Horse Creek Silica Quarry
Management Plans

Version 1: Created May 19 2025

Mines Act Permit No.: Q-5-134
Environmental Management Act Discharge Permit No.: 108864
Mine No.: 0600252

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Chapter 1: Introduction

The Sinova Quartz Horse Creek Silica Quarry ("the quarry" or "project") is an existing open pit silica quarry located in Nicholson, south of Golden in the Columbia Shuswap Region of southern interior British Columbia (BC). The quarry will provide high grade silica, an integral mineral used in the production of photovoltaic cells and battery anodes, which play important roles in the global transition to green energy. Sinova Quartz is committed to creating a sustainable future through the design, construction, and operation of an environmentally friendly and socially responsible business.

1.1 Company Information

The project proponent is Sinova Quartz Inc. ("Sinova", formerly HiTest Sand Inc.), a private Canadian corporation with a head office in Edmonton, Alberta. Sinova Quartz is owned by its parent company, Sinova Global Inc. The VP Resource Operations and principal contact person for the project is Chad Slee of Sinova Quartz Inc. The General Manager of Quarry Operations is TBD; their delegate is Craig Johnson of Sinova Quartz Inc. The Environmental Site Manager is Michael Keefer (PAg) of Keefer Ecological Services (KES). The site is mined by Speers Construction, a contract quarry operations company led by Michael Speerbrecker. Contact information is provided in Table 1.

Table 1. Contact information: Key site personnel.

VP Resource Operations	General Manager of Quarry Operations	Quarry Manager's Delegate
Chad Slee Sinova Quartz Inc. 5241 Calgary Trail Unit 300 Edmonton, AB T6H 5G8 Office: 587-770-1663 Cell: 780-215-3182 chad.slee@sinovaglobal.com	**TBD**	**Craig Johnson** Sinova Quartz Inc. 5241 Calgary Trail Unit 300 Edmonton, AB T6H 5G8 Cell: 604-655-6235 craig.johnson@sinovaglobal.com
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1.2 Project Location

Horse Creek Silica Quarry is a small open pit silica quarry located on a brownfield site in Nicholson, BC, approximately 12 kilometres (km) south of Golden and situated within the Golden Mining Division.

The quarry site is located on Kapristo Mountain within the Rocky Mountain Trench 3 km east of the Columbia River and 0.34 km south of Horse Creek. The upper site is an open pit quarry (24.28 hectares [ha]) that exists entirely within mineral claim #373717, which in totality comprises 224.90 ha of Crown land. From Highway 95, the upper site quarry is approximately 4.5 km northeast on a haul road located at the Austin Road turn off. The two-lane gravel haul road runs through private property and Crown land; however, easements are in place to allow access to the quarry area. The UTM coordinates for the upper site are 509760 E, 5673311 N (NAD83, Zone 11N).

The entire project lies within the Traditional Territory of the Secwépemc and Ktunaxa Nations and the local government administrative boundaries of the Columbia Shuswap Regional District (CSRD). See Figure 1 for a location map and site overview.

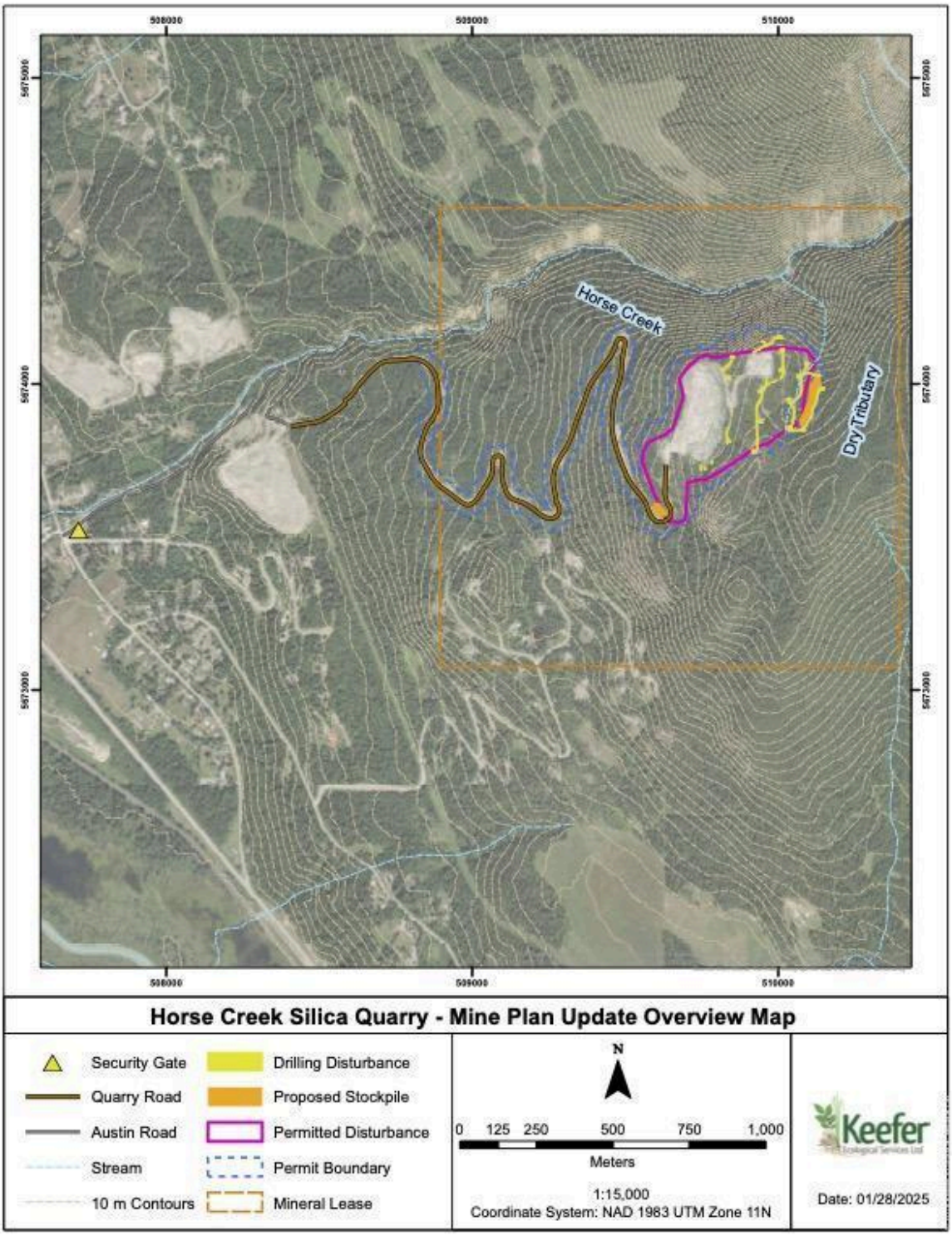


Figure 1. Site overview of the Horse Creek Silica Quarry, depicting the upper site with the current footprint and proposed expansion areas, the permitted disturbance area and the mineral lease, south-southeast of Golden, British Columbia.

1.3 Permitting

The Sinova Quartz Horse Creek Silica Quarry is a small open pit quarry (24.28 hectares [ha]; "upper site") located 342 meters (m) south of Horse Creek and approximately 12 kilometres (km) south-southeast of Golden, BC in the Golden Mining Division (Foye, 1996; Zdunczyk, 2013). The quarry site exists entirely within mineral claim #373717, which comprises 224.90 ha of Crown land (HiTest Sand Inc., 2013).

The site was previously in operation from 1980 to 1999 (Zdunczyk, 2013) under Horse Creek Silica, Horse River, Hunt and Nicholson, and Horse Creek (Foye, 1996). While in operation from 1980 to 1997, there was an estimated 861,192 tonnes of ore mined and milled (Foye, 1996). Production estimates from 1997 onward are not available. The mined silica was used for silicon and ferrosilicon production (Foye, 1996). In 1984, some finer-grained waste rock was reportedly used in cement manufacturing (Foye, 1996).

In 2013, HiTest Sand Inc. (now Sinova Quartz Inc.) submitted *Horse Creek Silica Mine Permit Application Report to Amend Existing Permit M-188* to the Ministry of Energy, Mines and Petroleum Resources (EMPR) to expand the existing quarry at Horse Creek Silica Mine and restart operations. The permit was approved by EMPR on October 29, 2013, and updated in 2020. *Mines Act* permit M-188 was replaced by Q-5-134 on January 31, 2020, following receipt of the security bond for the site. The mineral lease is presently registered under Sinova Quartz Inc., which is 100% owned by Sinova Global Inc. Sinova Quartz is responsible for quarry operations and currently maintains four claims.

Environmental Management Act permit 108864, granted in 2018, authorizes the discharge of operations impacted surface water runoff (consisting of waste water from washing of rock for dust management only, with no chemical processing and no chemical waste produced) to ground and fugitive sources of air contaminants, subject to conditions. Sinova also holds a Ministry of Transportation and Infrastructure (MOTI) authorized Highway Crossing permit with conditions, which allows for up to 60 haul trucks daily to cross Highway 95 between the haul road/Maintenance site and the Railyard site. Sinova is currently awaiting approval for a water licence (submitted April 30, 2021) to allow water to be drawn from the on-site well for ore processing and dust management.

