical activities near the Project that involve these resources. Section 6.7 (Fish Populations and Fish Habitat) provides a detailed assessment of potential Project effects on fish and fish habitat. For the purpose of the Outdoor Recreation VC, the primary interest is in understanding potential effects related to fish in recreational fishing lakes in the immediate vicinity of the Project including Jacko Lake. Sections 6.8 to Section 6.17 provide detailed assessments and mitigation of potential Project effects on wildlife and vegetation. Measures to mitigate potential changes fish and fish habitat include continued monitoring of fish populations, contaminants, and nuisance factors. KAM will seek to engage anglers through the angler/recreation working group to help ensure issues are being addressed and intended mitigation outcomes are achieved. The residual effect related to reduced availability of fish and wildlife for fishing and hunting is expected to be Not Significant (Minor) during the Construction, Operations, and Decommissioning and Closure phases.

The Project, in conjunction with other project and activities active or being developed within the region, has potential overlap with the proposed TMPL, however cumulative effects are not expected. Table 8.6-10 provides a summary of Project residual effects, mitigation and significance for Outdoor Recreation.

Table 8.6-10. Summary of Project and Cumulative Residual Effects, Mitigation, and Significance for Outdoor Recreation

Residual Effects	Project Phase	Mitigation Measures	Residual Effect Significance	Residual Cumulative Effect Significance
Changes in access to Jacko Lake, Goose Lake and Goose Lake Road	• Construction • Operation • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; adaptive management. • Access Management Plan will include signage and communications regarding temporary closures of Jacko Lake. • Angler/recreation working group, and potential development of new or improved fishing, biking, trails, and/or other recreation areas.	Not Significant (Moderate)	N/A
Diminished quality of outdoor recreation experience	• Construction • Operation • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management; • Angler/recreation user working group.	Not Significant (Moderate)	N/A
Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.	• Construction • Operation • Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; mitigation of fish and wildlife project effects. • Adaptive management. • Angler/recreation working group, and potential development of new or improved fishing areas.	Not Significant (Minor)	N/A

8.7 SUPPORTING TOPIC – JACKO LAKE

8.7.1 Rationale

Over the past number of years, KAM has engaged with key stakeholders (Community, Aboriginal Groups and Government) regarding the Ajax Project (the Project). Throughout this engagement process, a diverse group of individuals and organizations have expressed a range of concerns regarding potential Project effects on Jacko Lake. These concerns are particularly relevant given the expressed importance of Jacko Lake and its location within the Project's proposed footprint, adjacent the open pit. KAM appreciates the various environmental, social and cultural values associated with Jacko Lake and is committed to developing, operating, and closing the Project in a responsible manner that is reflective and respectful of these diverse interests.

Individuals, organizations, and communities engaged included:

- Aboriginal Groups for whom the lake is culturally important;
  - The Project lies within the asserted Stk'emlupsemc of the Secwpémec Nation (SSN), Secwépemc, and Nlaka'pamux Nation traditional territories.
- Ranchers who use the lake for watering cattle and/or hold water licences downstream;
- Recreational resource users who value the lake for readily available angling opportunities;
- Recreational users who value the lake for other interests and opportunities (e.g., birdwatching, hiking); and
- Municipal, regional, provincial, and federal government departments that include the lake in their jurisdictions.

As shown in Figure 8.7-1, Jacko Lake is situated within the Project footprint. Given its location, its importance to stakeholders, and to ensure sound environmental assessment practice, potential Project effects on the lake are considered in the Application for an Environmental Assessment Certificate/Environmental Impact Statement for a Comprehensive Study (Application/EIS). As outlined in the AIR, Jacko Lake as a supporting topic is intended to integrate results from relevant valued components (VCs) in the Application/EIS into a single reference. Effects are considered from a variety of perspectives and disciplines, which include potential effects on Water Quality; Water Quantity; Groundwater Quantity; Fish and Fish Habitat; Visual Impacts and Aesthetic Features; Land and Resource Use; Current Use of Lands and Resources for Traditional Purposes; Outdoor Recreation; Heritage; Air Quality; Human Health; and Noise and Vibration.

Table 8.7-1 below provides references to the corresponding Application/EIS section for each of the relevant VCs listed above.

Section 8.7.2 below provides a consolidated, high-level background for readers and reviewers to aid in understanding historical and contemporary features of Jacko Lake, while Section 8.7.3 facilitates reader and reviewer understanding of how the Project could potentially affect Jacko Lake.

Table 8.7-1. Valued Component Assessments Included in the Summary for Jacko Lake

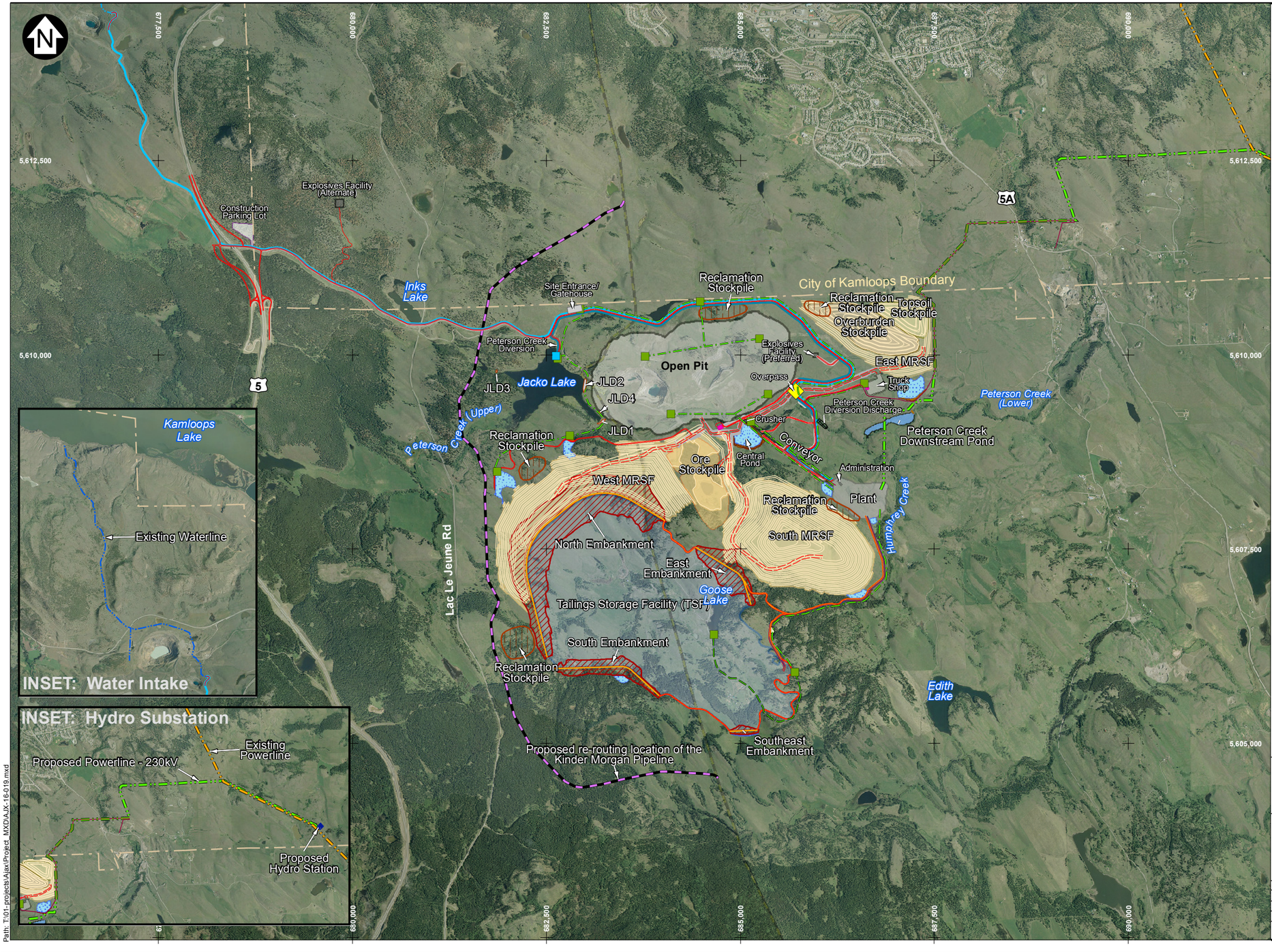
VC	Corresponding Application Section
Surface Water Quality	Section 6.3
Surface Water Quantity	Section 6.4
Groundwater Quantity	Section 6.6
Fish and Fish Habitat	Section 6.7
Wildlife	Section 6.11 (Terrestrial Invertebrates); Section 6.12 (Amphibians); Section 6.13 (Reptiles); Section 6.14 (Migratory Birds); 6.15 (Raptors); Section 6.16 (Non-migratory Gamebirds); and Section 6.17 (Mammals)
Visual Impacts and Aesthetic Features	Section 8.3
Land and Resource Use	Section 8.4
Current Use of Lands and Resources for Traditional Purposes	Section 8.5
Outdoor Recreation	Section 8.6
Heritage	Section 9.1 (Archaeological Sites); and Section 9.2 (Aboriginal and non-Aboriginal Heritage Sites).
Air Quality	Section 10.1 Air Quality
Human Health	Section 10.4 Human Health
Noise and Vibration	Section 10.5 Noise and Vibration

Background information on Jacko Lake was collected from a variety of sources, including that provided directly by the SSN members as part of the Cultural Heritage Study (CHS) and Preliminary Mitigation Report, as well as consultation data, and secondary sources (e.g., review of relevant EAs, NEB filings, ethnographies, historical records, First Nation websites, and other publically available information). A formal Key Person Interview (KPI) program, totalling 35 interviews, was also completed between June 2011 and November 2012 and additional and follow-up interviews occurred in 2014 and 2015. In addition to the KPI program, workshops (discussed in Appendix 7.1-A) and other informal discussions occurred with stakeholders. Information and insights regarding Jacko Lake were gleaned from engagement with:

- Representatives of the City of Kamloops and TNRD;
- Local outfitting business operators who use the lake for fishing purposes;
- Provincial regulatory authorities; and
- Local recreational and tourism association representatives.

Figure 8.7-1
Location of Ajax Project

InterGroup CONSULTANTS



- Hydroline Existing
- Kinder Morgan Pipeline - Current
- Waterline Existing
- City of Kamloops

Proposed Structures

- Overpass
- Electrical Infrastructure
- Powerline - 230kV
- Powerline - 25kV
- Powerline - Cable
- Natural Gas Line (approx. location)
- Kinder Morgan Pipeline - Rerouted
- Tailings Line
- Mine Rock Storage Facility (MRSF)
- Pit Outline
- Tailings Storage Facility (TSF)
- TSF Embankment
- Reclaim Waterline
- Waterline
- Road
- Road - Haul
- Cut / Fill
- Other Infrastructure
- Construction Parking Lot
- Fuel Island
- Ore Stockpile
- Overburden Stockpile
- Reclamation Stockpile
- Topsoil Stockpile

Water Management

- Water Management Pond
- Water Management Berm
- Dam Outline

Peterson Creek

- Diversion Intake
- Peterson Creek Diversion
- Downstream Pond
- Diversion Discharge

NOTES:

1. BASE MAP: Orthophoto (2005)
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:100,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - BRITISH COLUMBIA AND CANADA

SCALE 0 0.5 1 1.5 Kilometres

KGHM

KGHM Ajax Mining Inc.

2015 August 27			
DATE			
PvL	JH	PvL	JR
DESIGNED	DRAWN	CHK'D	APP'D
REF NO.	AJX-16-019		REV H

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The KPI participants were leaders in the community and had typically lived in the area for a long time. As such, their insights were based on many years of knowledge and experience. Topic areas for KPI questions included details regarding recreational activities around the Project site (i.e., activities, specific locations, types of people engaged in the activities), and trends in usage of the area for these activities. Participants were asked for their insights into how Project construction and operation might affect these activities. Participants identified activities, locations and concerns based on their particular experience and knowledge, and where information was provided on Jacko Lake activities, this was noted in the assessment process.

Other information related to Jacko Lake came out through KPI questions that examined potential effects on business (e.g., for outfitters/associations with an interest in Jacko Lake), land and resource use (e.g., relevant development plans), visual impacts (e.g., viewpoints in and around the lake) and community health and well-being. Where issues were raised in other workshop and informal discussion settings, these were also incorporated into the application.

8.7.2 Background

Jacko Lake is located close to the City of Kamloops (Kamloops) in the Thompson-Nicola Regional District (TNRD), approximately 1 km south of the Kamloops southern boundary and about 2 km east of Lac Le Jeune Road. The Project lies within the asserted SSN, Secwépemc, and Nlaka'pamux Nation traditional territories. Jacko Lake lies within the Ajax Project footprint, adjacent to the proposed open pit.

Jacko Lake is located largely on private land, with the exception of a seasonally gated public access road (via Lac Le Jeune Road) and a staging, parking and boat launch area located at the north arm of Jacko Lake. Additionally, on account of various lake height raises, private land remains under the now flooded southwest, southeast and northeast arms of the lake. In 1962, an agreement was reached between ranchers and the Kamloops Fish and Game Association that allowed public fishing access to the Lake in the non-winter months. The Afton Operating Corporation (AOC), which purchased the land surrounding Jacko Lake from the Morrison Ranch in 1988 to access the Ajax ore bodies, concluded agreements that guaranteed continuity of public access for recreational fishing. Access was maintained through the establishment of a road easement to the lake and a lease for the land to be used for parking and a boat launch at the northern most arm of the lake (Price 1991). The road easement leading to Jacko Lake via Lac le Jeune road, as well as the area set aside for parking and the boat launch, was then purchased by the Ministry of Environment Fish and Wildlife branch.

8.7.2.1 History

This section describes the history of Jacko Lake, including archeological sites in the area, a brief history of its namesake, and the series of modifications made to the lake beginning in the early twentieth century.

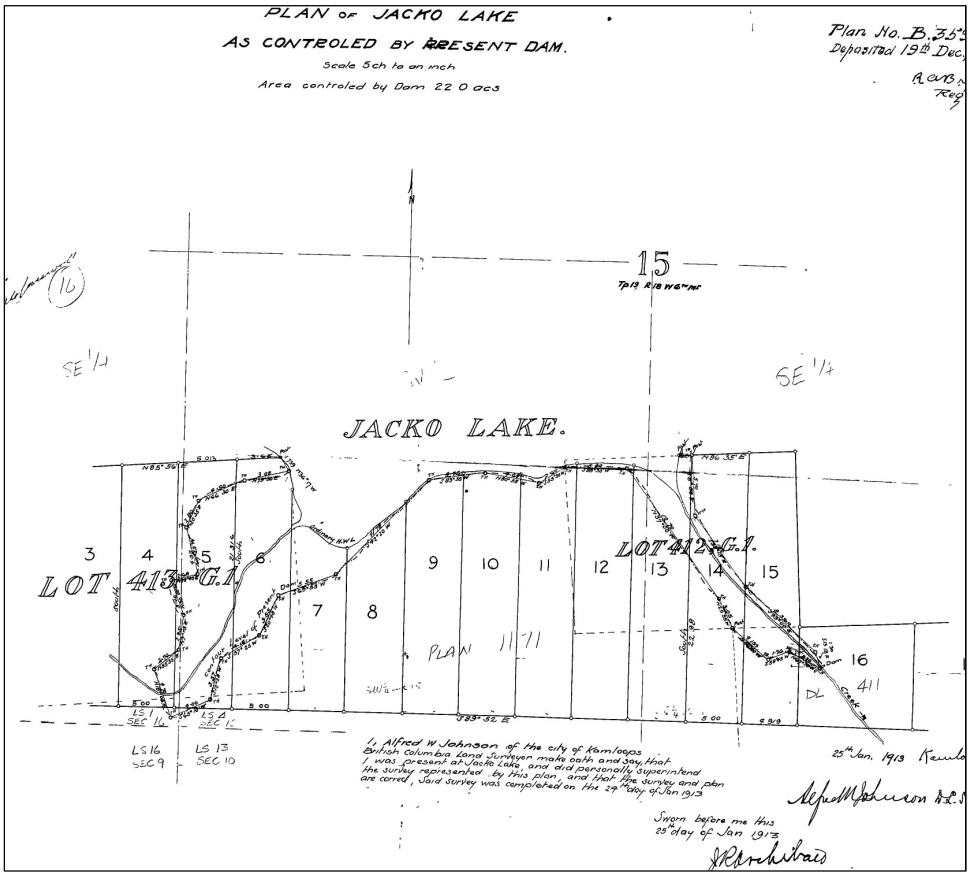
<u>Philip Jacko</u>

Based on information provided in the SSN Cultural Heritage Study (Ignace 2014), Jacko Lake shares its name with an early resident of the area, Alexander Jacko, who may have been Métis. According

to Ignace (2014), Alexander Jacko came into the area with the fur trade in the 1830s, and in the 1850s was running horses in the area. His son, Philip, was believed to be a member of the Tk'emlúps te Secwépemc (TteS), as he is listed as a *Tk'emlupsemc* in documents from the 1870s to his death in the 1880s. After his father's death, Philip apparently pre-empted a portion of the family horse range from Jacko Lake to the creek mouth (Ignace 2014).