Vegetation Management

The following permit conditions apply to vegetation management. *Mines Act* Permit Q-5-134 for Horse Creek Silica Quarry specifies:

- D.6.i: *Stockpiled topsoil and organic materials must be re-vegetated using a certified weed-free seed mix, to reduce erosion during the storage period.*
- D.7:

  b. *Disturbance to vegetation is limited to those areas approved by this permit.*

  c. *Burning and/or disposal of woody debris suitable for use in reclamation must be avoided.*

  d. *Weeds that establish on the site must be managed and controlled such that they do not migrate from the site to adjacent areas. Use of non-toxic means for weed control must be considered. All seed used on-site must be certified weed free.*

- D.10.c: *Research must be conducted to determine the viability of revegetation with native plant species, including culturally important species.*

Ministry of Transportation Permit 2021-02856-Amendment for Horse Creek Silica Quarry specifies:

- 16: *The permittee is responsible for preventing the introduction and spread of noxious weeds on the highway right-of-way as defined by the British Columbia Weed Control Act and Weed Control Regulation.*

Cultural Resource Management

The following permit conditions apply to Cultural Heritage Resources. *Mines Act* Permit Q-5-134 for Horse Creek Silica Quarry specifies:

> 9.a. *Prior to any ground disturbance, evaluation of archaeological potential in the area of work must be conducted by a qualified professional. Any recommendations resulting from this evaluation, provided by a qualified professional, must be implemented.*
>
> 9.b. *Horse Creek Silica Mine Chance Find Procedure (CFP) must be implemented prior to commencement of work. All employees and contractors at the mine site must be trained on the CFP. The plan must be maintained onsite and available to an Inspector upon request.*

Reclamation Research Program

The reclamation research program fulfills Permit Q-5-134 Condition D 10 (a):

> *The Permittee shall submit to the Chief Inspector 90 days prior to commencement of work, a Reclamation Research Program that includes details for achieving the research requirements outlined in this permit with a schedule for implementation and description for how results will be utilized and reported.*

The research requirements outlined in the permit conditions D 10 (c through i) are:

> *(c) The Permittee shall conduct research to determine the viability of revegetation with native plant species, including culturally important species.*
>
> *(d) The Permittee shall conduct research intended to develop an end land use plan for the post-closure landscape represented in the quarry disturbance footprint that is based on pre-extraction ecosystems and habitats. Where a discrepancy in the comparative areas represented by ecosystem types is identified, the Permittee shall develop mitigation options.*
>
> *(e) The Permittee shall conduct research designed to test potential mitigation options for restoring ecosystems and habitats that are predicted to be affected by extraction activities.*
>
> *(f) The Permittee shall establish test plots that will be used to evaluate the reclamation approaches and prescriptions applied to confirm that ecological trajectories consistent with the land use and capability targets are being achieved.*

(g) The Permittee shall conduct research to inform the development of a soil replacement plan that is designed to achieve land capability and end land use objectives. If a shortfall of soil volumes is anticipated, the Permittee shall develop contingency plans.

(h) The Permittee shall conduct research to assess decompaction methodologies to ensure that the severity of compaction that exists prior to commencing reclamation activities is effectively addressed in a manner intended to achieve end land use objectives and erosion control.

(i) The Permittee shall develop a monitoring program designed to evaluate the success of revegetation, habitat restoration, soil development and erosion control. The Permittee shall include in this program ecosystem-specific sampling parameters and performance criteria, which the Permittee shall base on pre-extraction ecosystem benchmarks.

Water Licence and Management

Water will be used on-site for processing ore (consisting solely of washing of rock for dust management) and mitigating fugitive dust. Sinova Quartz is currently awaiting approval for a water licence (application tracking number: 100346542, submitted April 30, 2021). The application for a licence requested 19 m3/day year-round for processing (e.g., crusher) and 56 m3/day year-round for well drilling and transportation or utility corridor management (i.e., dust control). Upon approval, water will be drawn from the well and transported to the crusher and wash plant via hose pipe (pending construction). Water will also be transported via water truck to be used for dust control on the roads and stockpiles as needed. The source of water is a 20 foot well located beyond the security gate (Parcel ID: 012-732-702; Latitude 51.2079609 Longitude: -116.8909175). No well construction report exists for this well; personal communication estimates the drilling date to be in the 1970s.

1.4 Project Description and Environmental Setting

The Horse Creek Silica Quarry is located on an extensive outcrop of the Ordovician-age Mount Wilson Quartzite Formation (Foye, 1987; Zdunczyk, 2013). The surrounding terrain is rugged, with cliffs and deep valleys (Zdunczyk, 2013). The closest water source is Horse Creek which is 342 m north of the site (Zdunczyk, 2013). Figure 1 shows a tributary located east of the quarry; however, it has not been observed to facilitate any flow and has no channel.

The highest elevation of the site is 1,220 m (Zdunczyk, 2013). The local terrain is steep with areas of exposed bedrock (Miller, 1989; Zdunczyk, 2013). A shallow layer of soil, which is occasionally up to 1 m in depth in depressions, covers all but the exposed outcrops (Miller, 1989; Zdunczyk 2013; Golder Associates, 2013a; KES, 2015). The soils at the site have been classified as Orthic Dystric Brunisols with pH values less than 5.5 and poor nutrient regimes (Golder Associates, 2013). The soils developed on very shallow sandy loam with thin, poorly decomposed surface organic horizons (LF) over shallow B horizons approximately 15 cm deep on average (Golder Associates, 2013).

According to the provincial biogeoclimatic ecosystem classification (BEC), the upper site footprint and majority of the access road falls within the Columbia Dry Cool Montane Spruce (MSdk) biogeoclimatic (BGC) subzone (MacKillop et al., 2018). The plant community in the undisturbed areas that surround the

quarry footprint most closely resembles the MSdk/105 FdPl (Douglas-fir lodgepole pine) – Pinegrass – Twinflower site series, consisting of Douglas-fir and lodgepole pine leading stands and a well-developed herb layer of pinegrass, showy aster, and twinflower (MacKillop et al., 2018).

Pre-extraction aerial imagery (1967; Figure 2) indicates that a variety of ecosystems were present at this site. The bulk of the upper site appears to have been on very shallow soils with very open tree canopy and an area covered in tall deciduous shrubs as well as closed canopy forest on presumably slightly deeper soils. The closed canopy forest was likely consistent with the current MSdk/105 community, while the more open areas were likely MSdk/103 FdPl – Juniper – Pinegrass site series with shallow soils, dominated by Douglas-fir, common juniper, pinegrass and kinnikinnick. The tall shrub field is not a common feature of this subzone, so what its species composition might have been is unclear, although trembling aspen and willow have been found on site and can form dense patches.

Due to its proximity to Golden in the Columbia valley, the quarry upper site likely has a similar climate with slightly cooler temperatures and marginally higher precipitation than values reported from the Environment Canada weather station ('Golden A') due to the higher elevation of the site (approximately 400 m above the valley). From 1981-2010, the daily average temperature in Golden was 5.1˚C, with annual averages of 352.2 mm of rainfall occurring primarily from June to September (56% of total rainfall) and 158.7 mm of snowfall occurring primarily from November to January (75% of total snowfall; Government of Canada, 2023a).

Figure 2. Aerial image of the upper pit pre-mining.

1.4.1 Groundwater

No groundwater has been encountered at the site to date. Any surface water on site following a precipitation event will be sampled, monitored, and reported based on quality standards within regulatory guidelines. Ore will not be processed beyond primary crushing and washing on site, greatly reducing or eliminating the likelihood of metals leaching from the operation. Furthermore, deposit contains nearly pure silica with only trace metallics and is not considered a source of ML/ARD contamination.

There is an aquifer located approximately 1,500 m downslope (shortest straight-line distance) from the quarry site which services 17 domestic water wells. The aquifer's easterly boundary is defined by the bedrock geology, confirmed by water well records; the west boundary is defined by the Columbia River; and north and south boundaries are also defined by water well records. The aquifer is approximately 2.4 km^2 and generally flows from the east towards the valley bottom (Province of British Columbia, 2003). The sediments overlying the aquifer are sandy and silty sediments from the Horse Creek alluvial fan which overlies older fan sediments of sand and gravel. The aquifer occurs in the permeable zones within the alluvial fan and glaciofluvial sediments at the mouth of Horse Creek on the east side of the valley (Province of British Columbia, 2003). In 2023, Sinova retained a Qualified Professional (hydrogeologist) to verify these claims.

1.5 Surface Preparation Activities

1.5.1 Access Road to the Quarry Site

The existing access road to the site is topped with gravel and is single lane with occasional passing areas. Much of the road's shoulder and some of its surface has been grown in with predominantly native vegetation. The access road will require vegetation clearing at a minimum, with possible road widening and ditch design to adhere to both the *Health, Safety and Reclamation Code for Mines in BC* and erosion and sediment control (ESC) measures.

1.5.2 Grubbing

Prior to the temporary quarry closure in 1999, all trees in the extraction area were cleared. Throughout the temporary closure, vegetation has regenerated where the topography allows. All regenerated trees will be cleared from this area to allow for the quarry expansion. All cleared vegetation will be chipped and used to top the topsoil stockpiles as an erosion control measure or integrated into soil as woody debris to be used in reclamation.

1.5.3 Topsoil Removal and Storage

The *Mine Design* (2013) authored by Golder Associates estimated that the total existing volume of stockpiled soil at the quarry is 8,000 cubic meters (m^3) with a further volume of 8,500 m^3 to be salvaged during the quarry expansion. The total stockpiled soil volume upon completion of the five-year expansion is estimated to be 16,500 m^3.

As a best practice, an organic covering of wood chips or other organic debris is to be used as a vegetative cover to discourage the transport of fine soil. It is recommended in the *Mine Design* that the locations of potential stockpiles around the perimeter of the excavated pit have a geotechnical stability assessment done prior to being constructed (Golder Associates, 2013). Further, the establishment of native plants on stockpiles, which will occur via natural colonization or by reclamation planting, will mitigate erosion of the piles and ensure their longevity. Soil stockpiles will be monitored for erosion, native plant establishment and invasive plant management as per the *Mines Act* permit for the site.

1.5.4 Overburden Handling and Storage

Given the absence of substantial overburden and the purity of the silica ore, there should be minimal waste rock generated by the quarry (Zdunczyk, 2013). Any material not suitable for sale or offsite use will be used as road building material or will be incorporated into the topsoil stockpiles if sized under 25 cm in diameter. Overburden designated for road maintenance will be stockpiled on the site.

1.5.5 Haul Roads

The construction of haul roads and runaway lanes will occur throughout the six-year operation plan and are detailed further in the *Mine Design* (Golder Associates, 2013).

1.6 Quarry Development and Off-Site Infrastructure

The *Mine Design* (Golder Associates, 2013) outlines the quarry components and auxiliary infrastructure in detail. The extraction method used will be based on a "bench by bench" top-down extraction method. In summary, the components of the site will include an open pit, haul roads, and a Terex J1480 54' x 30'' single toggle jaw crusher or comparable portable primary crusher and a portable office trailer with washroom facilities. Ore will be moved using an 8 cubic yard loader to load 40 tonne haul trucks, which will transport ore around the site. Highway trucks will be used to haul material from the quarry to the off-site storage, handling and/or transportation facility.

Quarry development and operations remain as planned in the *Mine Design* report. The quarry will run seasonally; operations will be driven by weather and the economical demand of the ore. Primary crushing will be done at the site, with fuel and lubricants required for operating the machinery and water for dust control being transported to the site. Blasting will be contracted out with no explosives or fuel being stored at site. There will be no additional processing equipment, waste rock storage or ponds constructed at the site.

The permitted annual extraction from the site is 1.4 million tonnes, however a lower amount will be extracted in the early years of operations until the maximum level can be achieved through operation efficiency and market demand. Estimated annual extraction from the site will target 10,000 tonnes in 2025 and scale to 320,000 tonnes by 2027.

1.7 Existing Site Conditions

1.7.1 Topography

The site is an outcrop of the Mt. Wilson Quartzite Formation and is located on Kapristo Mountain on the west side of the Beaverfoot Mountain Range, southeast of the Town of Golden. The site is located at an elevation of 1,225 m above sea level (HiTest Sand Inc., 2013), on top of a ridge, which ensures the only water present on the site is from precipitation that falls directly on the site. The precipitation travels to the south and west, with no localized runoff channels of any significance (Miller, 1989). Further, there has been no evidence of groundwater during or after the past quarry operations (Miller, 1989; Golder Associates, 2013).

1.7.2 Geologic Setting

The site consists of three formations, although the uppermost formation was not observed by Zdunczyk (2013). From bottom to top, the formations are the Ordovician Glenogle Formation, the Mt. Wilson Quartzite Formation, and the Whiskey Trail Member. The deposit is hard dense quartzite, a monomineralic rock consisting essentially of interlocking grains of quartz which have lost almost every trace of their clastic origin (Zdunczyk, 2013). During metamorphism, intense heat and pressure deform and compress the grains forming sutured boundaries between grains creating a loose-fitting mosaic. Pure quartzite is white; the colour of impurities reflects the kind and amount of foreign material (Zdunczyk, 2013).

1.7.3 Soils

The soils at the site have been classified as Dystric Brunisols with pH values less than 5.5 and very poor nutrient regimes (Valentine, 1978; as cited in Golder Associates, 2013). The soils developed on very shallow sandy loam with thin, poorly decomposed surface organic horizons (LF) over shallow B horizons only approximately 15 cm deep on average.

Past extraction practices included the dozing and stockpiling of surface soils in small piles surrounding the current pits. In 2013, Golder Associates observed that the soil stockpiles also included a significant amount of waste rock and woody debris, and that some had experienced natural revegetation.

1.7.4 Climate

Climate information was sourced from Environment Canada, from the weather station 'Golden A'. Between 1981 and 2010 the recorded daily average temperature was 5.1 ˚C, with an average monthly rainfall of 27.1 mm occurring primarily between June and September and an average monthly snowfall of 13.2 cm occurring mainly November to January (Government of Canada, 2023a). Figure 3 depicts average monthly temperature and precipitation for Golden, BC between 1981 and 2010.

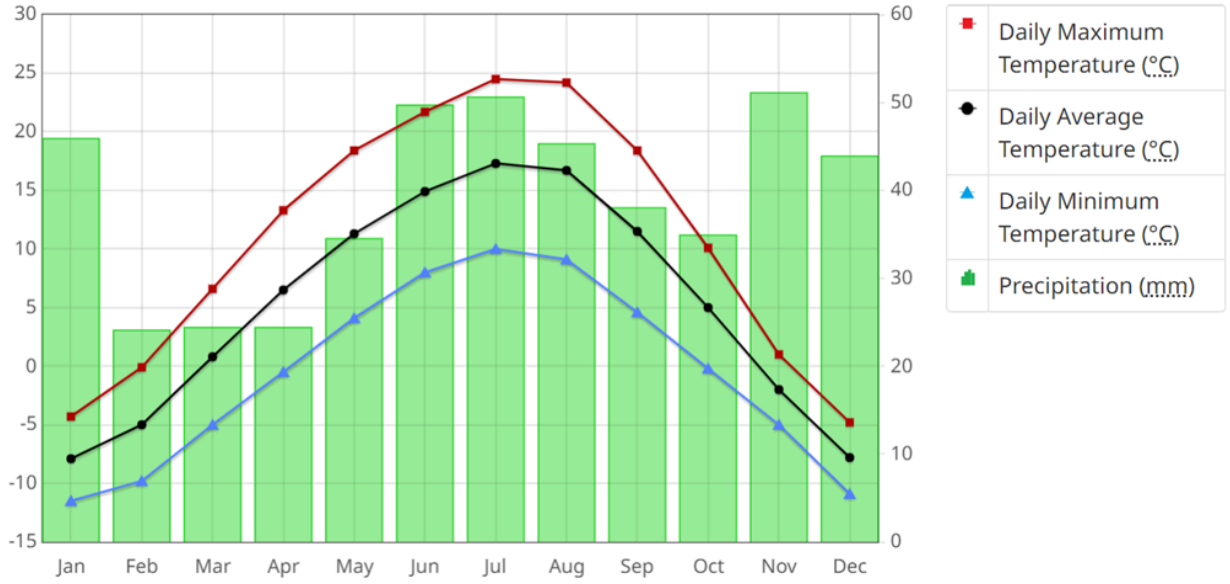


Figure 3. Temperature and precipitation averages for Golden, BC - 1981-2010 (Government of Canada, 2023a).

Figure 4 shows the intensity-duration-frequency (IDF) curve for the 'Golden A' weather station, which illustrates that, in any given year, there is a 50 percent chance the site will experience 8 millimetres of rain falling in a one-hour period (a '1 in 2-year' rainfall event) and a 2 percent chance of 20 millimeters of rain falling in a one-hour period (a '1 in 50 year' rainfall event; Government of Canada, 2023b).