Modifications Made to Jacko Lake

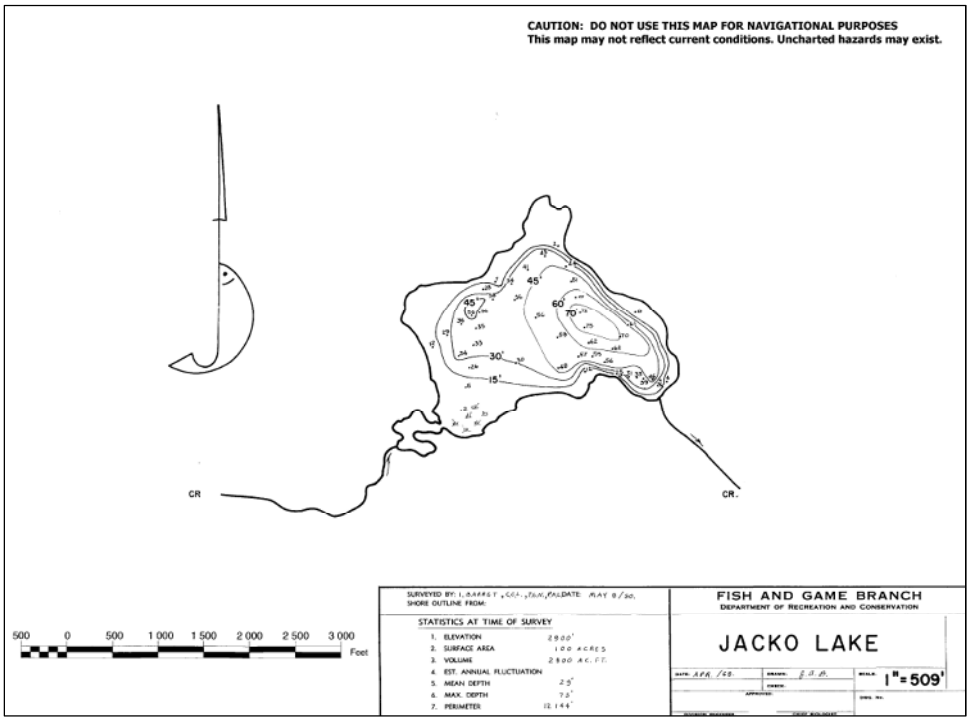
The Jacko Lake that its namesake, Alexander Jacko, knew is not the same as the Jacko Lake of today. Beginning in the early twentieth century, modifications have been made to the Lake. A survey dating back to 1913 shows a dam on the southeast arm of Jacko Lake, which is the outflow to Peterson Creek (See Plate 8.7-1). The dam was built to store water and offer flood control for Kamloops. Jacko Lake, at the beginning of the twentieth century, did not have the northeast arm (i.e., Mine Bay) or the southeast arm, while the western arms were not as pronounced.



Source: Map Title Block n.d.a.

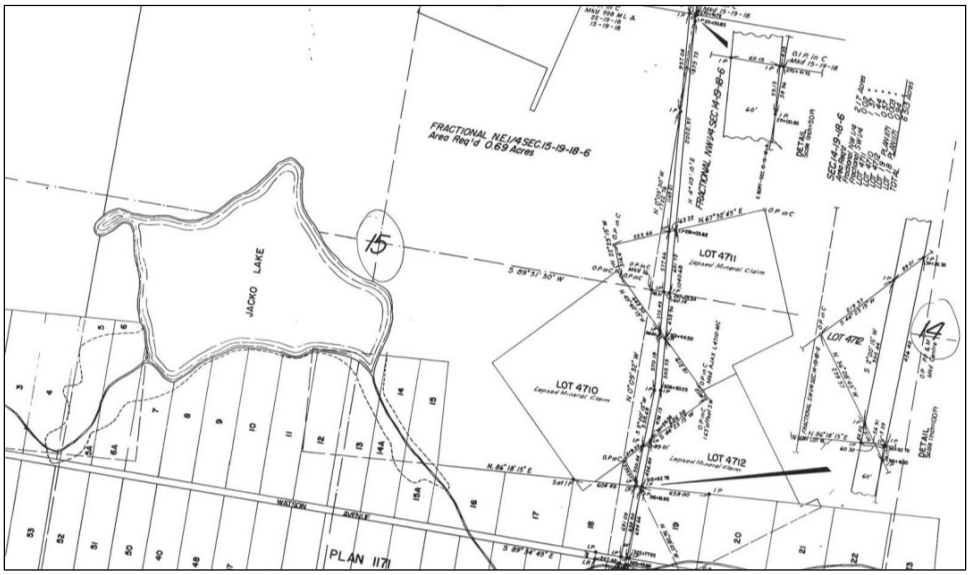
Plate 8.7-1. Plan of Jacko Lake as Controlled by Present Dam, 1913.

The Jacko Lake dam has been modified and rebuilt over the course of the twentieth century, which has, in turn, affected the size and shape of the lake and its water levels. In the 1950s, the lake was about 40 hectares with an inlet and outlet (Plate 8.7-2 and Plate 8.7-3).



Source: Map Title Block n.d.b.

Plate 8.7-2. Jacko Lake in 1950.



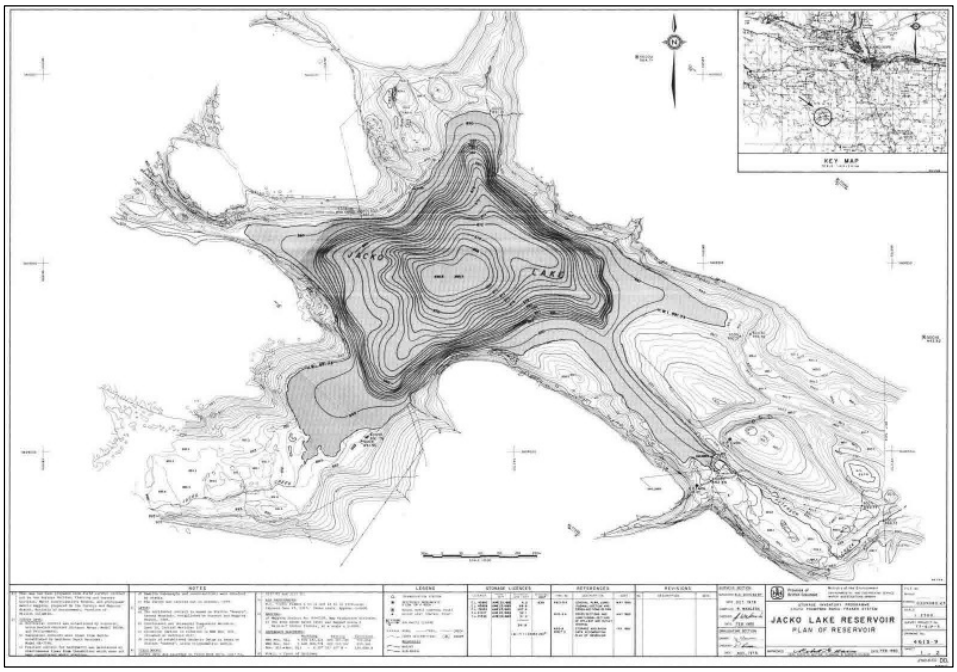
Source: Map Title Block n.d.c.

Plate 8.7-3. Jacko Lake in 1953.

In the 1970s, the lake area was larger and levels were higher. Jacko Lake was raised by about 1 metre to improved water storage for licence holders thereby increasing the lake area to 46.7 ha. Two additional arms were created (the northeast and southeast arms) with a dam and spillway (southeast arm) and the west arms of the lake were expanded (Plate 8.7-3). Two decades later in the

fall of 1990, the Lake was raised by an additional metre when the dam when the Afton Operating Corporation reconficuted the dam (the dam was also raised by a metre). The increased storage was allocated to Ministry of Environment for fish conservation (Price 1991). These alterations increased the area of the lake to 48.5 ha and the potential lake volume by 60%.

Plate 8.7-4 shows the current shape of Jacko Lake.



Source: Map Title Block n.d.d.

Plate 8.7-4. Jacko Lake in 1978.

Trans Mountain Pipeline

Kinder Morgan's Trans Mountain Pipeline (TMP) was constructed from 1951-1953 and saw its first shipment to the Burnaby terminus marine terminal on October 17, 1953. The TMP continues to be in operation. Locally, the line remains and bisects the Ajax Project footprint along a roughly north-south axis. A stretch of the pipeline, which was rerouted prior to the AOC's operations, follows the northeastern shoreline of Jacko Lake east around the lake itself (Figure 8.7-1). When the aforementioned 1990 dam and lake height raises were completed, the northeast arm of Jacko Lake was created, and the buried pipeline and private land thereunder were inundated.

8.7.2.2 Cultural Importance and Traditional Use by SSN

The Project falls within the SSN, Secwépemc, and Nlaka'pamux Nation Traditional Territories. KAM has gathered the following information regarding the Cultural Importance and Traditional Use as communicated by the SSN. Jacko Lake is one component of Pipsèll, which also includes the area surrounding Jacko Lake. SSN considers Pipsèll a "cultural keystone place." Nancy Turner (2013, qtd. in SSN 2014) defines Pipsèll as "a site or location with high cultural salience for one or more groups of people and which plays, or has played in the past, an exceptional role in a people's cultural

identity." These areas can be used for a variety of purposes, including resource-based activities, stories, and social and ceremonial practices. The Cultural Heritage Study (Ignace 2014) describes the importance of Jacko Lake as a supernatural residence, site of a story in the sacred oral tradition, site of ceremonial practices, and the location of resource harvesting.

Social and Ceremonial Uses

The Cultural Heritage Study (Ignace, 2014) chronicles many traditional activities that occurred in the Jacko Lake area such as root gathering, fishing and hunting in and around the lake (SSN, pers. comm., 2014). The oral history surrounding this area is said to be connected to the epistemological underpinning for Secwepemc *stsq'ey* (which means indigenous law) that explains the reciprocal and mutually accountable relationships between human beings and the environment (e.g. fish, birds, animals, the atmosphere and the water cycle). This relationship is illustrated in a story called the *The Trout Children*, part of the oral tradition of this area. The story explains the relations between humans and the trout people who are said to live in and under the lake. It explains how water-beings (*xqelmecwetkwe*) active underneath the lake travel via underground connectors to Kamloops Lake, Adams Lake, Shuswap Lake and the North Thompson River. They are believed to be protectors of the water to whom people should make offerings when travelling on waterways; this would provide protection when travelling via canoe, boat, or fishing.

The Trout Children story is also connected to rituals and ceremonies by way of a song called Chickadee (*tsqiqse7*) which is also connected to Pipsell. The story was also connected to a Prayer Tree which was at one time located at the eastern entrance of the mine site, north of the crossing of Peterson Creek just off Long Lake Road. The tree was removed by development of the road decades ago and no longer exists. The tree served as a medium for human communication with the sky (atmosphere) world. It was important to communicate and show respect for the land and creatures in this area.

The SSN identify this area as having spiritual, cultural and ceremonial values through oral traditions, an offering tree, spiritual connections and prayers with water beings. Jacko Lake was also one of several locations in Secwepemc traditional territory used to perform *Etsxem* or ritual fasting and vision quests (Ignace, 2014). Ignace (2014) notes the presence of culturally modified trees in the Jacko Lake area that support stories outlining the special significance of the area to SSN people. Of particular importance, the SSN has identified a second Prayer Tree located in the vicinity Jacko Lake. This Prayer Tree remains standing today; it is outside the current Project footprint and direct effects are not anticipated. Some cultural and ceremonial uses still occur today; however the Secwepemc people, including the SSN have been largely alienated from these lands from various agricultural and industrial activities since the 1860s. Further information is provided throughout Part C.

Resource Use

Hunting

According to Ignace (2014), historically the area around Jacko Lake supported large elk herds and also provided areas to hunt deer and moose; however, by the mid-1800s, many of the elk were displaced by grazing horses and cattle. Other factors have also played a role in making hunting near Jacko Lake more difficult. According to SSN members, a changing landscape and restrictions to

access have reduced their use of the area. Ranching, urbanization, and mining have altered the way the landscape is used, and in the case of mining, has changed the landscape through the creation and reclamation of mining waste rock piles. The presence of private property with its attendant fencing and gates hamper access to the area. Despite these difficulties, SSN members note that they still hunt around Jacko Lake and Peterson Creek, especially for moose and deer (Ignace 2014). Additional information on hunting activities is provided in Current Use of Lands and Resources for Traditional Purposes (Section 8.5).

Fishing

During the twentieth century, prior to European contact, Jacko Lake is reported by the SSN to have been an important rainbow trout fishery; historical government records indicate that there were no fish in the lake at the turn of the century (Ignace 2014). SSN members report having used a traditional method of catching trout by scoop-netting them as they prepared to spawn at the Jacko Creek inlet. This method was apparently used because the focus was on catching enough fish to feed the community. Interviews with SSN members by Ignace (2014) suggest that members no longer feel comfortable fishing Jacko Lake using traditional methods; other interviews suggest that members still fish Jacko Lake, but use fishing rods instead. Fishing on Jacko Lake is now primarily angling. These activities form part of the seasonal rounds as ice conditions typically leave Jacko Lake ice free earlier and later than most regional lakes; this leads to the lake often being suitable for early and late season fishing. SSN members have noted that access to the Jacko Lake area is limited and that provincial fishing regulations, which prohibit ice fishing and also limit access, apply to the lake.

Plant Gathering

In addition to hunting and fishing, the SSN reports that the area around Jacko Lake has been used to gather traditional plants. Potentially due to the mineralization of the soil around the lake, the area was considered a prime area for gathering medicinal plants. Plants gathered around Jacko Lake include soapberries, sweet sage, squirrel tails, Indian potatoes, and other berries (SSN Affidavits 2011; Ignace 2014).

SSN interviewees have noted that private property, gates, and fences have affected access to the area and limited their ability to engage in plant gathering. Provisions for lawful access to grazing lease land parcels for hunting and gathering activities exists but must be established in accordance with applicable grazing lease agreements; KAM is unaware of any such agreements. In addition, SSN members have noted the introduction of non-native, including noxious weeds in the area (Ignace 2014).

Archaeological Sites

The historic use of Jacko Lake and surrounding area is confirmed by the six archaeological sites identified near the shore of Jacko Lake; at one of the sites (EdRc-19), an Early Nesikep projectile point was found indicating use of this area extends back approximately 7,000 years Before Present (B.P.) (ERM Rescan 2015). One of these sites (EdRc-25) consists of petroform features identified as hunting blinds. The Hunting Blind Complex noted in the Cultural Heritage Study (Ignace 2014) was likely used to harvest game and perform traditional ceremonies; further information regarding the Hunting Blind Complex can be found in Chapter 9.

8.7.2.3 Recreational Uses of Jacko Lake

During key person interviews on a wide range of topics that were not necessarily related to Jacko Lake, people repeatedly mentioned the high quality of life in Kamloops, one aspect of which is the easy access to outdoor recreational activities (Ajax KPI Program 2011-2012; 2014-2015). Ready access to the outdoors as an appealing trait for living in Kamloops is supported by the most recent Citizen Survey available (Ipsos Reid 2012). Residents of Kamloops considered recreational offerings the second most important factor contributing to making Kamloops a good place to live, which residents largely thought was good. The most important factor was the weather. Jacko Lake could be considered an important component of this facet of the Kamloops community image given its unique characteristic as an angling lake and its proximity to Kamloops.