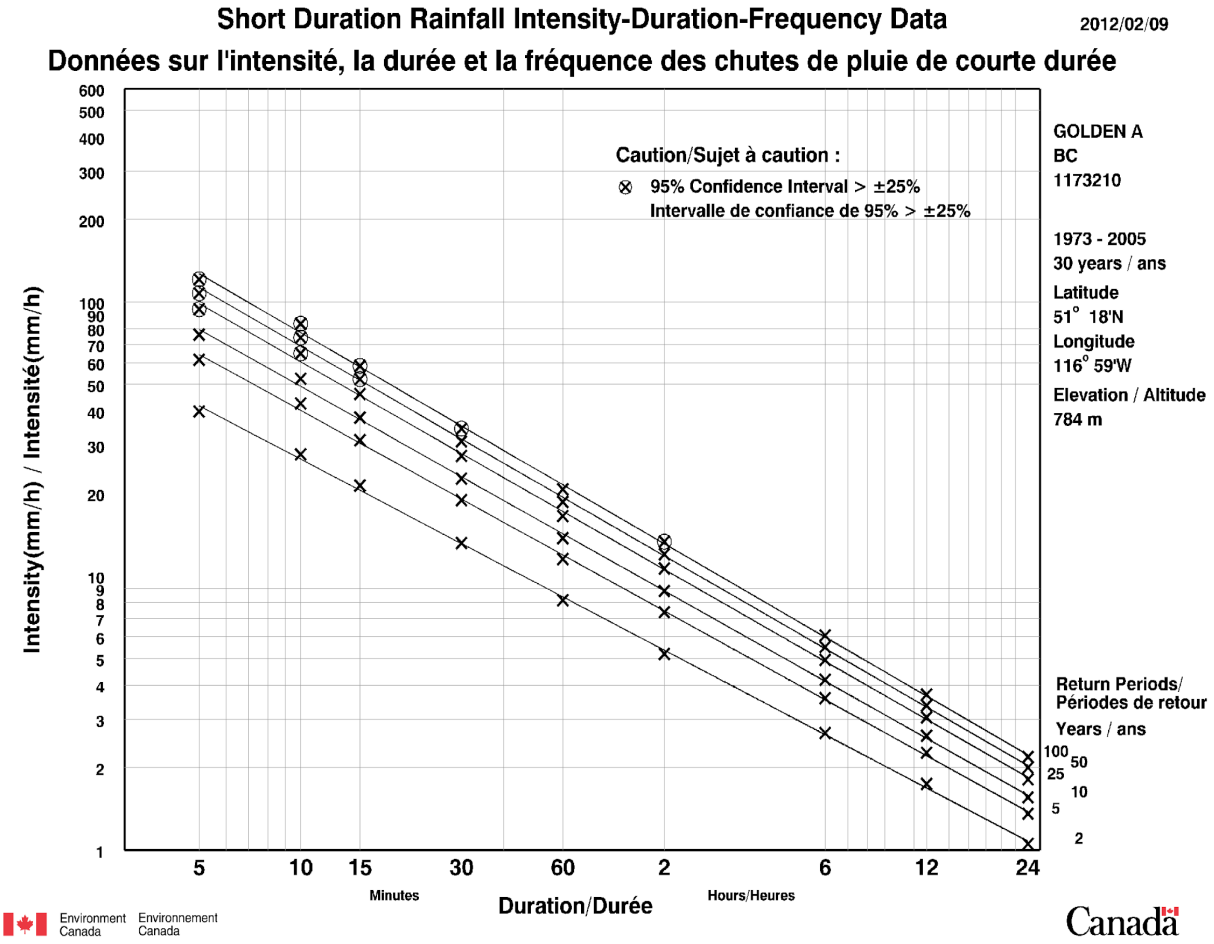


Figure 4. Short duration rainfall IDF data for the 'Golden A' weather station (Government of Canada, 2023b).

Table 2 details the average number of days per month, over a 30-year period (1981-2010), in which precipitation occurred, ranging from 0.2 mm to more than 25 mm, in the Golden, BC area (Government of Canada, 2023a). The occurrence of a precipitation event in which more than 25 mm of precipitation falls within one day is rare, most often occurring in July and August. This trend illustrates the unlikely occurrence of major runoff events at the site.

Table 2: Average number of days per month with precipitation 1981-2010 (Government of Canada, 2023a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
> 0.2 mm	14.6	9.1	9.8	10.6	12.5	15.4	13.7	13.2	10.6	12.1	13.9	13.5
> 5 mm	3.0	1.3	1.7	1.3	2.3	3.2	3.2	3.1	2.5	2.2	3.4	2.7
> 10 mm	1.0	0.48	0.23	0.38	0.58	0.84	1.1	1.0	0.58	0.58	1.2	0.96
> 25 mm	0.0	0.0	0.0	0.04	0.0	0.08	0.12	0.12	0.0	0.0	0.08	0.04

Due to its proximity to Golden in the Columbia valley, the quarry upper site likely has a similar climate with slightly cooler temperatures and marginally higher precipitation than values reported from the Environment Canada weather station ('Golden A') due to the higher elevation of the site (approximately 400 m above the valley). The site is very well drained, and the areas downslope are part of a sizable fluvial deposit as evidenced by the gravel quarry operations below, indicating low environmental risk from surface water.

1.7.5 Hydrology

The quarry is located on top of a ridge on the south side of Horse Creek, which is 342 m north of the site, straight line distance. The only water present on site is from precipitation which directly falls on site but does not pool as the material present at the site is porous. Any precipitation runoff is to the south and west and no significant runoff channels have been documented (Miller, 1989; Golder Associates, 2013). There has been no accumulated water in the pit to date and none is anticipated in the future (Miller, 1989; Golder Associates, 2013).

1.7.6 Vegetation

Ecologically, the quarry footprint and majority of the access road falls within the Montane Spruce – dry cool Columbia (MSdk) biogeoclimatic (BEC) unit (MacKillop, Ehman, Iverson and McKenzie, 2018). The southern portion of the access road (Austin Road) falls within the Interior Douglas fir – dry cool Columbia (IDFdk5) BEC unit. The plant community in the undisturbed areas that surround the quarry footprint most closely resembles the MSdk/105 site series, consisting of Douglas fir and lodgepole pine leading stands and a well-developed herb layer of pinegrass, showy aster and twinflower (MacKillop et al., 2018).

Invasive plant species have been identified throughout the project area, many of which are considered priority invasive species under the BC *Weed Control Act* or by the Columbia-Shuswap Invasive Plant Council. Control of invasive species is detailed in the Vegetation Management Plan.

Chapter 2: Environmental Management System

2.1 Authorship and Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
3	Updated company details. Reformatted version control. Added conveyance and railyard. Separated upper from lower site. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES KES	2023-06-28
2	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-09

2.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2020-09-21

2.3 Overview

The Environmental Management System (EMS) functions as a series of standards that outline the minimum expectations and interrelated processes to effectively control environmental risks and opportunities. These standards and their associated detailed plans, programs and procedures provide the documented framework that supports consistent integration of the EMS into the project. The basis for the environmental management framework is founded on the concept of 'Plan, Do, Check, Act' (PDCA; Figure 5). The PDCA model is an iterative process used to achieve continual improvement in process and performance.

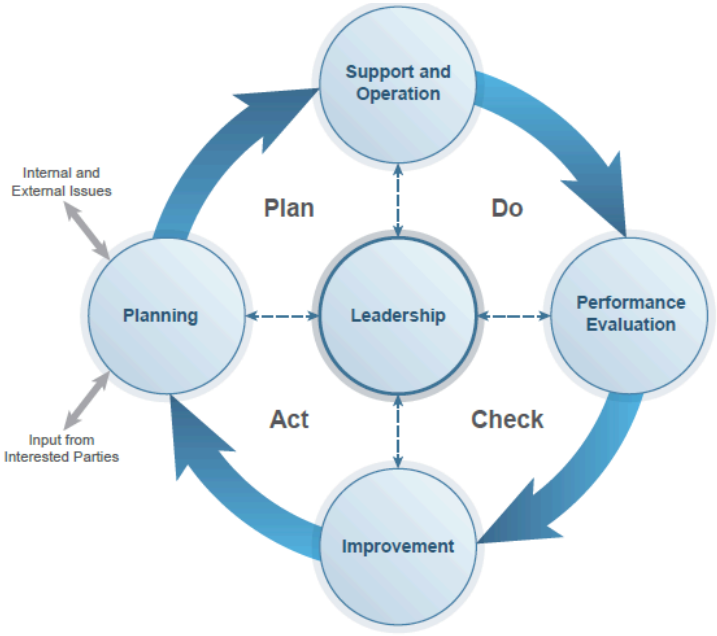


Figure 5. 'Plan, Do, Check, Act' framework.

The **PLAN** phase establishes objectives and processes necessary to deliver results in accordance with Sinova's Environmental Policy. The **DO** phase encompasses the implementation of the EMS process. The **CHECK** phase involves the monitoring and measuring of EMS processes against the Environmental Policy, objectives, compliance obligations, and operational controls, and reporting the results. The **ACT** phase includes taking actions to continually improve.

The EMS guides environmental management across the lifecycle of the project and is progressively developed as the project moves through construction, operations, closure, and post-closure phases. The first stage of the EMS development includes the drafting of Environmental Management Plans (EMP). The EMPs are commitment-based and broad in their level of detail. As the project progresses, the level of detail of the EMPs are expanded upon as more details are known.

The EMS provides the framework, minimum standards, and management processes to manage and monitor potential environmental effects. The scope of the EMS is informed by the needs of interested parties and internal and external risks and considerations that have the potential to affect the project. Each major component of the EMS is summarized in the following sections.

2.4 Planning

2.4.1 Environmental Aspects

This project has the potential to interact with the environment in the following positive ways:

- Contributing to the green energy transition.
- Minimizing emissions through the electrification of extraction activities.
- Reducing dust by using appropriate dust suppression techniques that will not cause harm to the environment.
- Recycling water on site through the primary crushing process to reduce overall water needs.
- Planning appropriately to avoid discharge of effluent to the receiving environment.
- Controlling the potential for negative interactions with wildlife with a well-trained and respectful workforce and through proper waste management that eliminates attractants.
- Promoting long-term ecological restoration through reclamation research focused on an end land use that is based on pre-extraction ecosystems and habitats.

This project has the potential to interact with the environment in the following negative ways:

- Temporarily removing vegetation and soil materials from the landscape.
- Temporarily disturbing wildlife and their habitat.
- Potentially releasing deleterious substances to the environment through spills and incomplete combustion of blasting materials.
- Contributing to greenhouse gas emissions through non-electrified activities.
- Contributing to local environmental concerns (e.g., noise, dust, traffic, etc.).