Angling

Angling is currently the most common recreational use at Jacko Lake, which has been stocked annually by the Ministry of Environment since 1954, when 74,000 rainbow trout were introduced (Knight Piésold 2015). Lakes are stocked with diploid and triploid, or all-female strains of fish. Triploid fish, which are sterile, improve the recreational fishing experience as they tend to grow larger since no energy is expended on reproductive development (Knight Piésold 2015). The fishing season on the lake typically runs from the beginning of April, when the ice has melted, through November. Ice fishing is prohibited on the lake. Jacko Lake is well-known in the region as a fly-fishing lake and draws anglers from the immediate vicinity and as far as Vancouver, BC. Characteristics that draw anglers to Jacko Lake include:

- **Close proximity:** The lake is a 10 minute drive from Kamloops;
- **Productivity:** One of 10 small lakes in the TNRD capable of consistently growing trout over 10 lbs;
- **Ease of access:** There is a boat launch and secure access;
- **Variety of methods:** Not only can anglers fish from boats on the water; it is possible to fish from the shore;
- **Length of season:** Due to the lake's lower elevation, the season starts early and ends late; and
- **Aesthetics:** The lake is relatively unique because it is one of the few low-elevation grassland lakes that has not suffered from recent degradation due to the loss of pine trees from the mountain pine beetle (FLNRO 2015).

According to the Ministry of Forests, Lands, and Natural Resource Operations (FLNRO), Jacko Lake is one of the top 20 lakes in the TNRD for top angler effort with a mean of 4,094 days between 2008 and 2010 (FLNRO 2015). An angler day is defined as one fisherman fishing a body of water for any amount of time on a given day. FLNRO cautions against data presenting the whole picture of Jacko Lake's popularity, since data do not include the months of April and November, which are typically very busy on Jacko Lake (FLNRO 2015). In light of the lower elevation and proximity to Kamloops, Jacko Lake has a longer fishing season and has better accessibility than other lakes in the TNRD (DFO et al. 2015).

Other Recreational Uses

While the main outdoor recreational activity near Jacko Lake is angling, nature walks and birdwatching also occur around the lake as there is a trail network located on the private lands around the lake of which people take advantage. In connection with water-based recreation, interviews suggest that fishing is the primary activity with no mentions of waterskiing or canoeing/kayaking (Ajax KPI Program 2011-2012; 2014-2015). Some birdwatching occurs in the area given the diversity of species in the area, such as sandhill cranes, eagles, and small songbirds, although Inks Lake is close and easier to access for birdwatching, which may affect Jacko Lake's popularity in this regard (Ajax KPI Program 2014-2015).

8.7.2.4 Other Uses of Jacko Lake

Water licences for Jacko Lake date back to 1877 (Price 1991). Currently, there is one water license listed for Jacko Creek that is registered for the purpose of agricultural irrigation (BC Ministry of Environment n.d.a). In addition, there are 36 current water licences on Peterson Creek, including Jacko Lake for domestic use, irrigation, stockwatering, non-power storage, and conservation. Seven of the 36 licenses have no identified purpose or quantity (Knight Piésold 2015).

8.7.2.5 Relevant Project Design Features

KGHM Ajax Mining Inc. (KAM) is committed to developing, operating and closing the Project in recognition of the environmental, social, and cultural values associated with Jacko Lake. KAM has undertaken detailed investigations to understand current conditions around the lake, and has incorporated design features and mitigation measures in recognition of these values.

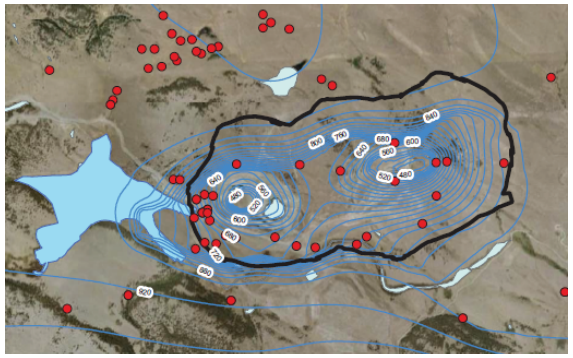
Key design features and mitigations that KAM has integrated into the Project are illustrated in Figure 8.7-2, and include:

- Creating a new access road and parking area for recreational users.
- Developing and operating the Open Pit in a manner that maintains the integrity of the lake (i.e. Baseline geotechnical data collection, pit design, monitoring plans).
- Peterson Creek diversion system to maintain water supply to downstream water users during the Construction and Operations phases.
- Re-establishment of Peterson Creek during Decommissioning and Closure and into Post-Closure.
- Managing blast design as the open pit develops towards Jacko Lake in a manner that will keep vibration to levels that will preserve aquatic life.
- Progressive reclamation of the MRSFs to minimize visual impacts from the lake.
- Dust control measures (e.g., road watering, covered loads, covered conveyors) to limit dust deposition onto the lake.

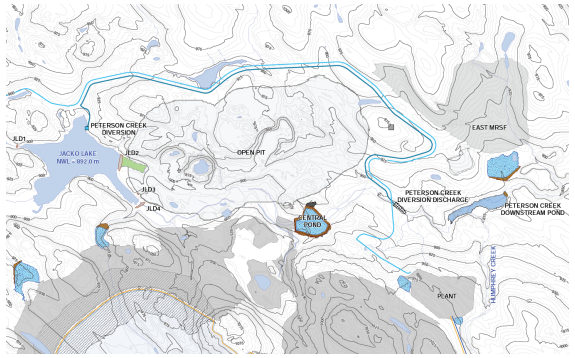
Figure 8.7-2
Summary of Key Design Features Related to Jacko Lake



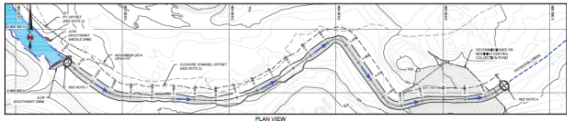
Access and Parking *See Section 11.21*



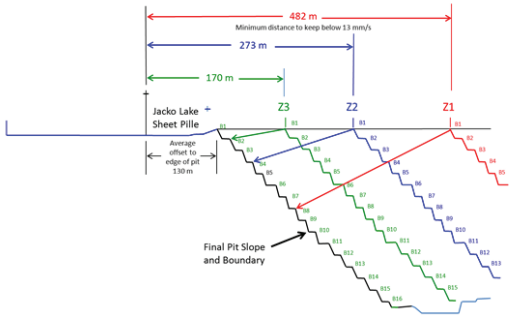
Groundwater and Geotechnical Holes *See Appendix 6.6-A*



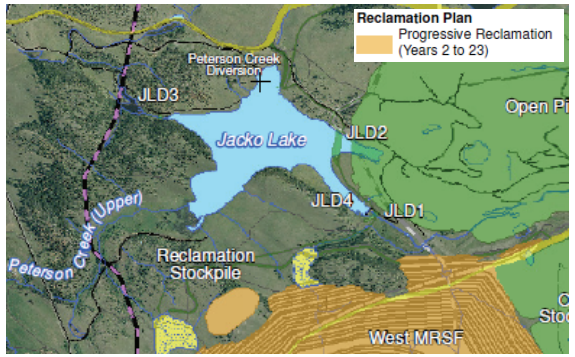
Peterson Creek Diversion System *See Section 6.4; 11.7*



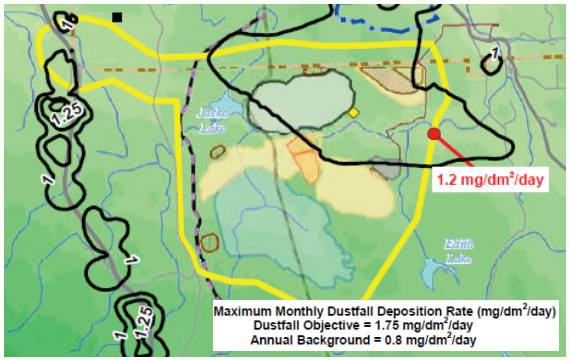
Peterson Creek
- Conceptual Closure Channel *See Section 3.17*



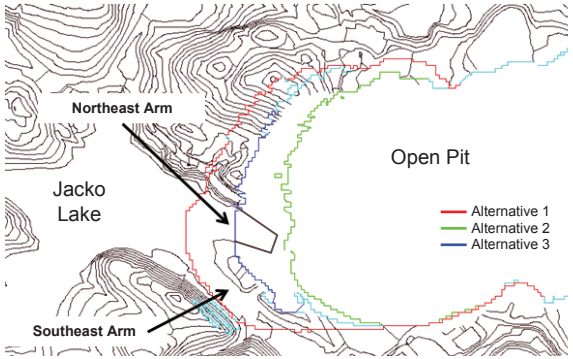
Blast Zones Approaching Jacko Lake *See Section 6.7*



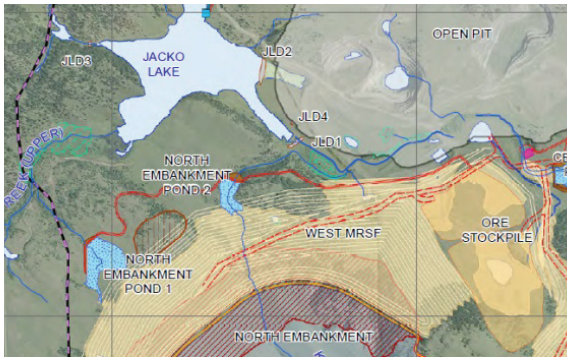
Progressive Reclamation *See Section 3.17*



Dust Deposition *See Section 10.1*



Open Pit Limits *See Section 17.4*



Seepage Control *See Section 11.7*

- Constraining the pit limits to minimize impacts on Jacko Lake, see Alternative Means of Carrying Out the Project Section 17.4.
- Seepage control ponds and site ditching to capture on-site contact water, and minimize potential surface runoff or seepage from the Project to the lake.

In addition, KAM has developed and will implement an Access Management Plan that will allow continued use of Jacko Lake during all phases of the Project.

A key concern about the Project is the potential for development of the Open Pit to result in seepage from Jacko Lake to the pit, which could risk the viability of the lake. KAM has completed detailed investigations related to this topic, including (among others):

- Detailed site investigations and hydrogeology assessments of the area between Jacko Lake and the Open Pit (Appendix 6.6-A), which evaluate current conditions between the lake and the historic open pits, and analyzes the potential for increased connectivity with further pit development.
- Open Pit geotechnical design (Appendix 3-C), which optimizes the pit slope design criteria taking into account the geologic model, as well as the results of the hydrogeology/geotechnical site investigations;
- Groundwater flow modelling (Appendix 6.6-D), which includes estimation of the amount of seepage from the lake to the pit that would result from the Project; and
- Water balance modelling (Appendix 6.4-C), which takes the results from the groundwater flow modelling to evaluate the contribution of predicted seepage rates to the overall lake water balance.

The results of these studies, which inform the assessments for numerous Valued Components, indicate that Jacko Lake interacts with groundwater through seepage between the lake and the groundwater flow system. With the design as proposed, the models indicate that Jacko Lake would contribute approximately 60 to 300 m^3/day of the groundwater flow system that discharges to the open pit. As a result, the net water balance for the annual flow from the lake is predicted to decrease by approximately 5%; however, overall, Jacko Lake will remain a net gaining system, and will be sufficient to maintain existing lake levels and water supply downstream to Peterson Creek (see further discussion in Section 8.7.3.3 and 8.7.3.4).

The risk of excessive seepage from Jacko Lake to the Open Pit is recognized and assessed in Section 17.6 (Accidents and Malfunctions). As described in more detail in Section 17.6, the risk will be highest through the first few years of Operation as the pit rim advances toward the lake; however, this risk is manageable through standard mining practices including the implementation of a robust system monitoring the geotechnical and hydrogeological conditions; adjustments to the mining operation will be implemented, if necessary, based on the results of the monitoring programs. The risk will then decrease again during the later stages of the Operation as the IPMRSF is developed, with lower risk conditions carried into Post-Closure. With the implementation of design as planned, along with a robust monitoring system, KAM and its consulting team are

confident the Project can be implemented in a manner that retains the many environmental, social and cultural values associated with Jacko Lake.

8.7.3 Summaries of Selected VCs

Summaries are provided below for VCs for which potential pathways of effect from the Project have been identified within the context of Jacko Lake. The intent of these summaries is to provide a snapshot of residual effects, mitigation and the determination of significance for each of the relevant VCs. If the reader is particularly interested in how the Project may affect each specific VC, the overviews provide cross-reference to the appropriate section of the Application/EIS.

8.7.3.1 Spatial and Temporal Boundaries

As the various VCs relating to Jacko Lake host a range of spatial and temporal boundaries, Table 8.7-2 provides references to the spatial and temporal boundaries sections for each of the relevant VCs described below. Temporal boundaries consisted of the following:

- **Construction**: 2 years;
- **Operation**: 23 years;
- **Decommissioning and Closure**: 5 years (includes Project Decommissioning, abandonment and reclamation activities, as well as temporary closure, and care and maintenance); and
- **Post Closure**: 5+ years (includes ongoing reclamation activities and Post-closure monitoring).

Table 8.7-2. Spatial and Temporal Boundaries for VCs Relevant to Jacko Lake

VC	Corresponding Application Section
Surface Water Quality	Section 6.3.3
Surface Water Quantity	Section 6.4.3
Groundwater Quantity	Section 6.6.3
Fish and Fish Habitat	Section 6.7.3
Wildlife	Section 6.11.3 (Terrestrial Invertebrates); Section 6.12.3 (Amphibians); Section 6.13.3 (Reptiles); Section 6.14.3 (Migratory Birds); 6.15.3 (Raptors); Section 6.16.3 (Non-migratory Gamebirds); and Section 6.17.3 (Mammals)
Visual Impacts and Aesthetic Features	Section 8.3.3
Land and Resource Use	Section 8.4.3
Current Use of Lands and Resources for Traditional Purposes	Section 8.5.3
Outdoor Recreation	Section 8.6.3
Heritage	Section 9.1.3 (Archaeological Sites); and Section 9.2.3 (Aboriginal and non-Aboriginal Heritage Sites).
Air Quality	Section 10.1.3 Air Quality
Human Health	Section 10.4.3 Human Health
Noise and Vibration	Section 10.5.3 Noise and Vibration

8.7.3.2 Surface Water Quality VC Summary

Project inputs that potentially affect Surface Water Quality within Jacko Lake include the following:

- Potential dustfall on Peterson Creek, upstream of the lake and dustfall directly on the lake;
- Tailings Storage Facility (TSF) – seepage from the TSF;
- West Mine Rock Storage Facility (WMRSF) – seepage from the WMRSF; and
- North Embankment Water Management Ponds – seepage from the North Embankment Water Management Ponds.

Key mitigations measures that will minimize potential effects to Jacko Lake include:

- Air Quality Management Plan includes best management practices, specifically, the dust management aspects will minimize the amount of dust emitted by Project activities.
- TSF design, which includes an underdrain system in the embankment foundation, a liner system on the upstream face of the embankment, and a low permeability glacial till basin liner.
- Closure of the TSF includes dry cover to reduce infiltration into the underlying tailings solids and increase non-contact runoff and reduce seepage loading.
- Interception of seepage from the WMRSF at down-gradient water management ponds (all Project phases).
- Reclamation of WMRSF in Decommissioning and Closure with a low permeability till layer overlain with topsoil to reduce infiltration and maximize evapotranspiration and runoff.
- Interception of seepage from the WMRSF and TSF at down-gradient water management ponds (all Project phases).
- Implement the Metal Leaching and Acid Rock Drainage Management and Monitoring Plan (Section 11.5), the Water Management and Hydrometric Monitoring Plan (Section 11.7), the Surface Water Quality Management Plan (Section 11.23), and the Groundwater Quality Management Plan (Section 11.24).

To evaluate potential effects of these inputs, a predictive water quality model was developed. The model used baseline (existing) water quality data from the lake, plus results from air quality modelling (for dust), groundwater modelling (seepage sources), and geochemical characterisation of these sources to generate future estimates of water quality in Jacko Lake on a monthly basis through the entire life of the Project. A base case and numerous sensitivity scenarios were modelled to ensure that the model considered a wide range of potential conditions. Predicted concentrations of parameters in Jacko Lake were screened against provincial water quality guidelines to identify potential effects resulting from the Project. Potential effects were evaluated based on their magnitude and probability of occurrence. All parameters remained below guidelines for the range of sensitivity scenarios, indicating a low and reasonable magnitude and low probability of occurrence. As such, potential effects to water quality in Jacko Lake were not considered residual effects, and were not carried through the significance determination for the effects assessment.

Additional detail is provided in Section 6.3 of the Application/EIS.

8.7.3.3 Surface Water Quantity VC Summary

A majority of the mine infrastructure will be located downstream of Jacko Lake. However, potential effects on Surface Water Quantity relate to the following:

- **Reduction in drainage:** The current drainage area of the Jacko Lake watershed is 4,000 hectares (ha). This area will be reduced by about 80 ha following construction of the WMRSF and the downstream North Embankment Pond 1 and a minor expansion of the Open Pit into Jacko Lake, a reduction of about 2%; and
- **Reduced flows into the lake:** Flows into the lake from surface and groundwater sources will be reduced by approximately 5% as a result of a progressive drawdown of the bedrock groundwater table around the Open Pit, as the pit is excavated downward, and the collection of contact water (see 8.7.3.4 below).

Table 8.7-3 provides an overview of the residual effects of the Project on Surface Water Quantity at Jacko Lake. Additional detail is provided in Section 6.4 of the Application/EIS.

Table 8.7-3. Overview of Residual Effects, Mitigation and Significance for Surface Water Quantity Related to Jacko Lake

Residual Effects	Project Phase	Proposed Mitigation	Determination of Significance
Reduced inflows to and outflows from Jacko Lake	Construction, Operation, Decommissioning and Closure, Post-Closure	Implementation of the Water Management and Hydrometric Monitoring Plan (Section 11.7)	Not Significant (Minor)

8.7.3.4 Groundwater Quantity VC Summary

Jacko Lake interacts with groundwater through seepage between the lake and the groundwater flow system. Under existing conditions and during Construction, the combined groundwater and surface water balance for Jacko Lake has a net average annual flow from the lake of 3,840 m^3/day, of which approximately 0 to 50 m^3/day is from groundwater inflow. By the end of Operations, the models indicate that Jacko Lake would contribute approximately 60 to 300 m^3/day of the groundwater flow system that discharges to the open pit. As a result, the net water balance for the annual flow from the lake is predicted to decrease to 3,648 m^3/day in Post-Closure, which is a flow reduction of approximately 5%; this predicted value includes both groundwater and surface water flows. Overall, Jacko Lake will remain a net gaining system. The Post-Closure water balance is nearly the same as at the end of Operations. The change in Jacko Lake water balance is due to the development of the adjacent open pit. The Surface Water Quantity assessment accounts for changes to the groundwater balance for Jacko Lake due to mine development.

Specific to Jacko Lake, substantial geotechnical and hydrogeological investigations surrounding the potential interaction between the proposed pit and Jacko Lake was undertaken (Baseline Groundwater Hydrology Assessment Section 6.6 - A).

Table 8.7-4 provides an overview of residual effects of the Project on Groundwater Quantity at Jacko Lake. Additional detail is provided in Section 6.6 of the Application/EIS.

Table 8.7-4. Summary of Residual Effects, Mitigation and Significance for Groundwater Quantity Related to Jacko Lake

Residual Effects	Project Phase	Mitigation Measures	Significance
Reduction of groundwater discharge into Jacko Lake	Operations, Decommissioning and Closure, Post-Closure	Implementation of the Water Management and Hydrometric Monitoring Plan (Section 11.7)	Not significant (Minor)

8.7.3.5 Fish and Fish Habitat VC Summary

Most of the angling lakes in the Kamloops region of BC that are 100 metres or more above the valley floors of major rivers were originally fishless, with their current trout populations the result of stocking programs (McPhail 2007). Provincial records report that no fish were present in Jacko Lake in 1939 (BC Ministry of Environment Fisheries Information Summary System 2015). Rainbow trout were first introduced to Jacko Lake in the 1940s; Jacko Lake has been stocked by the provincial government annually since 1954, except for 1990 when no stocking occurred. In the last two decades between 6,500 and 16,000 rainbow trout were released annually. Rainbow trout are typically released in the spring (between April and June) as yearlings and fingerlings. The provincial government currently stocks a mix of diploid (fertile) and triploid (sterile) rainbow trout, as well as some all-female strains to improve the recreational and asserted Aboriginal fisheries.

The outlet of Jacko Lake is controlled by an existing dam (crest elevation 893 m) and overflow spillway (invert elevation 892 m), which discharges into Peterson Creek on the east side of the lake. The dam includes a low level outlet that is controlled by a manually operated screw valve gate, which allows for regulated releases of water from Jacko Lake to Peterson Creek during periods when there is no flow over the spillway. The low level outlet is controlled by the water steward, who releases water to the downstream users as required. Peterson Creek, downstream of Jacko Lake, has been heavily altered by anthropogenic influences. This reach flows through an engineered open channel through the historic Ajax Mine operated by the Afton Operating Corporation for approximately 2.3 km, with the Ajax east and west pits to the north and a reclaimed waste rock storage facility to the south. The sub-reach immediately below Jacko Lake that measures 1,000 m runs through the historic mine site was lined with impervious till during the fall of 1990 to reduce water seepage and improve irrigation flows in the channel. Flow in this section of the creek is typically ephemeral (seasonal), with high flows during freshet as the elevation of Jacko Lake exceeds the elevation of the dam spillway, and low flows during late summer and fall when the Jacko Lake screw valve gate is closed. Rainbow trout from Jacko Lake are only able to migrate downstream to Peterson Creek when the spillway is flowing, while Rainbow trout habitat (rearing, wintering, spawning) in the 1 km section downstream of Jacko Lake has been assessed as marginal, due to the lack of complexity, abundant fine substrates, lack of cover, lack of pools, high water temperature, low dissolved oxygen, and flow regime. Peterson Creek upstream of Jacko Lake is a low gradient, meandering glide with undefined banks as it flows through a wetland for a distance of approximately 400 metres. The channel lacks complexity (no boulders, instream vegetation, or large woody debris) and the only cover is offered by overhanging vegetation and some undercut banks.

Potential effects on Fish and Fish Habitat in Jacko Lake relate to the following:

- Direct habitat loss resulting from the Open Pit development near the northeast arm;

- Direct mortality to fish resulting from blasting or installation of the sheet pile dam;
- Direct mortality to fish in as a result of entrainment or impingement associated with the Peterson Creek Diversion Intake;
- Direct mortality to fish from stranding in areas dewatered for construction; and
- Sub-lethal effects on fish resulting from changes in water quality, sediment quality or altered primary productivity.

The proposed Fish Habitat Offsetting concept to address direct habitat loss is to modify the volume and depth of the south basin of Inks Lake (through excavation of sediment materials and supplying fresh water via the freshwater pipeline from Kamloops Lake). Direct mortality on fish in Jacko Lake from blasting will be mitigated by implementing measures to avoid causing harm to fish and fish habitat recommended by Fisheries and Oceans Canada (DFO). In addition to these measures, the blasting patterns were designed to meet overpressure and peak particle velocity criteria (maximum overpressures of 100 kPa and peak particle velocities of 13 mm/s) previously endorsed by DFO (Wright and Hopky 1998) at the closest shoreline of Jacko Lake. Implementation of the Project-specific blast designs, field controls and monitoring will prevent effects to fish in Jacko Lake. Direct mortality from installation of the sheet pile dam in the northeast arm of Jacko Lake will be addressed by constructing in accordance with National Oceanic and Atmospheric Administration interim criteria for Sound Pressure Level and Sound Exposure Level. To prevent fish mortality in Jacko Lake associated with entrainment or impingement on the fresh water intake, screens will adhere to DFO advice, including locating screens in areas and depths of water with low concentrations of fish throughout the year. Instream works will be conducted in the dry either by scheduling the work for low flow periods or by isolating and dewatering the work area and conducting a fish salvage. A change in surface water quality that may lead to sub-lethal effects on fish could result from dustfall deposition, inflow of contact water, and soil erosion. However, no residual effects on fish related changes in surface water chemistry are anticipated following implementation of mitigation by Project design and water management. Details regarding predicted changes to water quality and the assessment of potential effects of these changes are provided in Sections 6.3 and 6.7 respectively.

Table 8.7-5 provides an overview of the residual effects of the Project on Fish and Fish Habitat, including mitigation and the determination of significance for the VC. Additional detail is provided in Section 6.7 of the Application/EIS.

Table 8.7-5. Overview of Residual Effects, Mitigation and Significance for Fish and Fish Habitat Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance
Direct loss of habitat in northeast arm of Jacko Lake from Open Pit Development affecting the productivity of the fish population	Implementation of Offsetting Measures, and the Fisheries and Aquatic Life Monitoring Plan (Section 11.25)	Not Significant (Minor)
Fish mortality in Jacko Lake associated with changes in pressure from installation of the sheet pile dam for Open Pit Development	Sheet pile dam design and construction methods will be in accordance with criteria to prevent the onset of physical injury to fish	Not Significant (Minor)

8.7.3.6 Wildlife VCs Summary

Wildlife characteristics and abundance within Jacko Lake and the immediate vicinity are influenced by the elevation, vegetation and wetland conditions. Terrestrial invertebrates such as dragonflies and damselflies (Odonta) may use the lake shore and adjacent wetlands for foraging and breeding. In lakes, dragonfly larvae are confined to the warm shallow edges where water plants flourish. The red-listed Olive-clubtail was not found as this species prefers rivers or streams, rarely using lakeshores. Amphibians were also observed using and breeding in the fringes and wetlands of the lake. Four species were detected including the blue-listed Great Basin spadefoot and western toad, and the yellow-listed Columbia spotted frog and Northern Pacific treefrog. This low elevation lake is an early ice-off lake (April) and provides habitat for migratory birds and waterfowl. During surveys, 24 different waterfowl species were detected on the lake (see Section 6.14 for details) as well as the Sandhill Crane and red-listed Barn Swallow. Additionally, there is a resident pair of bald eagles with a nest on the southeast arm of the lake. Mammal species such as the muskrat and beaver may also use Jacko Lake, while bats may also use the lake for foraging. Additional detail regarding baseline characteristics, effects and mitigation is provided in Sections 6.8 through 6.17.

Potential effects on Wildlife relate to the following:

- **Habitat loss:** Through loss of the northeast arm of the lake due to pit location.
- **Habitat alteration**: Through potential introduction of invasive species as well as dust and erosion at the north arm of the lake.
- **Sensory disturbance:** Resulting from continuous noise (e.g., Project traffic) and blasting. This could also include changes to air quality, noise and vibration and others.

Table 8.7-6 provides an overview of the residual effects of the Project on wildlife, proposed mitigation and the determination of significance for the VC. The table is in summary format, describing potential effects related to amphibians, migratory birds, raptors and mammals. Additional detail is provided in Sections 6.11 through 6.17 of the Application/EIS.

Table 8.7-6. Overview of Residual Effects, Mitigation and Significance for Wildlife Related to Jacko Lake

Residual Effects	Proposed Mitigation	Determination of Significance
Reduction in available habitat, living and reproducing	Reclamation; revegetation; artificial diversion pools	Not Significant (Minor)
Reduction in overall population numbers	Translocation of individuals to areas of suitable habitat; avoid critical windows	Not Significant (Minor)
Habitat loss	Reclamation; revegetation	Not Significant (Minor)
Effective habitat loss	Limiting blasting windows	Not Significant (Minor)
Sensory disturbance	Limit noise to certain windows (avoid sunrise and sunset)	Not Significant (Minor)
Nests may be abandoned (raptors)	Limit noise to certain windows (outside of breeding system)	Not Significant (Minor)

8.7.3.7 Visual Impact/Aesthetic Features VC Summary

Potential effects on Visual Impact and Aesthetic Features relate to the following:

- **Reduced visual quality:** Locations in and around Jacko Lake will have a clear view of large Project components, including the West and South MRSFs and the Ore Stockpile; and
- **Increased shading:** Large Project components with substantial elevation will change patterns of shading and solar insolation (i.e. the amount of solar energy per unit area).

Shading modelling indicates that increased shading from Project infrastructure is not expected at Jacko Lake. Table 8.7-7 provides an overview of the residual effects of the Project on Visual Impact/Aesthetic Features, proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 8.3 of the Application/EIS.

Table 8.7-7. Overview of Residual Effects, Mitigation and Significance for Visual Impacts and Aesthetic Features Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance
Reduced visual quality – Operations Phase	Progressive and on-going re-vegetation of large Project components	Not Significant (Moderate)
Reduced visual quality – Post Closure Phase	All Project components will be completely re-vegetated to match the surrounding landscape	Not Significant (Minor)

8.7.3.8 Land and Resource Use VC Summary

The assessment of effects to Land and Resource Use is related primarily to potential effects on the City of Kamloops and TNRD planning, as well as ranching operations in the area. With respect to Jacko Lake, potential direct interactions between the Project and land use plans involve potential overlap of Project presence and activities with existing land use designations and plans defined by the TNRD.

The presence of the Project and Project activities may limit the ability of the City of Kamloops and the TNRD to meet the objectives of various land use planning initiatives. Throughout the Project, particularly at changes between phases (Construction, Operations, Decommissioning and Closure), Project activities may necessitate review and revision to existing plans and designations. Design changes to project location have reduced the overlap of various plans and designations (specifically within the City of Kamloops). Environmental mitigation of contributing Project-specific activities is expected to remove, reduce or minimize potential overlaps. KAM has committed to use of formal processes to amend land designations where required and has committed to ongoing engagement between KAM and the City of Kamloops and the TNRD to discuss potential areas of interaction between Project and planning. With respect to Jacko Lake, these interactions would be focused on the TNRD.

Cattle ranching is the primary agricultural activity in proximity to the Project. Cattle ranching typically involves the production of hay (which is normally baled for winter feed), movement of cattle between ranges (on private and crown land), and other activities. Ranching activities are expected to be affected through changes in dust, noise and vibration, physical access to grazing fields, and access to sufficient water quantities to support ranching operations. KAM is committed to working with Sugarloaf Ranch and other potentially affected ranchers to encourage continued ranching activities in proximity to the Project, so long that the safety of mining activities and/or the safety of ranching activities are not compromised.

No changes are anticipated with respect to water quality and quantity for irrigation and stock water purposes. Further, given the continued availability of land and water for ranching activities, the development of an informed access management plan, and a strong corporate commitment to ongoing engagement, information sharing, and adaptive management in collaboration with Sugarloaf Ranch and other ranchers, potential effects of the Project on ranching activities are expected to be effectively mitigated. No residual effects on ranching are identified.

Table 8.7-8 provides an overview of the residual effect of the Project on Land and Resource Use related to Jacko Lake, including proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 8.4 of the Application/EIS.

Table 8.7-8. Overview of Residual Effects, Mitigation and Significance for Land and Resource Use Related to Jacko Lake

Residual Effects	Proposed Mitigation	Determination of Significance
Presence of Project may limit the ability of the TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development.	Design changes to project location, environmental mitigations, use of formal processes to amend land designations, ongoing engagement between KAM and the TNRD to discuss potential areas of interaction between Project and planning.	Not Significant (Moderate)

8.7.3.9 Current Use of Lands and Resources for Traditional Purposes

Introduction

Jacko Lake is located within the asserted SSN, Secwépemc, and Nlaka'pamux Nation traditional territories. The BC EAO formally delegated aspects of its consultation responsibilities to KAM through an Order issued under section 11 of the BC *EAA*. The section 11 Order identifies the Project "First Nations" as the Stk'emlupsemc te Secwépemc Nation (SSN), which is comprised of the Tk'emlúps te Secwépemc (TteS) and Skeetchestn Indian Band (SIB), whom KAM is required to consult regarding potential Project effects on their Aboriginal interests. The section 11 Order also identifies "Working Group First Nations" comprised of the Lower Nicola Indian Band (LNIB) and Ashcroft Indian Band (AIB). The section 11 Order directs KAM to provide information to the LNIB and AIB regarding the Project, specifically the Application/EIS. On July 23, 2015, the BC EAO issued a section 13 Order directing KAM to provide information to the WP/CIB regarding the Project as the "Notification First Nation". In addition to the Aboriginal Groups identified above, the CEA Agency

identifies the Métis Nation British Columbia (MNBC) as an Aboriginal Group potentially affected by the Project.