Table 3. Overview of environmental impacts and their significance.

Area of Activity	Aspect	Impacts	Impact Scoring	Significance
Quarry site	Removal of vegetation and soil materials	Erosion and sedimentation, fugitive dust, invasive species	Likelihood: moderate with controls in place Magnitude: moderate	Medium, short-term

Area of Activity	Aspect	Impacts	Impact Scoring	Significance
Quarry site	Disturbing wildlife and their habitat	Loss of habitat (fragmentation), noise	Likelihood: moderate with controls in place Magnitude: moderate	Medium, short-term
Quarry site	Introducing deleterious substances	Water quality, soil contamination	Likelihood: low Magnitude: low	Low
Quarry site	Contributing to greenhouse gas emissions	Air quality	Likelihood: moderate with controls in place Magnitude: low	Low, short-term
Quarry site	Contributing to local environmental concerns	Air quality, noise, traffic, fugitive dust	Likelihood: is moderate with controls in place Magnitude is moderate	Medium, short-term

Impact Scoring: Likelihood: Continuous (High), Frequent (Moderate), Infrequent (Low), Improbable/Never (No Impact)
Impact Scoring: Magnitude/Severity: Serious (High), Moderate, Minor (Low), No Impact

2.4.2 Legal and Other Requirements

This operation will implement, uphold, and abide by the *Health, Safety and Reclamation Code for Mines in British Columbia* (the Code), the act and applicable regulations. The Quarry Manager will ensure that all employees who supervise workers are familiar with all appropriate parts of the act, applicable regulations, and the Code.

2.4.3 Objectives and Targets

The following is a preliminary list of objectives and targets for the EMS:

1. Improve employee awareness of environmental issues at site by incorporating environmental management issues into safety meetings that are attended by all site personnel.
2. Improve compliance with discharge permit by reviewing and highlighting any noncompliance issues identified in previous reporting. Ensure complete compliance for the current years' report and thereafter.
3. Maintain compliance with all *Mines Act* permit requirements through the first year of operation through careful management of plans and associated requirements. Annual review of compliance/ noncompliance issues will guide new objectives and targets.
4. Maintain compliance with all Code requirements through the first year of operation through careful management and monitoring of requirements and effective reporting. Annual review of compliance/ noncompliance issues will guide new objectives and targets.
5. Minimize risk associated with respirable crystalline silica dust by implementing best management practices and exposure controls and meeting air-borne concentration thresholds specified in the Code. Annual review of monitoring data will guide new objectives and targets.

2.4.4 Environmental Management Program

The environmental management program will be implemented to help achieve the goals and objectives of this EMS (i.e., an action plan), including a description of how Sinova will translate its goals and policy commitments into actions so that objectives and targets are achieved. The environmental management program is intended to be dynamic, such that it can be modified when objectives and targets are modified or added; relevant legal requirements are introduced or changed; substantial progress in achieving objectives and targets has or has not been made; or products, services, processes or facilities change or other issues arise. A summary of the initial objectives and targets for the site is provided in Table 4.

Table 4. Overall objectives and targets of the Environmental Management System.

Action Items	Priority	Responsibilities	Schedule	Resources	Comments
Objective #1: Environmental Responsibility Orientation					
Site personnel orientation	High	Quarry Manager, Site Supervisor/ Shiftboss	Annually, ongoing (as needed)	Safety meeting material, management plans	Cycle through environmental issue awareness, add topics as they arise
Safety meetings	High	Site Supervisor/ Shiftboss	Ongoing	Safety meeting material, management plans	Cycle through environmental issue awareness, add topics as they arise
Objective #2: Water Quality Monitoring					
Compliance with discharge permit	High	Environmental Site Manager	Quarterly, ongoing	Sampling equipment, site access	Authorization number: 108864
Monitoring	High	Environmental Site Manager	Ongoing	Management plans, reporting templates, camera (for site photos)	Ongoing monitoring of operations and receiving environment for potential effects
Adapt	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	As needed	Monitoring results	Adapt operations and controls in response to environmental effects
Objective #3: *Mines Act* Requirements					

Action Items	Priority	Responsibilities	Schedule	Resources	Comments
Compliance with *Mines Act* permit	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Annually, ongoing	Permit document, management plans, consultants/ engineers	Permit number: Q-5-134
Monitoring	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Ongoing	Management plans, reporting templates, camera (for site photos)	Ongoing monitoring of operations and receiving environment for potential effects
Adapt	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	As needed	Monitoring results	Adapt operations and controls in response to environmental effects
Objective #4: Code Requirements					
Compliance with Code requirements	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Annually, ongoing	Access to the Code, training	Code requirements for surface mines
Monitoring	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Ongoing	Management plans, reporting templates, camera (for site photos)	Ongoing monitoring of operations and receiving environment for potential effects
Adapt	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	As needed	Monitoring results	Adapt operations and controls in response to environmental effects
Objective #5: Respiratory Protection					
1	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Annually, ongoing	Management plans, reporting templates, camera (for site photos)	

Action Items	Priority	Responsibilities	Schedule	Resources	Comments
Monitoring	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	Ongoing	Sampling equipment, site access	Ongoing monitoring of operations and receiving environment for potential effects
Adapt	High	Quarry Manager Site Supervisor/ Shiftboss, Environmental Site Manager	As needed	Monitoring results	Adapt operations and controls in response to environmental effects

2.4.5 Management Plans

The following is an inventory of management plans that are required as part of the *Mines Act* permit for the site:

- Open Pit Monitoring and Implementation Plan
- Water Management and Monitoring Plan
- Fugitive Dust Management Plan
- Erosion and Sediment Control Plan
- Soil Management Plan
- Vegetation Management Plan
- Wildlife Management Plan
- Reclamation Research Program

In addition, a Traffic Control Plan is required as part of the Highway Crossing permit.

Access will be granted on request by the Quarry Manager or Site Supervisor/Shiftboss. All site personnel will receive orientation training and a clear explanation of each individual's role and responsibility in the different management plans in place at the site. While not all site personnel will be involved directly in the implementation of the site operational and management plans, all site personnel will be aware that the plans exist and the appropriate person to contact in the event that they observe a potential hazard or emergency.

2.5 Plan Implementation

2.5.1 Roles and Responsibilities

2.5.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry

Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

2.5.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs , the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives.

Specific management responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of environmental management concerns/actions.

2.5.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulations, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies or Indigenous groups on the aspects of this plan.

2.5.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

2.5.1.5 Employees and Contractors

A safety and environmental orientation will be developed for project personnel and contractors and will include all relevant management actions specific to this plan. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of health, safety, and environmental factors on site. Training will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

2.5.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Health and safety requirements and protocols,
- Permit requirements, including management plans and programs,
- Reporting requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of site management plans, all site personnel will be aware that the plans exists and the appropriate person to contact in the event that they observe a potential health, safety or environmental issue during the course of their regular site activities. Records of all training activities will be maintained by the Quarry Manager and copies of certificates/proof of training will remain on site.

2.5.3 Communication

Sinova is committed to maintaining the flow of information with stakeholders, including neighbouring properties, community groups, First Nation governments, local officials and other regulatory agencies, and emergency responders; as well as internally among workers at site.

Internal communication methods may include email, staff meetings, bulletin boards/signage and training. External communication methods may include press releases, website updates and annual reporting.

2.5.4 Documentation and Document Control

This EMS will be reviewed annually, revised as soon and as often as required, and made available at the quarry site at all times. Findings and updates will be included in the Annual Reclamation Report for the site.

Document control will be achieved through the implementation of the following elements:

- Issue/revision dates and version numbers.
- Effective date.
- Approval (i.e., signature).

Site management plans and programs will be reviewed at least annually. The Quarry Manager and Site Supervisor/Shiftboss will be responsible for ensuring that the most recent version of a plan or program is made available to site personnel. All obsolete documents will be removed from site with an electronic version being archived and available via the cloud (if needed). Updating site plans and programs is the responsibility of the Quarry Manager and their consultants.

2.5.5 Operational Control

In addition to training, operational controls will be in place to manage impacts, ensure compliance and achieve environmental objectives.

2.5.5.1 Safe Work Procedures and Standard Operating Procedures

All Safe Work Procedures (SWPs) and Standard Operating Procedures (SOPs) will be provided by the contract miner and maintained on site.

2.5.5.2 Health and Safety Program

All site personnel will participate in a facilitated review (annually) of the Health and Safety Program (HSP). The HSP is a stand-alone document and will be maintained on site. All site personnel are expected to abide by the HSP at all times.

2.5.5.3 Environmental Management Plans

All site personnel will participate in a facilitated review (annually) of the Environmental Management Plans (EMP) associated with the *Mines Act* permit for the site. Copies of the Environmental Management Plans will be maintained on site. All site personnel are expected to abide by all EMPs at all times.

2.5.6 Emergency Preparedness/Response

All site personnel will review (annually) and abide by the Mine Emergency Response Plan (MERP). The MERP will be maintained on site and will be kept in all site vehicles for quick reference in an emergency situation.