These Aboriginal groups, particularly the SSN, assert a number of land uses around Jacko Lake described briefly below. The Métis Nation British Columbia (MNBC) also identified Jacko Lake as one area where harvesting occurs, although the degree of use is unknown.

Historic Use

The SSN note that historically, Jacko Lake played an important role in the seasonal round. Jacko Lake was typically ice free by mid-April, meaning it provided the first fish protein of the year due to an early trout run. Root plants from the area also became available during a critical time in early to late spring when higher elevation plants were not in season yet. Jacko Lake is said to have played a significant role in the food economy and seasonal round of Secwépemc people (SSN pers. comm., 2015). The mid-summer months saw additional plant harvesting of berries (strawberries, Saskatoons, soapberries etc.), medicinal plants and roots in the hills surrounding Jacko Lake and other mid-elevation areas.

Current Use

Chief Ignace (2014) argues that historic and current developments (road construction, ranching, mining, and pipelines) in the Jacko Lake area have had negative effects on traditional land uses. In addition, SSN members have noted frustrations in accessing the Jacko Lake area due to fencing and private property (Ignace, 2014). However, Aboriginal Groups state that they continue to practice fishing, hunting, gathering and ceremonial uses/sites in the Jacko Lake area, as described below.

- **Fishing.** Jacko Lake is noted to be of significant spiritual and cultural value to the SSN, as well as the use of the lake for fishing (SSN, pers. comm., 2014). SSN members interviewed for the Cultural Heritage study (Ignace, 2014) described fishing in Jacko Lake for large size rainbow trout (over 30 centimetres [cm]), typically fishing along the inflow creek in the spring. A recent report identifies Jacko Lake as a valued SSN trout fishery (Pottinger Gaherty Environmental Consultants, on behalf of SSN, 2015). It is likely that Aboriginal groups continue to engage in fishing and fly fishing activities on Jacko Lake today.
- **Hunting.** Aboriginal Groups, particularly SSN have noted some hunting continues in the areas surrounding Jacko Lake. Species targeted include deer and moose.
- **Gathering.** Jacko Lake was a "preferred picking grounds" for a number of traditional medicinal plants which may, in part, be due to the mineral content of the soil (Ignace, 2014). Other elders interviewed for the SSN Cultural Heritage Study note that root plants and soapberries (sxusem) are harvested near Jacko Lake (Ignace, 2014). Interviewees also recall gathering sweet sage, squirrel tails, Indian potatoes, and other berries in the Jacko Lake area.
- **Ceremonial uses.** Pipsell (Jacko Lake and its surroundings) is considered an important cultural landscape and place with spiritual and cultural value (SSN, pers. comm., 2014). Pipsell is noted to be connected to an epic oral history for the SSN called The Trout Children. The story explains the deeds of Secwépemc people on the lands and to the land as inseparably connected. The SSN believe that Jacko Lake connects the livelihood of

Secwépemc people to the caretaker above (atmosphere which also supports the notion of protecting air quality). The area surrounding Jacko Lake is characterized by the SSN as a "spiritual complex" where SSN members traditionally interact with the spirit world and engage in prayer. It is believed this area connects the water people (found in Jacko Lake and Kamloops Lake) to transformation sites within the complex and may also include prayer trees, alters, the seasonal round and Hunting Blinds (SSN, pers. comm., 2014). As part of this, the SSN notes that the Secwépemc people continue to carry out various cultural and spiritual ceremonies and communicate with the water people at Jacko Lake to prevent any future disturbances from the water people (SSN, pers. comm., 2014). According to Chief Ignace there are three to six sharp-tailed grouse "dance houses" in the vicinity of Jacko Lake (National Energy Board: Oral Presentation from Chief Ignace, 2014). Ignace (2014) notes the presence of culturally modified trees in the Jacko Lake area support the stories claiming the area had special significance to SSN people.

- **Title.** The SSN also assert rights and title to Jacko Lake and surrounding areas. The SSN believe there is an interconnectedness between the geographic components of these areas and that interconnectedness plays an important role in their worldview and cultural values, practices, and traditions.

Based on information provided by Aboriginal Groups, potential Effects on CULRTP in the Jacko Lake area may include:

- Changes in the availability of species (i.e. trout) or ceremonial sites used by Aboriginal Groups;
- Changes in access to preferred ceremonial sites or harvesting locations in the Jacko Lake area;
- Changes in the experience of traditional land uses due to sensory disturbances from Project activities (e.g. dust, noise, air quality); and
- Changes to the quality of resources harvested by Aboriginal Groups due to potential contamination caused by the Project.

Table 8.7-9 provides an overview of the residual effects of the Project on CULRTP, including the potential effect, proposed mitigation, and the determination of significance for the VC. The determination of significance is for the areas within the Local Study Area (LSA) for CULRTP and includes Jacko Lake, as well as surrounding areas such as Jacko Creek, Peterson Creek, and Goose Lake. Additional detail is provided in Section 8.7 of the Application/EIS.

Table 8.7-9. Overview of Residual Effects, Mitigation and Significance for Current use of lands and Resources for Traditional Purposes Related to Jacko Lake

Potential Effects	Proposed Mitigation	Aboriginal Group	Determination of Significance of Residual Effect[1]
Disruption of fishing, uses, changes in the experience of fishing and the quality of fish resources	• Construction Phase work in Jacko Lake completed outside of the spring fishing season • Fish Habitat Mitigation and Offsetting Plan • Maintain access to Jacko Lake through construction of an alternative access road to Jacko Lake south of the proposed main access to the Project • KAM will also construct an additional parking lot area to facilitate continued access to Jacko Lake. • Post-closure land use objectives that include restoring access to current conditions	SSN AIB LNIB WP/CIB MNBC	Not Significant (Minor) Not Significant (Negligible) Not Significant (Minor) Not Significant (Minor) Not Significant (Minor)
Disruption of hunting uses, changes in the experience of hunting and the quality of the harvested resources	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features • KAM will implement a strict no guns and hunting policy banning these activities on site by any mine employees or contractors • Implementation of a Reclamation and Closure Plan (Section 11.28) to reverse habitat losses and re-established the land to a similar condition to prior to Project development, where feasible • Speed limits, wildlife signage, yield to wildlife, reporting wildlife sightings to supervisory personnel • Maintain access to Jacko Lake, additional parking • Post-closure land use objectives that include restoring access to current use conditions • The transportation management plan proposes measures to minimize traffic congestion in public roads	SSN AIB LNIB WP/CIB MNBC	Not Significant (Moderate) Not Significant (Negligible) Not Significant (Minor) Not Significant (Minor) Not Significant (Minor)
Disruption of plant gathering uses, changes in the experience of plant gathering and the quality of the plants	• Reclamation and Closure Plan (Section 11.28) estimates a net gain of grasslands in the post closure conditions. • Implementation of a Reclamation and Closure Plan (Section 11.28) to reverse habitat losses and re-established the land to a similar condition to prior to Project development, where feasible • No plant gathering policy banning these activities on site by any mine employees or contractors. • Maintain access to Jacko Lake, additional parking • Post-closure land use objectives that include restoring access to current conditions • The transportation management plan proposes measures to minimize traffic congestion in public roads	SSN AIB LNIB WP/CIB MNBC	Not Significant (Moderate) Not Significant (Negligible) Not Significant (Minor) Not Significant (Minor) Not Significant (Minor)

Potential Effects	Proposed Mitigation	Aboriginal Group	Determination of Significance of Residual Effect[1]
	• Collaborative approach to reclamation with the SSN which may include providing funding for ongoing reclamation research and incorporating SSN input into identification of plants for revegetation • Facilitate SSN involvement in future reclamation activities and may include identification of habitat offsetting locations for key species		
Disruption of ceremonial uses/sites, and changes in the experience of ceremonial or other cultural uses	• Work with the SSN to identify suitable mitigation for the Hunting Blind Complex • Support the SSN to participate in accessing, harvesting, and/or documenting resources of cultural value prior and during Project execution. • Identify opportunities to support cultural heritage programming for SSN members • Maintain access to Jacko Lake, additional parking • Post-closure land use objectives that include restoring access to current conditions	SSN	Not Significant (Moderate)

Note:
[1] The determination of significance was done considering a spatial boundary larger than Jacko Lake and it surroundings as presented in Section 8.5 CULRTP of the Application/EIS. The determination of significance considered a LSA that includes the middle and lower Peterson Creeks sub-catchments where Jacko Lake is located and an RSA that cover the whole Peterson Creek catchment.

8.7.3.10 Outdoor Recreation VC Summary

Jacko Lake is a popular outdoor recreation area in large part due to its relatively close proximity to the City of Kamloops (approximately 1 km south of the Kamloops southern boundary and about 2 km east of Lac Le Jeune Road). The lake is within the Ajax Project footprint, adjacent to the proposed Open Pit. Angling is currently the most common recreational use of Jacko Lake, which has been stocked annually by the Ministry of Environment since 1954. The fishing season on typically runs from the beginning of April, when the ice has melted, to November. There is no ice fishing allowed. Characteristics that draw anglers to Jacko Lake include: a) close proximity to Kamloops: b) productivity; c) ease of access; d) variety of fishing methods; e) length of season; and f) aesthetics. Many of these factors also make the site appealing for other outdoor recreationalists, including birdwatchers and hikers. The purpose of this summary is to present an overview of potential effects on outdoor recreation that are relevant to Jacko Lake.

Potential effects on Outdoor Recreation relate to the following:

- **Changes in (or removal of) access for recreational opportunities:** With respect to Jacko Lake, the northeast arm of Jacko Lake will no longer be available to fishers and there will be restrictions to access during the Operation Phase for Jacko Lake, particularly during phases of the mine plan where blasting events occur closest to Jacko Lake.
- **Diminished outdoor recreation experience**: The presence of the Project will affect a number of different variables (or VCs) which would indirectly affect individuals' experience at Jacko

Lake. This could include changes to air quality, noise and vibration and visual impacts and aesthetic features.

- **Reduced availability of natural resources:** Fish mortality in Jacko Lake could result from pile driving used to install the sheet pile dam on the Northeast arm of the lake. The sheet pile dam is required to isolate a portion of the arm for dewatering prior to removal of a segment of the Kinder Morgan pipeline and construction of a permanent dyke to retain the lake for pit development. Fish mortality may occur from sound pressure changes created by driving hollow piles with an impact hammer depending on substrate type, pile size and type, hammer size and type, number of pile strikes necessary to drive a pile, and the number of piles that will be driven in a day.

Table 8.7-10 provides an overview of the residual effects of the Project on Outdoor Recreation, including the proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 8.6 of the Application/EIS

Table 8.7-10. Overview of Residual Effects, Mitigation and Significance for Outdoor Recreation Related to Jacko Lake

Residual Effects	Proposed Mitigation	Determination of Significance
Changes in Access to Jacko Lake	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management. • Access Management Plan will include signage and communications regarding temporary closures of Jacko Lake. • Angler/recreation working group, and potential development of new or improved fishing, biking, trails, and/or other recreation areas.	Not Significant (Moderate)
Diminished Quality of Outdoor Recreation Experience	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; • Adaptive management; • Angler/recreation user working group.	Not Significant (Moderate)
Reduced Opportunities for Fishing and Hunting as a Result of Effects to Fish and Wildlife Resources	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features • Mitigation of fish and wildlife project effects. • Adaptive management. • Angler/recreation working group, and potential development of new or improved fishing areas	Not Significant (Minor)

8.7.3.11 Heritage VC Summary

Jacko Lake has been identified as an important area for traditional and current practices of the Secwépmec people. It is within the Project Heritage LSA and adjacent to the proposed Open Pit. There are currently six known archaeological sites near the shores of Jacko Lake (EdRc-1, EdRc-5, EdRc-6, EdRc-7, and EdRc-8, and EdRc-19). All six sites are classified as lithic sites and will require additional mitigation prior to disturbance. Based on the current Project footprint impacts are anticipated at four of the six sites (EdRc-5, EdRc-6, EdRc-7, and EdRc-8). There is also a Prayer Tree identified as significant by the SSN located in the vicinity of Jacko Lake. The Prayer Tree is outside the current footprint and direct effects are not anticipated.

Potential effects on Heritage relate to the disturbance of archaeological sites located along the shoreline of Jacko Lake. An archaeological chance find procedure will be in place, and measures implemented if additional sites are identified through the course of Project development.

Table 8.7-11 provides an overview of the residual effects of the Project on Heritage, including the proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 9 of the Application/EIS.

Table 8.7-11. Overview of Residual Effects, Mitigation and Significance for Heritage Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance
Disturbance of archaeological sites.	Based on the current Project footprint the mine pit will impact four archaeological sites (EdRc-5, EdRc-6, EdRc-7, and EdRc-8). Archaeological Sites are protected by the Heritage Conservation Act and appropriate mitigation measures will be instituted in consultation with Archaeology Branch and Aboriginal Groups. Implementation of the Archeological Sites Management Plan (Section11.18) will also direct KAM's activities relating to heritage or archeological sites.	Not Significant (Minor)

8.7.3.12 Air Quality VC Summary

Potential effects on Air Quality relate to the following:

- **Change in criteria air contaminants (CAC) concentrations during Construction:** Periodic increases in particulate and gaseous CACs will be apparent at Jacko Lake.
- **Change in CAC concentrations during Operation**: Periodic increases in particulate and gaseous CACs will be apparent at Jacko Lake.

Key mitigation measures related to air quality near Jacko Lake include:

- Project Design mitigations such as enclosing the primary crusher, minimizing drop heights, covering transport trucks, and optimizing haul road design.

- Project Operations mitigations such as dust control on roadways, reclamation of exposed surfaces prone to wind erosion, and minimizing the areas of exposed soil and rock.

An air dispersion model was undertaken to characterize current conditions around the Project, and to predict future concentrations of CAC. Particulate matter, in the form of dust and fine particulates, are of primary concern. Given the prevailing wind patterns the Jacko Lake area is less affected than regions to the north-east of the project. These predictions were used as inputs to the water quality prediction model, and were an input to the Human Health and Ecological Risk Assessment model.

Table 8.7-12 provides an overview of the residual effects of the Project on Air Quality, including the temporal scope, proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 10.1 of the Application/EIS.

Table 8.7-12. Overview of Residual Effects, Mitigation and Significance for Air Quality Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance
Change in CAC concentrations during Construction	Implementation of Project design and best management practices for air quality. Implementation of the Air Quality Monitoring and Dust Control Plan (Section 11.6)	Not Significant (Moderate)
Change in CAC concentrations during Operation	Implementation of Project design and best management practices for air quality. Implementation of the Air Quality Monitoring and Dust Control Plan (Section 11.6)	Not Significant (Moderate)

8.7.3.13 Human Health VC Summary

The assessment of Project effects on Jacko Lake included an evaluation of the potential for Project activities to effect human health risks for Aboriginal and non-aboriginal people who may spend time in the vicinity of Jacko Lake. The Human Health assessment considered members of the Aboriginal community who may harvest country foods (wild meat, fish, plants and traditional medicines) from Jacko Lake and the lands surrounding the lake. The assessment also considered non-aboriginal members of the community who may consume fish from the lake or access the lake and its environs for recreational activities.

The assessment considered the potential changes in human health risk for people who may inhale particulate matter (PM_{10} and $PM_{2.5}$) SO_2, NO_2 and CO generated by Project activities, while in the vicinity of Jacko Lake.