2.6 Checking/Corrective Action

2.6.1 Monitoring and Measurement

Monitoring and measurement criteria are contained within each of the environmental management plans required under the *Mines Act* permit for the site. The results of these programs will be compared to the objectives and targets stated in this EMS to monitor overall success in meeting environmental commitments.

2.6.2 Nonconformance, Corrective, and Preventative Action

Sinova will implement the following key steps to identify and address problems associated with the implementation of this EMS or component management plans for the site:

- Identify and document the problem.
- Investigate to identify and document the root cause.
- Come up with a solution.
- Implement the solution.
- Document the solution.
- Communicate the solution.
- Evaluate the effectiveness of the solution.

The Quarry Manager, Site Supervisor/Shiftboss and Environmental Site Manager all have a responsibility in ensuring the EMS and management plans are functioning effectively and as intended.

2.6.3 Records

Records of compliance with the Code, the *Mines Act* permit and the discharge authorization for the site will be recorded on an ongoing basis, with reports being submitted annually. Records of [non]compliance will be maintained electronically and submitted to the Quarry Manager and Environmental Site Manager. All records and reports will be maintained for the life of the quarry. A copy of the Annual Compliance Status Report and associated tracking table, summarizing all noncompliance issues for the previous year, will be maintained on site.

2.7 Evaluation and Adaptive Management

Sinova is committed to auditing all parts of the EMS at least annually. Results should identify trends or patterns in EMS deficiencies which will be corrected in a timely fashion. All results and corrective actions will be documented, as outlined in Section 6.2. Information that will be considered in the management review may include:

- Audit results.

- Internal suggestions.
- External communications.
- Progress towards objectives and targets.
- Other environmental performance measures.
- Reports of emergencies, spills, other incidents.
- New or modified legislation and regulations.
- New scientific/technical data.

Sinova will implement adaptive management practices to ensure the continual improvement of management plans and mitigation measures, such that they are consistently meeting or exceeding performance targets. This will be achieved through periodic reviews of the EMS and EMPs and informed by the results of the monitoring programs.

Chapter 3: Water Resource Management Plan

3.1 Authorship and Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
4	Annual Review - Updated Figure	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
	Updated company details. Reformatted version control. Separate upper from lower site. Expanded baseline. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES KES	2023-04-26
3	HiTest updated to Sinova Quartz	Jessica Lowey, PAg Michael Keefer, PAg	KES	2022-02-8
2	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg	KES	2020-08-31

3.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2020-09-21

3.3 Purpose/Objectives and Scope

This plan is for the Permitted portions of the project only. The intent is to enable safe and efficient extraction while preventing adverse effects in the aquatic receiving environment, encompassing water quality, water quantity and aquatic life. The receiving environment for the project is Horse Creek, which is situated to the north of the site and drains west into the Columbia River. Horse Creek parallels the site access road for approximately 400 m, from the active gravel pit towards the intersection of Austin Road and Horse Creek Road. This plan provides strategies and mitigation measures for the ongoing management of water resources at the site and is based on guiding principles outlined in the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (MoE, 2016), the *Water Sustainability Act,* and follows the ambient water quality guidelines for aquatic life, wildlife, and agriculture.

The plan is designed to fulfill the guidance provided by provincial and federal statutes and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for water resource management.

The performance objectives of the plan are to:

- Enable safe and efficient extraction while preventing adverse effects in the receiving environment.
- Ensure the continued assessment of ambient surface water conditions (see Discharge Permit #108864), including the use of detection limits comparable to water quality standards and a suitable QA/QC program.
- Track changes to surface water quality such that early warning about an increase in contaminant loading is possible.
- Intercept and divert runoff from the quarry site and access road away from natural catchments or the receiving environment, to the extent possible.
- Implement monitoring plans to allow for the development of adaptive management strategies as required.

Aspects of water management and monitoring that are not applicable to the site currently include groundwater and seepage quality and quantity. If either of these aspects of water management and monitoring are encountered at the site as extraction progresses, this plan must be updated with written approval of the Chief Inspector.

3.4 Baseline Data

The Mine Plan (Golder Associates, 2013) recommended that a hydrogeological study be completed to confirm the assumptions of the groundwater conditions; the study could be conducted at the same time as the drilling of the exploration drill holes. In 2023, a Qualified Professional conducted an assessment of the area, to expand and update baseline data regarding surface water and ground water movement and

composition. The next revision of this plan will include updated data as well as recommendations from the hydrogeologist to mitigate against receiving environment concerns, if applicable.

3.4.1 Surface Water

The quarry upper site is situated on the top of a ridge on the south side of Horse Creek. There are no significant surface or groundwater sources entering the site; the only water source is precipitation. Precipitation runoff can occur to the south and west although no established runoff channels have been observed to date. The original Reclamation Plan (Nugget, 1989) indicated that there were no accumulations of water in the quarry pit (Golder Associates, 2013); further site visits by KES in 2015 following a substantial rain event rendered the same observations. Subsequent site visits by KES during spring freshet (April 2023) found the site to be largely dry with minor pooling from snow melt in the center of the pit. The spring 2023 visit also observed minor volumes flowing in some sections of access road drainage ditches, however many sections were dry and there was no evidence of surface run-off towards Horse Creek, including at the point where it is nearest to the access road. For these reasons, minimal runoff is expected from the site.

3.4.2 Groundwater

No groundwater has been encountered to date at the site. There is an aquifer (reference number 600) located approximately 1,500 m downslope (shortest straight-line distance) from the quarry site, which services 17 domestic water wells. The aquifer's easterly boundary is defined by the bedrock geology, confirmed by water well records; the west boundary is defined by the Columbia River; and north and south boundaries are also defined by water well records. The aquifer is approximately 2.4 km^2 and generally flows from the east towards the valley bottom (Province of British Columbia, 2003). The depth to static water level ranges from 1.2 to 22.86 m (4 ft to 75 ft). The sediments overlying the aquifer are sandy and silty sediments from the Horse Creek alluvial fan which overlies older fan sediments of sand and gravel. The aquifer occurs in the permeable zones within the alluvial fan and glaciofluvial sediments at the mouth of Horse Creek on the east side of the valley. The aquifer is classified as IIA with a ranking of 10 due to a moderate level of development and a moderate to high vulnerability to contamination. The protective layer above the aquifer appears not to be continuous. The average thickness of the confining layer is 10.36 m (34 ft), with a maximum of 27.4 m (90 ft). Well recharge is probably from infiltration from Horse Creek and from infiltration of precipitation (Province of British Columbia, 2003).

3.4.3 Water Quality

While Horse Creek does not have any publicly available fish observation points, the Columbia River, into which Horse Creek flows, contains a diversity of native and introduced fish species. As a tributary of such an important fish-bearing river it is important that Horse Creek maintains acceptable water quality for aquatic life. Baseline receiving environment water quality monitoring of Horse Creek has been conducted quarterly by KES since 2018 to meet the requirements of Discharge Permit #108864 issued under the *Environmental Management Act*. In-situ field parameters are measured using a YSI ProDSS Multiparameter Digital Water Quality Meter. Water quality samples are collected upstream and

downstream of the upper pit. Once collected, samples are preserved in a cold cooler, mailed the afternoon of the collection date to arrive at the laboratory for analysis for the following morning.

Based on the results of the *in-situ* field parameters, pH values fall within the 6.5-9.0 pH range for the freshwater environment which indicate a stable condition (i.e., unrestricted change is permitted) according to the BC Approved Water Quality Guidelines (ENV, 2019), and the DO (mg/L) values meet the instantaneous minimum water quality guidelines for all life stages of aquatic life (Province of British Columbia, 1997). Further, recorded temperatures values fall within all acceptable ranges for aquatic life (Province of British Columbia, 2001). In addition to field parameters, samples were collected and analysed for conventional parameters, major ions, nutrients, and total and dissolved metals. No exceedances in water quality guidelines have been observed during laboratory or field analysis from 2018-2022. Results are detailed in Annual Reclamation Reports for those years.

The geochemistry of the deposit is considered very pure with 99.8% silica and only trace mineral oxides (Al_2O_3, BaO, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, P_2O_5, SiO_2, TiO_2, and SrO) (Chen, 2013). This composition does not warrant species handling or storage of waste materials and there will be minimal processing on site (i.e., primary crushing), resulting in low risk of groundwater contamination from these sources (HiTest Sand Inc., 2013). .

3.4.4 Water Licence

Water will be used on-site for processing ore (again, consisting solely of washing of rock for dust control) and mitigating fugitive dust (see Fugitive Dust Management Plan for additional details). Sinova Quartz is currently awaiting approval for a water licence (application tracking number: 100346542, submitted April 30, 2021). The application for a licence requested 19 m3/day year-round for processing (e.g., crusher) and 56 m3/day year-round for drilling and transportation or utility corridor management (i.e., dust control). Upon approval, water will be drawn from the well and transported to the crusher and wash plant via hose pipe (pending construction). Water will also be transported via water truck to be used for dust control on the roads and stockpiles as needed. The source of water is a 20 foot well located beyond the security gate (Parcel ID: 012-732-702; Latitude 51.2079609 Longitude: -116.8909175). No well construction report exists for this well; personal communication estimates the drilling date to be in the 1970s.