The assessment concluded that the predicted Project-related changes in the concentrations of PM_{10} and $PM_{2.5}$, SO_2, NO_2 and CO in ambient air around Jacko Lake, do not represent a potential human health risk for people who spend time in the vicinity of Jacko Lake. The assessment also concluded that the consumption of fish from Jacko Lake and country foods harvested in the vicinity of Jacko Lake does not represent a potential human health risk for members of Aboriginal Groups or

members of the non-aboriginal community. Therefore, Project activities are not anticipated to represent a potential human health concern for Aboriginal and non-aboriginal community members who may spend time in the Jacko Lake area.

Table 8.7-13 provides an overview of the residual effects of the Project on Country Foods, including the proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 10.3 of the Application/EIS.

Table 8.7-13. Overview of Residual Effects, Mitigation and Significance for Country Foods Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance
Change in Inhalation Human Health Risk	Mitigation measures specific to the assessment of human health risks have not been recommended. The mitigation measures for control air and dust emission outlined in the Air Quality section will reduce project emissions to levels that are protective of human health.	Not Significant (Minor)
Change in direct contact and ingestion human health risks	Mitigation measures specific to the assessment of human health risks have not been recommended. Mitigation measures to control surface water discharges outlined in the Water Quality section will reduce project emissions to levels that are protective of human health.	Not Significant (Minor)

8.7.3.14 Noise and Vibration VC Summary

Potential vibration effects are related to perceptible change in vibration effect at Jacko Lake during blasting activities. Other activities associated with the Project Construction and Operations are not expected to result in perceptible change in vibration environment at Jacko Lake.

Potential noise effects are related to perceptible change in the acoustic environment at Jacko Lake during the Project Construction and Operation. In particular, the noise level is predicted to exceed annoyance threshold at the east end of Jacko Lake during the piling activities for the berm construction (which is expected to last for 2 months). Other activities associated with the Project Construction and Operations are not expected to result in noise exceeding annoyance threshold at Jacko Lake.

Table 8.7-14 provides an overview of the residual effects of the Project on Noise and Vibration at the east end of Jacko Lake, including the temporal scope, proposed mitigation and the determination of significance for the VC. Additional detail is provided in Section 10.4 of the Application/EIS.

Table 8.7-14. Overview of Residual Effects, Mitigation and Significance for Noise and Vibration Related to Jacko Lake

Potential Effects	Proposed Mitigation	Determination of Significance (1)
Change in acoustic environment	Implementation of Project design and best management practices for noise and vibration. Implementation of the Noise and Vibration Management Plan (Section 11.22)	Not Significant (Moderate)
Change in vibration environment	Implementation of Project design and best management practices for noise and vibration. Implementation of the Noise and Vibration Management Plan (Section 11.22)	Not Significant (Moderate)

Note:
[1] The "Moderate" rating is only applicable to Jacko Lake east end where noise and vibration effects exceed the annoyance threshold during piling activities and blasting near the western portion of the pit. In Section 10.4 of the Application/EIS, the overall significance rating for Noise and Vibration VC is "Minor" when other receptors are considered.

8.7.4 Cumulative Effects

Table 8.7-15 below provides references to the cumulative effects assessment sections for each of the relevant VCs described above.

Table 8.7-15. References to Cumulative Effects Assessment Sections

VC	Application Section
Surface Water Quality	Section 6.3.6
Surface Water Quantity	Section 6.4.6
Groundwater Quantity	Section 6.6.6
Fish and Fish Habitat	Section 6.7.6
Wildlife	Section 6.11.6 (Terrestrial Invertebrates); Section 6.12.6 (Amphibians); Section 6.13.6 (Reptiles); Section 6.14.6 (Migratory Birds); 6.15.6 (Raptors); Section 6.16.6 (Non-migratory Gamebirds); and Section 6.17.6 (Mammals)
Visual Impacts é Aesthetic Features	Section 8.3.6
Land and Resource Use	Section 8.4.6
Current Use of Lands and Resources for Traditional Purposes	Section 8.5.6
Outdoor Recreation	Section 8.6.6
Heritage	Section 9.1.6 (Archaeological Sites); and Section 9.2.6 (Aboriginal and non-Aboriginal Heritage Sites).
Air Quality	Section 10.1.6 Air Quality
Human Health	Section 10.4.6 Human Health
Noise and Vibration	Section 10.5.6 Noise and Vibration

Consistent with the methodology outlined in Section 5.3.1, each of the cumulative effects assessments referenced above considered the potential for other past, present, and reasonably foreseeable future projects and human activities that have caused or may cause effects and that could interact with the residual effects of the Project. The list of other projects/activities considered in the assessment is summarized in Table 5.3-1.

Each of the cumulative effects assessments for individual VCs recognized that past and present projects/activities are already contributing to effects on the landscape around Jacko Lake. This includes for example, historic mining, and past/present agriculture, ranching, and recreational activities. Such activities have been captured in the baseline characterization, and thus are incorporated into the Project-specific effects assessments that have been summarized above. Cumulative effects are generally considered at the scale of the regional study area. The number of other projects/activities that could meaningfully contribute to effects at the scale of Jacko Lake is limited. The results of each of the cumulative effects assessments did not identify any foreseeable future activities that would further contribute to cumulative residual effects.

Given that no specific cumulative residual effects were identified, consistent with the assessment methodology, the assessment does not carry on through an assessment of significance.

Further, no other mitigation measures beyond those described in Section 8.7.3, were identified as required to address overall effects to Jacko Lake that are not captured by other VCs.

8.7.5 Environmental Management System

Chapter 11 of the Application/EIS outlines the proposed Environmental Management System (EMS) for the Project. The EMS includes environmental monitoring programs, many of which will include specific programs to monitor effects at Jacko Lake, allowing for verification of predictions, or the implementation of appropriate adaptive management measures. Key monitoring programs with direct relevance to Jacko Lake will include:

- Continuous and passive monitoring of air quality (Section 11.6)
- Water levels in Jacko Lake, and operation of the Peterson Creek Diversion (Section 11.7)
- Continuous slope stability monitoring of the Open Pit through a combination of Automated Total Station Networks, non-reflective LIDAR (Light Detection and Ranging) scanning, Slope Stability Radar (SSR), Global Positioning System (GPS), and vibrating wire piezometers (Section 11.13).
- Slope stability of the TSF and the MRSFs with vibrating wire piezometers, slope inclinometers, and surface movement monuments installed in the foundations, embankment fill, and on the embankment crests (Section 11.13).
- Chance find procedure for any archaeological sites encountered as a result of the Project (Section 11.18),
- Monitoring effectiveness of access control on Jacko Lake during periods of blasting (Section 11.21)

- Noise levels at Jacko Lake (Section 11.22)
- Regular monitoring of water quality (physical and chemical parameters) in Jacko Lake (Section 11.23)
- Regular monitoring of groundwater levels and water quality in wells adjacent to Jacko Lake and between the lake and the Open Pit (Section 11.24)
- Visual monitoring of lake conditions during periods of blasting and sheet piling activities (Section 11.25);
- Regular monitoring of fish, sediment quality, primary producers (periphyton, phytoplankton), and benthic invertebrates in Jacko Lake (Section 11.25)
- Monitoring ecosystems around the periphery of Jacko Lake (Section 11.27)
- Bird, mammal, and amphibian monitoring, including recording of incidental observations, breeding evidence, mortality events and/or interactions with Project infrastructure (Section 11.27)
- Monitoring the success of progressive reclamation, particularly at the WMRSF (Section 11.28).
- Monitoring use of the lake, for example by anglers, other recreational users, and Aboriginal Groups (Section 11.30), through observation and interviews.

8.7.6 Conclusion

KAM is committed to developing, operating and closing the Project in recognition of the environmental, social, and cultural values associated with Jacko Lake. On the basis of the Project design and mitigation measures proposed, and the results of the effects assessments completed by KAM's consulting team, KAM believes the Project can successfully achieve this commitment. KAM will continue to pursue means of improving the Project design and strengthening the mitigation measures as the Project continues to develop, and through the implementation of the Environmental Management System, described in Section 11.

8.8 SUMMARY OF ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

Table 8.8-1 summarizes all residual Project and cumulative effects, significance determinations, and mitigation measures for the assessment of social Valued Components. Additional summary information is also provided in Chapter 18.

Table 8.8-1. Summary of Residual Project and Cumulative Effects and Mitigation Measures: Social

Residual Effect	Project Phase	Mitigation	Significance of Project Residual Effect	Significance of Cumulative Residual Effect
VC: Infrastructure, Public Facilities, and Services (Section 8.1)				
During peak construction, accommodation of the workforce could increase hotel/motel occupancy rates and constrain tourism, including the ability of the City of Kamloops to attract events, and the ability of independent tourists to access hotels/motel rooms in the city.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, Tourism Kamloops to discuss potential issues and solutions. • Ongoing dialogue with the City and Tourism Kamloops to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Not Significant (Minor)	Not Significant (Moderate)

Residual Effect	Project Phase	Mitigation	Significance of Project Residual Effect	Significance of Cumulative Residual Effect
VC: Infrastructure, Public Facilities, and Services (Section 8.1) *(cont'd)*				
During peak construction, Project demand for hotel/motel rooms and rental accommodations (including apartments) could increase rental prices and make it more challenging for vulnerable households to find and retain suitable accommodation.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, Tourism Kamloops to discuss potential issues and solutions. • Ongoing dialogue with the City and service organizations to inform them of workforce requirements. • Working with contractors and relevant stakeholders (including the City, social service providers, business community, and other organizations) to identify needs and suitable options for workforce accommodation, and developing a Construction Phase Workforce Accommodation Plan in consultation with these parties.	Not Significant (Minor)	Not Significant (Moderate)
Due to existing capacity constraints identified for the Kamloops RCMP detachment, there may be increased stress on policing services as a result of the non-local construction workforce if the RCMP needs to respond to calls regarding partying or other unprofessional behaviours.	Construction	• Completing and implementing a Project Recruitment Strategy to maximize local hires and reduce the number of non-local workers. • Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with service organizations (e.g., RCMP) to inform them of workforce requirements. • Development of Code of Conduct for direct and contractor employees. • KAM will facilitate recreational opportunities in Kamloops for direct and contract employees.	Not Significant (Minor)	Not significant (Minor)

Residual Effect	Project Phase	Mitigation	Significance of Project Residual Effect	Significance of Cumulative Residual Effect
VC: Infrastructure, Public Facilities, and Services (Section 8.1) *(cont'd)*				
Project-related traffic may increase congestion and affect the flow of traffic during the Construction Phase, including at the Pacific Way/Hugh Allan Drive intersection in 2016 and at the Versatile Drive/Hugh Allan Drive roundabout in 2018.	Construction	• Implementing carpooling incentives during construction and operations. • Providing workforce personnel shuttles from key locations within the City to the Mine Site during construction. • Staggering shifts during the construction phase and, to a lesser extent, during the operations phase. • Improved signage for Lac le Jeune Rd. • Proportionate road infrastructure improvements to Lac le Jeune Rd.	Not Significant (Minor)	Not Significant (Moderate)
Large municipal and regional district projects may be deferred due to inadequate supply of skilled labour.	Construction, Operations	• Forming an advisory committee comprised of relevant representatives from the City, the TNRD, services, and organizations to discuss potential issues and solutions. • Ongoing dialogue with the City and TNRD to inform them of workforce requirement.	Not Significant (Minor)	No residual cumulative effect
VC: Dark Sky (Section 8.2)				
Sky Glow	Construction; Operation	Limiting lighting to areas of activity; Illumination management (e.g., shielding, timers, dimmers) Spectral control (e.g., bulb selection)	Not significant (Moderate).	Not significant (Moderate).
VC: Visual Quality (Section 8.3)				
Reduction of visual quality.	Construction; Operation; Decommissioning and Closure	Progressively re-vegetate disturbed areas that are no longer in use. Employ good visual design principles.	Not Significant (Moderate).	Not Significant (Moderate).
Reduction of visual quality.	Post-Closure	Monitor vegetation cover on Project components. Ensure vegetation growth can attain desired re-vegetation.	Not significant (Minor).	Not significant (Minor).

Residual Effect	Project Phase	Mitigation	Significance of Project Residual Effect	Significance of Cumulative Residual Effect
VC: Land and Resource Use (Section 8.4)				
Presence of Project may limit the ability of City of Kamloops or the TNRD to meet the objectives of various land use planning initiatives related to population growth and residential development	All phases	Design changes to project location, environmental mitigations, use of formal processes to amend land designations, ongoing engagement between KAM. City of Kamloops and TNRD to discuss potential areas of interaction between Project and planning.	Not Significant (Moderate).	No residual cumulative effect
VC: Current Use of Land and Resources for Traditional Purposes (Section 8.5)				
Disruption of fishing use	All phases	Fish Habitat Mitigation and Offsetting Plan, No fishing policy, Transportation Management Plan	Not Significant (Negligible to Minor)	Not Significant (Moderate)
Disruption of hunting use	All phases	Transportation Management Plan, Firearms and Hunting Policy, Closure and Reclamation Plan	Not Significant (Negligible to Moderate)	Significant
Disruption of plant gathering	All phases	Closure and Reclamation Plan, Invasive Species Management Plan, No plant gathering policy, Transportation Management Plan	Not Significant (Negligible to Moderate)	Significant
Disruption of ceremonial use (SSN only)	All phases	Closure and Reclamation Plan	Not Significant (Moderate)	Significant
VC: Outdoor Recreation (Section 8.6)				
Changes in access to Jacko Lake, Goose Lake, and Goose Lake Road	Construction; Operation; Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features; adaptive management. • Access Management Plan will include signage and communications regarding temporary closures of Jacko Lake. • Establishment of angler/recreation working group, and potential development of new or improved fishing, biking, trails, and/or other recreation areas.	Not Significant (Moderate).	Not Applicable

Residual Effect	Project Phase	Mitigation	Significance of Project Residual Effect	Significance of Cumulative Residual Effect
VC: Outdoor Recreation (Section 8.6) *(cont'd)*				
Diminished quality of outdoor recreation experience.	Construction; Operation; Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features. • Adaptive management; • Angler/recreation user working group.	Not Significant (Moderate).	Not Applicable
Reduced opportunities for fishing and hunting as a result of effects to fish and wildlife resources.	Construction; Operation; Decommissioning and Closure	• Implementation of Project design and best management practices for air quality, noise and vibration, visual impacts and aesthetic features. • Mitigation of fish and wildlife project effects. • Adaptive management. • Angler/recreation working group and potential development of new or improved fishing areas.	Not Significant (Minor).	Not Applicable

8.9 REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

8.1 Infrastructure, Public Facilities, and Services

Aboriginal Affairs and Northern Development Canada. (2012). *Registered Indian Population by Sex and Residence 2011*.

Aird, D. Kamloops Rural Detachment. RCMP. *Telephone correspondence with AMEC Foster Wheeler*. March 31, 2015.

Ajax KPI Program. (2011-2012; 2014-2015). Key Person Interview Program conducted in Kamloops, BC and via phone from Winnipeg, MB.

Andersen, C., Doll, M., and McCorkell, B. Parks, Recreation, and Culture. City of Kamloops. *Telephone correspondence with InterGroup Consultants Ltd. November 14, 2014*.

ASK Wellness Society. (2015). *Homeless Count 2014*.

Board of Education of Schools District No. 73 (Kamloops/Thompson). 2012. Available from http://www3.sd73.bc.ca/schools [accessed September 4, 2014].

British Columbia Environmental Assessment Office [BC EAO]. (2013*). Guidelines for the Selection of Valued Components and Assessment of Potential Effects*. Victoria, BC.

BC EAO. (n.d.). *Harper Creek Project*. Available at http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_333.html [accessed June 21, 2015].

BC Housing. (2015*). 98 New Units of Affordable Housing Coming to Kamloops [press release]*. Available from http://www.bchousing.org/Media/NR/2015/06/26/11372_1506261246-373 [accessed July 28, 2015].

BC Real Estate Association. (2015). *Kamloops Housing Market*. Available from http://www.bcrea.bc.ca/sf-images/economics/kadrea.gif [accessed May 9, 2015].

Canadian Curling Association. (2014). *2014 Tim Hortons Brier*. Available from http://www.curling.ca/2014brier-en/[accessed August 11, 2015].