3.4.5 Water Management Infrastructure

The high-grade ore will be extracted and undergo only minor processing (i.e., crushing) before transport offsite. Dams, settling ponds, discharge structures, spillways, tailings management facilities or associated infrastructure, and species handling or storage of waste material are not needed or planned for the site. The only water management infrastructure on site are drainage ditches along the access road to maintain safety by preventing washouts. Road expansion and maintenance will occur in 2023 and has been designed to prevent unauthorized discharges towards Horse Creek. Observations by KES (spring freshet, 2023) observed that road drainage ditches were effectively sized to contain run-off generated by peak snow melt.

3.5 Site-Specific Mitigation Measures

Surface water quality sampling will be conducted quarterly to monitor for potential adverse impacts in the receiving environment (Horse Creek) from the site. This sampling schedule is a condition of Permit 108864 issued under the provisions of the Environmental Management Act. Sampling will occur at two locations: one upstream of the quarry site and one downstream of the quarry site. Sampling at each location will include in situ measuring of field parameters with a water quality sampling meter (YSI) and sending water samples to an accredited laboratory for analysis of conventional parameters, major ions, nutrients, as well as total and dissolved metals. Additionally, monitoring of ditch lines, stockpiles, and surface runoff channels (if identified) will be monitored daily during rain events and periods of substantial snowmelt. This will ensure that no unauthorized discharges to the receiving environment occur from the site.

Nitrogen-based explosives are to be used at the site by a third-party contractor with storage offsite. If full detonation does not occur, nitrates can enter contact water and have the potential to negatively impact aquatic life. Receiving environment surface water and any other water that may occasionally accumulate in the pit areas from precipitation will be monitored to characterize any potential increase in nitrogen levels following blasting. Blasting will not occur during rain events to help reduce the likelihood of nitrogen contamination of water at the site.

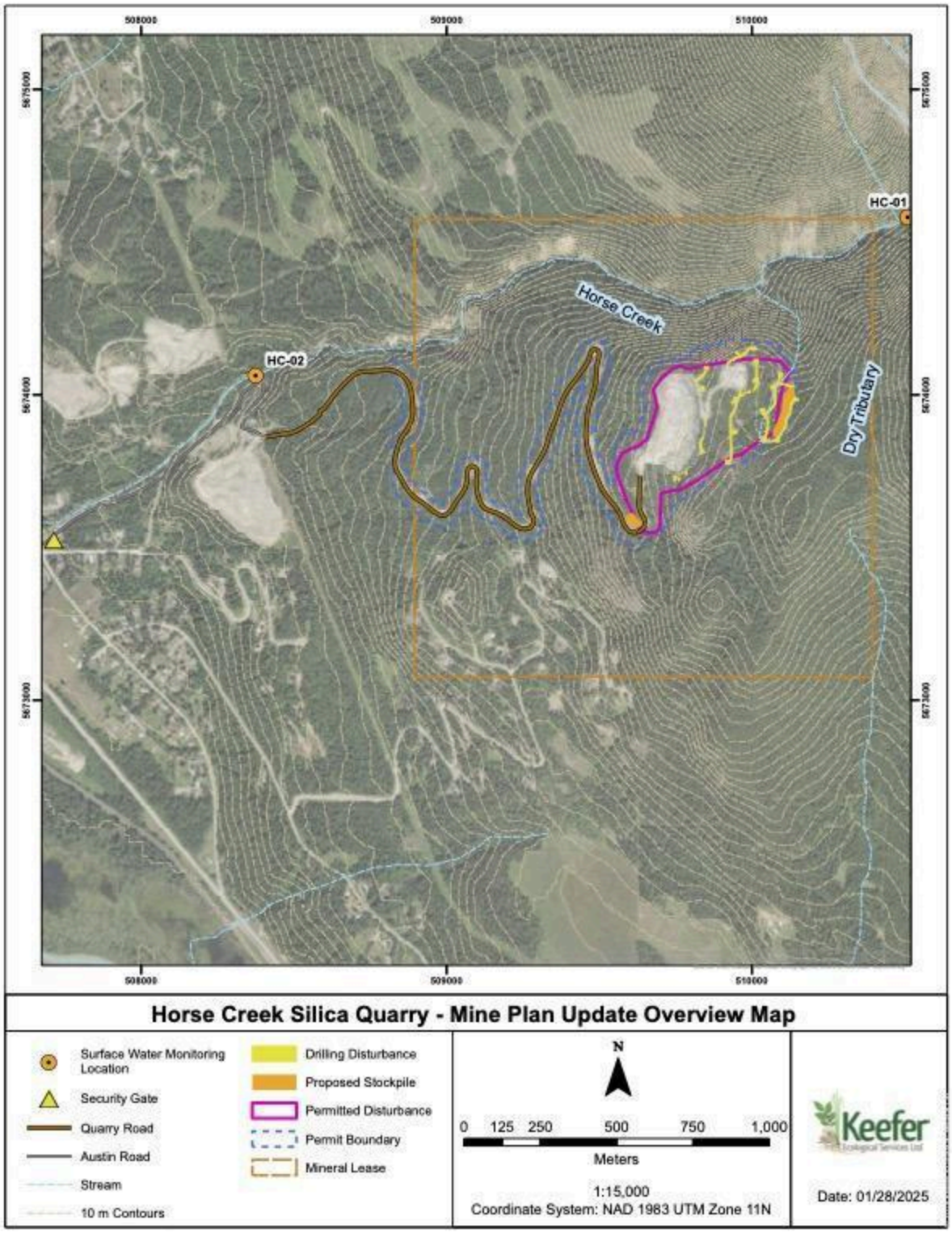
The site-specific mitigation measures for the project area detailed below and relate directly to the Trigger Action Response Plan (TARP; Section 3.8). In general, the following site-specific mitigation measures will be implemented:

- Surface water samples will be collected quarterly from Horse Creek and sent to an accredited laboratory for analysis.
- Sample collection, including the submission of QA/QC samples, will follow the procedures outlined in the most recent version of the BC Field Sampling Manual (Province of BC, 2013).
- QA/QC procedures will include obtaining in-house QA/QC data from the analytical laboratory in addition to submitting field duplicates for each parameter sampled at each monitoring site and each monitoring period.
- Additional sampling of contact water (e.g., runoff or pooling water) will be conducted on an as needed basis if concerns are identified by the Environmental Site Manager or other site personnel.
- Sinova will ensure the samples submitted for analysis are tested using standard methodologies with sufficient detection limits to meet BC Water Quality Guidelines.
- Sampling will be sufficient to track changes to surface, seepage and groundwater quality and quantity, although seepage and groundwater are not expected at the site.
- Sampling will also be sufficient to provide early warning about acid rock drainage (ARD; not expected at the site) or contaminant loading (e.g., from blasting, fueling).
- Blasting activity may pose a risk through contaminant loading (nitrates) if full detonation does not occur; to mitigate this risk, blasting will not be scheduled during rain events.

- Fueling and the maintenance of extraction equipment will occur only in designated areas which will be equipped with appropriate spill-response equipment. Any spills that exceed the reporting threshold (see the BC Spill Reporting Regulation) will be reported to the appropriate authorities.
- Sinova will maintain a dedicated database for all water quality sampling results. This database currently exists to maintain and compare quarterly surface water sampling in Horse Creek (2018-present).
- All surface water quality results will be reported annually to the Ministry of Environment and Climate Change Strategy (ENV) and EMPR. Observations of seepage and/or groundwater influence at the site will be recorded, if needed, and the plan updated to address these water resources.

3.6 Site Maps

Figure 6 displays the receiving environment surface water sampling locations HC-01 (E312550) upstream of the site and HC-02 (E312551) downstream of the site associated with the *Environmental Management Act* permit for the site (permit no. 108864). These monitoring locations continue to be monitored as part of the permit requirements and have been since 2018.


508000
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HC-01
HC-02
Horse Creek
Dry Tributary
Horse Creek Silica Quarry - Mine Plan Update Overview Map
Surface Water Monitoring Location
Security Gate
Quarry Road
Austin Road
Stream
10 m Contours
Drilling Disturbance
Proposed Stockpile
Permitted Disturbance
Permit Boundary
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0 125 250 500 750 1,000
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Coordinate System: NAD 1983 UTM Zone 11N
Keefer
Date: 01/28/2025

Figure 6. Surface water sampling locations.

3.7 Plan Implementation

3.7.1 Roles and Responsibilities

3.7.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

3.7.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups through their designated representatives for permitting as well as invasive species or native vegetation issues.

Specific water resource management responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of water resource management concerns/actions.

3.7.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific water resource management responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors water resource management concerns/actions.

3.7.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

3.7.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include the water resource management actions specific to Project activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of water resources and the avoidance of unauthorized discharges from the site. A current map of all nearby water courses and on-site water management infrastructure (e.g., ditches, culverts) and training will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan;
- Gain and maintain competency through training and awareness programs.

3.7.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Current water resource management concerns within the project area;
- Reporting requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential water resource management concern during the course of their regular site activities. Sinova will provide all site employees or contractors with updated maps indicating areas of concern with respect to water resource management (e.g., water courses, ditches, culverts).