Canadian Environmental Assessment Agency [CEA Agency]. (2006*). Terms Commonly Used in Federal Environmental Assessments*.

Canadian Institute for Health Information. (2014). *Supply, Distribution and Migration of Physicians in Canada, 2013: Data Tables*.

Canada Mortgage and Housing Corporation [CMHC]. (2015a). *Rental Market Statistics.*

CMHC. (2015b). *About Affordable Housing in Canada*. Available from http://www.cmhc-schl.gc.ca/en/inpr/afhoce/afhoce_021.cfm [accessed July 28, 2015].

City of Kamloops. (2004). *Kamplan: The Official Community Plan*. Retrieved from http://www.kamloops.ca/kamplan/index.shtml [accessed July 27, 2012].

City of Kamloops. (2008b). *Information Package on Land*.

City of Kamloops. (2010a). *Sustainable Kamloops Plan: Foundations for Sustainability*. Available from http://www.kamloops.ca/communityplanning/pdfs/11-SustainableKamloopsPlan-Foundations-12-11.pdf [accessed December 15, 2012].

City of Kamloops. (2010b). *City of Kamloops. Information Package on Water*. Available from http://www.kamloops.ca/sustainable/pdfs/SKP-WaterBackground.pdf [accessed August 11, 2015].

City of Kamloops. (2015a). *Building Permit Reports*. Retrieved from http://www.kamloops.ca/building/buildingstats.shtml [accessed May 9, 2015].

City of Kamloops. (2015b). *Where to Stay*. Available from http://www.tournamentcapital.com/where_to_stay.htm [accessed April 9, 2015].

City of Kamloops. (n.d.). *Waste Water*. Available from http://www.kamloops.ca/environment/water-wastewater.shtml#.Vc952flViko [accessed August 15, 2015].

City of Kamloops, KGHM Ajax Mining Inc., and InterGroup Consultants. (2014). *Ajax Project: Socio-economic Impact Assessment Workshop*. October 30, 2014.

Dechert, C. 2014. General Manager, Highland Valley Copper, Logan Lake, BC. Telephone correspondence InterGroup Consultants Ltd. November 17, 2014.

Destination BC Corp. (2015a). *Provincial Tourism Indicators*. 2014 Year-in-review.

Destination BC Corp. (2015b). *Provincial Tourism Indicators*. July 2015.

ERM Consultants Canada Inc. (2015*). Harper Creek Mining Corporation Application for an Environmental Assessment Certificate/Environmental Impact Statement*. Prepared by ERM Consultants Canada Ltd., Knight Piesold Ltd., Laurie McNeil and Associates, Merit Consultants International Inc., Dillon Consulting Ltd., Polar Geoscience Ltd. Susan Ames, ALS Canada Ltd., SRK Consulting (Canada) Inc., AMEC, Keystone Wildlife Research Ltd., McElhanney Consulting Services Ltd., Terra Erchaeology Ltd, Simpcw First Nation, B. Simonsen, Strategic Group, BC Stats.

Farrow, G. Streets and Environmental Services Manager. City of Kamloops. Telephone correspondence with InterGroup Consultants. April 8, 2015.

First Nations Health Authority. (2013). *BC First Nations Health Authority Marks Historic Transfer of Services from Health Canada*. Available from http://www.fnha.ca/Documents/FNHA_Oct1_TransferCommunique_FIN.pdf [accessed July 15, 2015].

Goldenberg, S.M., J.A. Shoveller, M. Koehoorn, and A.S. Ostry. 2010. *And They Call This Progress? Consequences for Young People of Living and Working in Resource-Extraction Communities*. Critical Public Health Vol. 20, no. 2, p. 157-168.

Highway Planning Section. (2014). *Overview of B.C. Highway Functional Classification.*

Horne, G. 2004. *British Columbia's Heartland at the Dawn of the 21st Century: 2001 Economic Dependencies and Impact Rations for 63 Local Areas*. Ministry of Management Services.

Horne, G. 2009. *British Columbia Local Area Economic Dependencies: 2006*. Available at: http://www.bcstats.gov.bc.ca/StatisticsBySubject/Economy/BCInputOutputModel.aspx. [accessed October 17, 2012].

Interior Health Authority [IHA]. (2012f). *Royal Inland Hospital Facility Profile*. Available from http://www.interiorhealth.ca/AboutUs/QuickFacts/PopulationLocalAreaProfiles/Documents/Royal%20Inland%20Hospital.pdf [accessed December 11, 2012].

IHA. 2013. *Royal Inland Hospital: Facility Profile*.

Ipsos Reid. 2012. *City of Kamloops: 2012 Citizen Survey*. Ipsos Reid, Vancouver: BC.

Kamloops District Real Estate Association. (2015a). *Comparative Analysis by Property Type – Monthly – June 2015*.

KDREA. (2015b). *Comparative Analysis by Property Type – Monthly – June 2015*.

Kamloops Homelessness Action Plan partners and the Kamloops Housing Board (2013). *Kamloops Affordable Housing Needs Assessment, 2012*.

Kamloops Indian Band Department of Education. (2015). *General Information*. Available from http://www.skelep.com/information.htm [accessed August 8, 2015].

Kinder Morgan. (n.d.) *Timeline*. Available from http://www.transmountain.com/timeline [accessed August 10, 2015].

Klassen, A. *Reported Crime on the Rise in Kamloops*. Kamloops this Week. Available from http://www.kamloopsthisweek.com/reported-crime-on-the-rise-in-kamloops/ [accessed August 7, 2015].

Learned, G. Risk Management and Planning Non-commissioned Officer. RCMP. Telephone correspondence with InterGroup Consultants. January 15, 2015.

Mazzotta, C. Social and Community Development Supervisor. City of Kamloops. Telephone correspondence with InterGroup Consultants. January 21, 2015.

McCorkell, B. Parks, Recreation, and Culture. City of Kamloops. Telephone correspondence with InterGroup Consultants. August 10, 2015.

McLean, D. Fire Chief, Kamloops Fire Rescue. City of Kamloops. Telephone correspondence with InterGroup Consultants. December 17, 2014.

Ministry of Justice, Police Services Division. (2014a). *British Columbia Policing Jurisdiction Crime Trends, 2004-2013*.

Ministry of Justice, Police Services Division. (2014b). *Police Resources in British Columbia, 2013*.

Opus International. (2015). *Ajax Mine – Traffic Impact Assessment*. Version dated June3, 2015. Prepared for KGHM International Inc.

Q'wemtsin Health Society [QHS]. Telephone correspondence with AMEC Foster Wheeler. March 31, 2015.

Royal Canadian Mounted Police [RCMP]. (2014). *About Kamloops RCMP*. Available from http://kamloops.rcmp-grc.gc.ca/ViewPage.action?siteNodeId=405&languageId=1&contentId=-1http://kamloops.rcmp-grc.gc.ca/ViewPage.action?siteNodeId=405&languageId=1&contentId=-1[accessed January 7, 2014].

Social Planning and Research Council of British Columbia. (2009). Kamloops Social Plan. Adopted April 7, 2009. For City of Kamloops.

School District No. 73. (2012). *About School District No. 73*. Available from http://www3.sd73.bc.ca/general/content/about-sd73 [accessed August 11, 2015].

Skeetchestn Indian band [SIB]. (n.d.) *Community School*. Available from http://www.skeetchestn.ca/community_school [accessed August 11, 2015].

Statistics Canada. (1997). *1996 Census of Canada, Beyond 20/20 CD-ROM*. Government of Canada. Data adapted by InterGroup Consultants Ltd.

Statistics Canada. (2002). *2001 Census of Canada, Beyond 20/20 CD-ROM*. Government of Canada. Data adapted by InterGroup Consultants Ltd.

Statistics Canada. (2007a). *2006 Census of Canada, Beyond 20/20 CD-ROM*. Government of Canada. Data adapted by InterGroup Consultants Ltd.

Statistics Canada. 2012. *Health Care Professionals and Official Language Minorities in Canada*. Available at http://www.statcan.gc.ca/pub/91-550-x/2008001/t022-eng.htm [accessed on May 10, 2015].

Statistics Canada. (2013a). *2011 Census of Canada, Beyond 20.20 CD-ROM*. Government of Canada. Data adapted by InterGroup Consultants Ltd.

Statistics Canada. (2013b). *National Household Survey Dictionary, 2011*. Ministry of Industry.

Sunderman, R. *Highland Valley Copper: Socio-economic Impact Assessment*. Prepared for Highland Valley Copper. May 15, 2003.

Sutherland, D. *Emergency Plan Coordinator for City of Kamloops and Assistant Chief, Communications. City of Kamloops*. Telephone correspondence with InterGroup Consultants. January 8, 2015.

Thompson-Nicola Regional District [TNRD]. (2013). *Thompson-Nicola Regional District 2013 Annual Report*. https://tnrd.civicweb.net/Documents/DocumentList.aspx?ID=86870 [accessed August 18, 2014].

Tk'emlups te Secwépemc [TteS]. (2015a). *Agreements*. Available from http://tkemlups.ca/agreements/ [accessed August 5, 2015].

TNRD. (n.d.) *Utilities/Water and Sewer Systems*. Available from https://www.tnrd.ca/content/utilitieswater-sewer-systems [accessed May 9, 2015].

Trans Mountain Pipeline ULC [TMPL]. 2013. *Trans Mountain Expansion Project*.

TMPL. 2014. *Trans Mountain Expansion Project Application: Technical Update No. 2*.

Tourism Kamloops. (2015*). Camping and RV Parks in Kamloops, BC*. Available from http://www.tourismkamloops.com/campgrounds-and-rv-parks-kamloops-british-columbia [accessed May 9, 2015].

Urban Futures. (2012). *A Context for Change Management in the Thompson-Nicola Regional District: Projections of Population, Housing, and Employment Change*. Prepared for the Thompson-Nicola Regional District.

Venture Kamloops. (2013). *Business Retention and Expansion Report*. Prepared by C. O'Leary.

Venture Kamloops. (2014). *Six New Family Doctors for Kamloops*. Available from http://venturekamloops.com/six-new-family-doctors-for-kamloops/ [accessed June 26, 2015].

Venture Kamloops. n.d. *Infrastructure*. Available from http://venturekamloops.com/community-profile/infrastructure/ [accessed June 9, 2015].

8.2 Dark Sky

BC EAO. 2013. *Guideline for the Selection of Valued Components and Assessment of Potential Effects*. British Columbia Environmental Assessment Office: Victoria, BC.

Bruce-White, C. and M. Shardlow. 2011. *A Review of the Impact of Artificial Light on Invertebrates.* Buglife – The Invertebrate Conservation Trust, ISBN 978-1-904878-99-5

CEAA. 2006. *Glossary: terms commonly used in federal environmental assessments*. Canadian Environmental Assessment Agency: Ottawa, ON.

Commission Internationale de l'Éclairage (CIE). 2003. *Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.*

Institution of Lighting Engineers (ILE). 2005. *Guidance Notes for the Reduction of Obtrusive Light:* United Kingdom.

KAM. 2014. KGHM International – Ajax Project. *Baseline Report in Dark Sky, Revision 0:* Kamloops, British Columbia, Canada

Leadership in Energy & Environmental Design (LEED). 2004. *Green Building Rating System for New Construction and Major Renovations LEED Canada-NC,* Version 1.0. (https://www.cagbc.org/)

NOAA/EOG. 2015 *VIIRS DNB Cloud Free Composites, Version 1 Nighttime VIIRS Day/Night Band Composites.* (http://www.ngdc.noaa.gov/eog/viirs/download_monthly.html)

Work Safe BC. 2008. *OHS Regulation, Part 4 General Conditions, Section 4.65 Illumination Levels.* (http://www2.worksafebc.com/Publications/OHSRegulation/Part4.asp). British Columbia, Canada

Bortle, John E. ,2001. *The Bortle Dark-Sky Scale*. Sky & Telescope. Sky Publishing Corporation. Retrieved 2007-09-08.

8.3 Visual Impact and Aesthetic Features

2002. *Forest and Range Practices Act,* SBC. C. 69.

Aberdeen Area Plan. 2008. http://www.kamloops.ca/communityplanning/pdfs/plans/08-AberdeenAreaPlan.pdf (Accessed June 2015).

BC EAO. 2013. *Guideline for the Selection of Valued Components and Assessment of Potential Effects.* British Columbia Environmental Assessment Office: Victoria, BC.

BC EAO. 2015. *Application Information Requirements – KGHM Ajax Mining Inc. Ajax Project.* British Columbia Environmental Assessment Office: Victoria, BC.

BC ILMB. 1995. *Kamloops Land and Resource Management Plan.* http://www.for.gov.bc.ca/tasb/slrp/lrmp/kamloops/kamloops/plan/files/klrmp_full.pdf (accessed March 2015). British Columbia Ministry of Forests, Integrated Land Management Bureau.

BC MOF. 1997. *Visual Landscape Inventory. Procedures & Standards Manual.* Prepared by BC Ministry of Forest, Forest Practices Branch for the Resource Inventory Committee, Cultural Task Force: n.p.

BC MOF. 2001. *Visual Impact Assessment Guidebook*. 2nd ed. Prepared by the Forest Practices Branch, British Columbia Ministry of Forests: Victoria, BC.

CEAA. 2006. *Glossary: terms commonly used in federal environmental assessments*. Canadian Environmental Assessment Agency: Ottawa, ON.

City of Kamloops. 2004. *KAMPLAN 2014: The Official Community Plan.* http://www.kamloops.ca/kamplan/index.shtml (accessed June 2015). City of Kamloops: Kamloops, BC.

Domtar. 2014. *The Fiber of Everyday, 2013 Annual Report*. Prepared by Domtar Inc. March 2014.

Hassell. 2005. *Taralga Wind Farm Landscape Visual Assessment*. http://www.planning.nsw.gov.au/asp/pdf/taralga_app_d_hassell_report-01.pdf (accessed October 2012).

8.4 Land and Resource Use

Abacus Mining and Exploration Corp. (2012). *Ajax Copper/Gold Project – Kamloops, British Columbia Feasibility Study Technical Report*. Available from http://www.amemining.com/i/pdf/2012_01_06_Feasibility_Study_Ajax.pdf [accessed April 27, 2015].

Ajax KPI Program 2011-2012; 2014-2015. Key person interview program conducted in Kamloops, BC and via phone from Winnipeg, MB.

BC Ministry of Energy. (2013). *Minefile Record Summary No. 092INE012*. Available from http://minfile.gov.bc.ca/Summary.aspx?minfilno=092INE012 [accessed August 12, 2015].

B.C. Ministry of Forests. (2000). *Range Use Plan Primer: Range Use Plan Training Program*. Ministry of Forests, Forest Practices Branch: V. 2, October 2000.

British Columbia Cattlemen's Association. (2012b). *Grazing and Riparian Management*. Available from http://www.cattlemen.bc.ca/docs/grazing.pdf [accessed January 25, 2012].

BC Ministry of Forests, Lands and Natural Resource Operations [FLNRO]. (1995). *Kamloops Land and Resource Management Plan*. Available from https://www.for.gov.bc.ca/tasb/slrp/lrmp/kamloops/kamloops/plan/files/klrmp_full.pdf [accessed August 7, 2015].

Canadian Environmental Assessment Agency [CEA Agency]. (2006). *Terms Commonly Used in Federal Environmental Assessments.*

City of Kamloops. (1999). *TravelSmart Project*. Available from http://www.kamloops.ca/transportation/pdfs/travelsmart/tsintro.pdf [accessed July 27, 2012].

City of Kamloops. (2004). *Kamplan: The Official Community Plan*. Retrieved from http://www.kamloops.ca/kamplan/index.shtml [accessed July 27, 2012].

BC EAO. (2013). *Guideline for the Selection of Valued Components and Assessment of Potential Effects*. Available from http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf [accessed July 7, 2015].

Ignace, M. (2014). *SSN Cultural Heritage Study*. Prepared for Stk'emlupsemc te Secwépemc by Marianne Ignace, D. Marshall, M. Anderson, and C. Nord.

McLean, A. (1982). History of the Cattle Industry in British Columbia. *Rangelands* 4(3). June 1982.

Mining, Minerals and Sustainable Development (MMSD). (2002). *Break new ground: Mining, Mineral and Sustainable Development*. International Institute for Environment and Development. Earthscan Publications: London.

Provincial Agricultural Land Commission. (2014). *ALR Values and Benefits*. Available online at http://www.alc.gov.bc.ca/alc/content.page?id=4ABFF720E9C04140BF33BA848930A526. Accessed December 29, 2014.

Statistics Canada. (2006). *2006 Census of Agriculture, Farm Data and Farm Operator Data, catalogue no. 95-629-XWE*. Available from http://www.statcan.gc.ca/pub/95-629-x/7/4182902-eng.htm [accessed December 14, 2012].

TNRD. (2004). *Lakeshore Development Guidelines*. Available from http://tnrd.fileprosite.com/contentengine/Link.aspx?ID=16009 [accessed December 14, 2012].

TNRD. (2011b). *Kamloops South Official Community Plan*. Available from https://www.tnrd.ca/content/official-community-plans-ocp [accessed July 26, 2015].

TNRD. (2011c). *South Thompson Settlement Strategy*. Available from http://tnrd.fileprosite.com/contentengine/Link.aspx?ID=15996 [accessed December 14, 2012].

TNRD. (2012). *Zoning Bylaw No. 2400*. Available from https://tnrd.civicweb.net/Documents/DocumentList.aspx?ID=70091 [accessed December 14, 2012].

TNRD. (2013). *Thompson Nicola Regional District 2013 Annual Report*. Accessed online on August 18, 2014 at: https://tnrd.civicweb.net/Documents/DocumentList.aspx?ID=86870.

True Consulting Group. (2008). *Aberdeen Plan*. Available from http://www.kamloops.ca/communityplanning/pdfs/plans/08-AberdeenAreaPlan.pdf [accessed December 14, 2012].

Venture Kamloops. (2013). *Mining in Kamloops – An Industry Snapshot*. Available from http://venturekamloops.com/industries/mining/ [accessed September 19, 2014].

8.5 Current Use of Land and Resources for Traditional Purposes

AIB, pers. comm. (2014, December 04). Meeting between AIB Chief and Council and KAM. AIB offices, BC, Canada.

AIB, pers. comm. (2014, June 24). Meeting with Jennifer Morrison. Record of Contact #713.

AIR Comments from SSN. (2014, 06 30). June 30, 2014 AIR Comments. BC, Canada.

Ashcroft Indian Band Website. (2013). Retrieved November 5, 2014, from http://issuu.com/guayabadesign/docs/2013_report_final_01_web

Blackstock, M. D., & McAllister, R. (2004). First Nations Perspective on the Grasslands of the Interior of British Columbia. *Journal of Ecological Anthropology Vol. 8*, 24-46.

Dawson, G. M. (1891). *Notes on the Shuswap People of British Columbia. .* Ottawa: Royal Society of Canada.

First Nations Land Rights and Environmentalism in British Columbia. (2007). *Secwepemc*. Retrieved 2014, from http://www.firstnations.de/development/secwepemc.htm

First Peoples' Heritage, Language and Culture Council. (2010). *Report on the Status of B.C. First Nations Languages, 2010.* First Peoples' Heritage, Language and Culture Council. Retrieved from http://www.fpcc.ca/files/PDF/2010-report-on-the-status-of-bc-first-nations-languages.pdf

Goulet, T. a. (2012). *The Metis in Brithish Columbia.* BC Metis Federation.

Government of BC. (2014c). *Consulting with First Nations, First Nations Negotiation, Nlaka'pamux.* Retrieved 2014, from British Columbia Business, Natural Resource Industries: http://www2.gov.bc.ca/gov/topic.page?id=44B74C301A294C22A882B012636E0723

Government of BC. (2015, March 27). *Fisheries Inventory Data Queries*. Retrieved from BC Government Ministries, Fisheries Inventory: http://www.env.gov.bc.ca/fish/fidq/

Highland Valley Copper. (2007, August). *First Nations Considerations Report.* Retrieved 2014, from Highland Valley Centre for Sustainable Waste Management Environmental Assessment Certificate Application:

http://a100.gov.bc.ca/appsdata/epic/documents/p263/d24676/1189462012362_259bcdef7b9f4a43926bb951c3efcaa9.pdf

Ignace, M. (1995). *Jules et al. v. Harper Ranch et al. Anthropological Expert Evidence Report.*

Ignace, M. (2013). *SSN Cultural Heritage Study - Second Preliminary Report.*

Ignace, M. (2014). *Cultural Heritage Study- Final Report.* BC, Canada.

Landowners, pers. comm. (2015, March 30). Kamloops, BC, Canada.

LeBourdais, S. (2009, july 24). SEXQÉLTKEMC: The Lakes Division of the Secwepemc Nation . *Tult: Transformation of Energy into Matter.* BC, Canada.

LNIB, pers. comm. (2012, June 28). Letter from Chief Victor York. Record of Contact #22.

LNIB, pers. comm. (2013a). Lower Nicola Indian Band resources and capacity.

LNIB, pers. comm. (2013b). Meeting between LNIB Chief and other LNIB representatives and KAM. July 10th , 2013.

LNIB, pers.comm. (2014). Meeting between LNIB Chief and Council and other representatives and KAM. Record of Contact # 753

Lower Nicola Indian Band. (2013). Retrieved April 2013, from Lower Nicola Indian Band: http://www.lnib.net/

Ministry of Attorney General. (2007, October 1). *New Afton Copper Gold Project: Review of Historical and Ethnographic Sources Relating to Aboriginal Use and Occupation of the Site Area by Kamloops and Skeetchestn Indian Bands.* BC, Canada: Ministry of Attorney General: Aboriginal Research Division.

MNBC. (2014). *MNBC- KGHM/Ajax Mine Initial Project Report, December 2014.* Kamloops.

MNBC website. (n.d.). *Metis Nation BC.* Retrieved October 28, 2014, from http://www.mnbc.ca/

MNBC, pers. comm. (2014). Email Communication with MNBC. BC, Canada.

Morin, S. (2012). *Archaeologicla Impact Assessment KGHM Ajax Mining Inc. Interim Report 2009-2011 Field Studies: Proposed Ajax Mine Site.* Kamloops: Unpublished.

Murphy, P., Nicholas, G., & Ignace, M. (1999). *Coyote U: Stories and Teachings from the Secwepemc Education Institute.* Penticton: Theytus Books Ltd.

National Energy Board: Oral Presentation from Chief Ignace. (2014, November 18). Trans Mountain Pipeline ULC: Trans Mountain Expansion Project. *Hearing Order OH-001-2014.* Kamloops, BC, Canada.

Palmer, A. (2005). *Map of Experience: The Anchoring of Land to Story in Secwepemc Discourse.* Toronto: University of Toronto Press Inc.

Pottinger Gaherty Environmental Consultants, on behalf of SSN. (2015, May). *Biological Effects from the Trans Mountain Expansion Project in SSN Territory. Canada , BC*: Pottinger Gaherty Environmental Consultants.

Prince, N. (2001). *Plateau Fishing Technology And Activity: Stl'atl'imx, Secwepemc And Nlaka'pamux Knowledge*. BC, Canada: Thompson Rivers University.

Prince, N. (2003). Plateau Fishing Technology and Activity: Stl'atl'imx, Secwepemc and Nlaka'pamux Knowledge. *Fisheries Centre Research Reports, Vol. 11 No. 1*, 381-391.

Shuswap Nation . (2014). *Skeetchestn Indian Band.* Retrieved October 31, 2014, from Shuswap Nation: www.shuswapnation.org/bands/skeetchestn-savona/

Shuswap Nation Tribal Council. (2014b). *Bands - Whispering Pines*. Retrieved November 2014, from Shuswap Nation: http://shuswapnation.org/bands/whispering-pinesclinton-clinton-kamloops

SIB pers. comm. (2013, November 21). Email to SIB. Record of Contact #420.

SIB, pers. comm. (2014, May 5). Meeting with Chief Ronald Ignace. Record of Contact #640.

Siska, H. S. (1988). *We are the Shuswap.* Kamloops: Secwepemc Cultural Education Society.

Skeetchestn Indian Band. (n.d.). *Skeetchestn Environmental Food Contaminants Project.* Retrieved October 27, 2014, from Skeetchestn Website: http://www.skeetchestn.ca/download/document/Contaminants.pdf

Skeetchestn Website. (n.d.). Retrieved October 31, 2014, from Skeetchestn Indian Band: www.skeetchestn.ca

SSN. (2014). *Preliminary Mitigation Report.* Kamloops.

SSN Affidavit. (2011, July). Affidavit #1- Christine Angela Basil Simon. National Energy Board.

SSN Affidavits . (2011, July). Affidavit #1 with Joe Camille. BC, Canada: National Energy Board.

SSN Affidavits. (2011, June). Affidavit #1 Harla Jules. BC, Canada: National Energy Board.

SSN Affidavits. (2011, July). Affidavit of Anthony Michael Anderson. BC, Canada.

SSN pers. comm. (2015, March 16). *Water, Fish & Aquatics & Project Design Issues and Concerns*- Letter from SSN to KGHM. Kamloops, BC, Canada.

SSN, pers. comm. (2014, July 22). Letter from Chief Shane Gottfriedson and Chief Ronald Ignace. Record of Contact #733.

SSN, pers. comm. (2014, April 23). Letter from SSN to Ministry of Energy Mines and Resources. *Notice of Work and Reclamation Application- Multi Year Area Based work program over a 3 year period.* BC, Canada.

Teit, J. (1898). *Traditions of the Thompson River Indians.* London: Houghton, Mifflin and Company.

Tera Environmental Consultants. (2013, December). *Environmental and Socio-economic Assessment for the Trans Mountain Pipeline ULC Trans Mountain Expansion Project- Volume 5D- Traditional Land and Resource Use Technical Report*. Canada.

Tk'emlups te Secwépemc. (2013). Retrieved November 05, 2014, from 2013-2014 Annual Report: http://tkemlups.ca/wp/wp-content/uploads/2014/09/Annual-Report-2013-2014.pdf

Tk'emlúps Website. (2014). Retrieved October 27, 2014, from Tk'emlúps : http://tkemlups.ca

TteS pers. comm. (2011, March 3). Meeting with TteS. Record of Contact #1.

Turner, N. (1947). *Food Plants of British Columbia Indians: Part 2/Interior Peoples*. Victoria: Province of British Columbia.

Turner, N. (1997). *Food Plants of Interior First Peoples.* Victoria: Province of British Columbia.

Whispering Pines Indian Band Website. (2014). Retrieved November 03, 2014, from Whispering Pines Indian Band: www.wpcib.com

8.6 Outdoor Recreation

Ajax KPI Program. 2011-2012; 2014-2015. Key person interview program conducted in Kamloops, BC and via phone from Winnipeg, MB.

BC Parks. (2011a). *Conservation*. Available from http://www.env.gov.bc.ca/bcparks/conservation.html [accessed December 13, 2012].

BC Parks. (2011b). *Ecological Reserves*. Available from http://www.env.gov.bc.ca/bcparks/eco_reserve/ [accessed December 13, 2012].

BC Parks. (2011d). *Wildlife Management Areas (WMAs).* Available from http://www.env.gov.bc.ca/bcparks/explore/wma/ [accessed December 13, 2012]

Cebuliak, A. (2012). FLNRO. Email correspondence with InterGroup Consultants. August 29, 2012.

City of Kamloops. (2004). *Kamplan: The Official Community Plan*. Retrieved from http://www.kamloops.ca/kamplan/index.shtml [accessed July 27, 2012].

City of Kamloops and InterGroup Consultants. 2012. Meeting on Special Topics Associated with Socio economic Effects Assessment of the KGHM-Ajax Mine. Kamloops, September 19, 2012.

FLNRO. (2012). *Mid-Term Timber Supply: Kamloops Timber Supply Area*. Available from http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/mid-term-timber-supply-project/Kamloops%20TSA.pdf [accessed November 28, 2012].

FLNRO. (2015). *Jacko Lake – Not Just Another Lake*. Unpublished presentation.

Freshwater Fishing Society of BC. (2012b). *Where to Fish: Region 3 – Thompson Nicola*. Available from http://www.gofishbc.com/where-to-fish/location-map.aspx?regionID=3 [accessed December 13, 2012].

Knight Piésold. (2015). *2014 Fish and Aquatic Baseline Report Update*. Rev. B. Prepared for KGHM Ajax Mining. May 6, 2015.

Stantec. (2015). *Ajax Mine Project: Air Quality Technical Data Report*. Draft at March 27, 2015. Prepared for KGHM Ajax Mining Inc.

TNRD. (2013). *Thompson Nicola Regional District 2013 Annual Report*. Accessed online on August 18, 2014 at: https://tnrd.civicweb.net/Documents/DocumentList.aspx?ID=86870.

Tourism Kamloops. (2015). *Kamloopa Powwow in Kamloops*. Available from http://www.tourismkamloops.com/kamloopa-powwow-in-kamloops-british-columbia [accessed February 8, 2015].

8.7 Supporting Topic – Jacko Lake

DFO, CEA, FLNRO, KAM, SSN, KP, InterGroup, Keystone, and EOA. Minutes of Meeting (FLNRO Fish Habitat Offsetting and Loss of Fishing Experience). April 21, 2015.

ERM Rescan. (2015). *Ajax Project: Heritage Baseline*. Prepared for KGHM Ajax Mining Inc.

FLNRO. (2015). *Jacko Lake – Not Just Another Lake*. Unpublished presentation.

Ignace, M. (2014). *Cultural Heritage Study- Final Report*. BC, Canada.

Ipsos Reid. (2012). *City of Kamloops - 2012 Citizen Survey*.

Knight Piésold [KP]. (2015). *2014 Fish and Aquatic Baseline Report Update.* Rev. B. Prepared for KGHM Ajax Mining. May 6, 2015.

Map Title Block. n.d.a. Plan No. B3598. Deposited 19th Dec 1929. "Plan of Jacko Lake As Controlled by Present Dam." 25th Jan 1913.

Map Title Block. n.d.b. "Jacko Lake." Fish and Game Branch – Department of Recreation and Conservation. Date: April 1968. Surveyed: May 9 1950

Map Title Block. n.d.c. Trans Mountain Oil Pipe Line Company "Survey Plan of Oil Pipe Line Right Of Way."Plan No. CG 227. Deposited in the Land Registry Office at Kamloops BC: 11 April 1953. Survey completed on 27th September 1952. Map Date: Jan 20 1953

Map Title Block. n.d.d. South Thompson Basin – Fraser System. "Jacko Lake Reservoir Plan of Reservoir". Province of British Columbia Ministry of the Environment, Environmental and Engineering Service Water Investigations Branch. Storage Inventory Programme. Drawing no. 4613-9; Map date: February 1980. Survey Sections: October 1978 (Surveyed by BR Schubert).

McPhail, J. D. (2007). *The Freshwater Fishes of British Columbia*.

Ministry of Environment (2015). *Fisheries Information Summary System*. Fish Inventories Data Quaries. Available at http://www.env.gov.bc.ca/fish/fiss/. Accessed December 2014

Price, C. G. (1991). *Integrating Mining with Other Resource Users at the Afton Mine*. *15th Annual British Columbia Mine Reclamation Symposium*, (pp. 377-383). Kamloops, BC.

SSN Affidavit. (2011, July). Affidavit #1- Christine Angela Basil Simon. National Energy Board.

SSN Affidavit. (2011, July). Jeanette Jules Affidavit #2. BC, Canada.

SSN Affidavits. (2011, July). Affidavit #1 with Joe Camille. BC, Canada: National Energy Board.

SSN Affidavits. (2011, June). Affidavit #1 Harla Jules. BC, Canada: National Energy Board.

SSN Affidavits. (2011, July). Affidavit #1 of Jeanette Jules. BC: National Energy Board.

SSN Affidavits. (2011, July). Affidavit of Anthony Michael Anderson. BC, Canada.

Wright, D. G. and G.E. Hopky. (1998). *Guidelines for the Use of Explosives In or Near Canadian Waters*. Canadian Technical Report of Fisheries and Aquatic Sciences 2017. Science Directorate Central and Arctic Region and Habitat Management and Environmental Science Directoriate, Department of Fisheries and Oceans.