3.7.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the plan, to ensure that effects of extraction activities are mitigated in a timely manner. The following monitoring and maintenance procedures will be in place:

- Quarterly receiving environment (Horse Creek) surface water sampling.
- Pre-construction surveys will be completed prior to ground disturbance at the site to identify any defined or suspect runoff channels.
- Regular inspection of the pit walls for seepage. If such a hazard is identified, an update to this plan must be made and mitigation measures put in place.
- As needed water resource monitoring to capture potential effects to water resources related to blasting or rainfall/snowmelt events.

This plan will be reviewed and updated at least annually.

3.8 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 5.

Table 5. Trigger Response Action Plan for water resource management throughout the project area.

Level of Risk	Trigger	Action/Response

Normal	Clearing and construction of site features	• Environmental monitor to perform pre-construction survey • Documentation of any concerns or watercourses (including runoff channels) found, track walked, support of decision to allow commencement of work activities
Level 1	Water ponding on site	• Consult with Quarry Manager on need for investigation, control, or testing • Quarry Manager to investigate potential drainage works to restore existing drainage characteristics with advice from a QP • Maintain record of decision-making process and mitigations applied
Level 2	Erosion	• Consult with Quarry Manager on need for investigation, control, or testing • Quarry Manager to obtain QP advice on appropriate remediation measures • Maintain record of decision-making process and mitigations applied
Level 3	Potential impact to downstream water quality	• Environmental monitor to document potential impact, source, and extent • Quarry Manager to obtain QP advice on appropriate control and/or remediation measures • Report incident to appropriate authorities as listed in the MERP

3.9 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant on-site communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

3.10 Adaptive Management

Sinova will work towards continual improvement of water resource management at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased monitoring frequencies;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures; and/or
- Additional supervisory oversight.

Chapter 4: Fugitive Dust Management

4.1 Authorship and Version Control

Version #	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
5	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
	Updated company details. Reformatted version control. Separated upper from lower site. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES	2023-05-11
4	HiTest updated to Sinova Quartz	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-02
3	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg Jeff Lundgren, MSc	KES KES RWDI AIR Inc.	2021-03-05

4.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2021-03-05

4.3 Purpose/Objectives and Scope

The intent of this plan is to ensure that work conducted at the site is carried out in such a way that minimizes adverse effects to the receiving environment through the creation, transportation and deposition of fugitive dust generated at the site. This plan provides strategies and mitigation measures for the ongoing management of fugitive dust sources at the site. Minimizing fugitive dust emissions at the source will have a combined benefit of protecting the health and safety of workers as well as protecting the environment and minimizing long-term impacts.

The plan is designed to fulfill the guidance provided by provincial and federal statutes and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for fugitive dust management.

The performance objectives of the plan are to meet the established ambient air quality objectives (AAQO) currently in effect provincially and nationally (Table 6). Ambient air is outside of the occupational

workplace; separate air quality guidelines and standards exist for the occupational workplace, as addressed in the Health, Safety and Reclamation Code for Mines in BC (Table 7).

Table 6. Summary of ambient air quality objectives currently in effect relative to the site.

Contaminant	Averaging Period	Air Quality Objective (AQO) µg/m³	Air Quality Objective (AQO) ppb	Source
Particulate Matter <2.5 microns ($PM_{2.5}$)	24-hour	25	-	Provincial AQO
		27	-	2020 CAAQS
	Annual	8	-	Provincial AQO
		8.8	-	2020 CAAQS
Particulate Matter <10 microns (PM_{10})	24-hour	50	-	Provincial AQO
Total Suspended Particulate (TSP)	24-hour	120	-	NAAQO
	Annual	60	-	NAAQO

CAAQS – Canadian Ambient Air Quality Standard
NAAQO – National Ambient Air Quality Objective

Table 7. Summary of Mines Act air quality thresholds.

Substance [CAS #]	Threshold Limit Value-Time Weighted Average (TLV-TWA)	Notes
Silica – Crystalline α-Quartz [14808-60-7]	0.05 mg/m³ per 24-hours	A2 – suspect human carcinogen (ACGIH) – carcinogenic to humans (IARC)

4.4 Fugitive Dust Source List

A list of fugitive dust sources found at the site are presented in Table 8, with more detailed descriptions provided in the following subsections. Currently, average discharge rates for each fugitive dust source identified in Table 4 have not been determined, however maximum amounts will remain under the Provincial AQO, 2020 CAAQS, and NAAQO standards shown in Tables 6 and 7.

For each point-source discharge stack height (m), stack top inside diameter (m), elevation of stack base (m above sea level), stack gas exit velocity (m/s), and stack gas discharge temperature are not applicable, and therefore have not been provided in this plan; quarry operations will be 100% powered by hydro electricity.

Table 8. Fugitive dust sources, locations, and materials.

Identifier	Location(s)	Potential Source	Material	Comments	Discharge Location
Open pit extraction	Upper and lower pits	Drilling, blasting, materials handling, transportation of ore rock	Road dust, aggregate	Encompasses all pit operations	Lower pit: 51.2163°, -116.8605° Upper pit: 51.2178°, -116.8577°
Quarry site roads	Extension of Austin Road, along Austin Road to Highway 95	Movement of mobile equipment	Road dust		51.2136°, -116.8683°
Portable primary crusher	TBD	Materials handling (dumping, crushing), transfer points, drop point	Aggregate	Includes all components of the portable primary crusher	51.2094°, -116.8942°
Coarse rock stockpile	TBD	Drop point, wind erosion from stockpile	Aggregate	Dust generation is a function of drop distance	Approximate: 51.2096°, -116.8936° / 51.2158°, -116.8612°
Soil stockpiles	TBD, perimeter of pit area	Wind erosion of dry, sparsely or unvegetated stockpiles	Soil, aggregate (overburden)	This source should be short-lived as stockpiles are expected to revegetate quickly	Approximate: 51.2096°, -116.8936° / 51.2158°, -116.8612°
Land clearing	Various	Soil disturbance	Road dust, airborne soil	Includes all construction activities	Approximate: 51.2180°, -116.8570° / 51.2141°, -116.8707°

4.4.1 Open Pit Extraction

Pit operations have the potential to create fugitive dust emissions through drilling and blasting, materials handling (loading) and transportation by heavy equipment and vehicles.

4.4.2 Quarry Roads and Mobile Equipment

Mobile equipment sources consist of various vehicles used at the quarry site. These include haul trucks used to transport material from the pit to the primary crusher, dozers, front end loaders, graders, and passenger vehicles. Dust generation will typically become greater as the road base materials (overburden rock) ages, is pulverized by traffic and dries out during periods of warm weather.

4.4.3 Portable Primary Crusher

Operation of the portable primary crusher can generate dust when rock is dumped directly into the feed bin, from the crushing process, from transfer points on the feed and return conveyors, and from the drop off end of the conveyor.

4.4.4 Coarse Rock Stockpile

Dust emissions from the open surfaces on a conical stockpile due to wind erosion will depend on the following factors:

- Age of the material in the pile.
- Moisture content of the crushed rock on the surface of the pile.
- Precipitation.
- Wind speed; and
- Time of the year.

The majority of the outer surface of the stockpile is composed of coarser material due to gravity separation and will therefore be resistant to the effects of wind erosion. As a result, fugitive dust emissions from the coarse ore stockpile will primarily be associated with wind erosion at the ore drop from the conveyor to the top of the pile. In addition to the factors listed above for the pile itself, dust emission levels from the ore drop onto the pile will also depend on the drop distance (i.e., height of the pile).

4.4.5 Soil Stockpiles

Soil stripped from construction areas will be stockpiled for future use in reclamation as this is a best practice and is required by the *Mines Act* permit for the site. The natural moisture content of native soils will mitigate against any such dust generation in the short-term; however, when these soils dry out over time, they can become more susceptible to wind erosion. Revegetation of soil stockpiles will reduce the potential for wind erosion, although a temporal lag exists.

4.4.6 Land Clearing, Grubbing and Stripping

As vegetation is cleared from construction areas or as earthworks projects are undertaken, soil materials have the potential to become airborne.

4.5 Update to Source List Procedure

The plan and source list (Table 8) will be reviewed annually and updated on an as needed basis. Any new non-point sources identified to be generating dust will be managed immediately using dust control measures that are appropriate to the source type. The fugitive dust source will then be added to this plan and included in the source list during the annual review and update. Similarly, areas reclaimed with vegetation cover in a given year, may be removed from the source list during the subsequent review and update.

4.6 Fugitive Dust Management

4.6.1 Site-Specific Mitigation Measures

To the maximum extent possible, Sinova will conduct qualitative monitoring through visual observations using a permanent on-site camera at a Sinova-owned basic weather station. Short-term weather forecasting and seasonal trends will be used to proactively identify and implement appropriate dust suppression measures prior to potential dust events on a daily, weekly, and seasonal basis. If needed, Sinova may implement dustfall sampling/monitoring to address nuisance dust concerns (e.g., from visible dust plumes) and establish a non-continuous, filter-based sampling of PM2.5 and PM10 concentrations at locations determined in consultation with subject matter experts and the appropriate government agencies.

Site-specific mitigation measures for the Project area detailed below and relate directly to the Trigger Action Response Plan (TARP; Section 4.9). In general, the following site-specific mitigation measures will be implemented.

4.6.2 Open Pit Extraction

The Site Supervisor/Shiftboss or Site Environmental Manager will visually monitor pit activity and implement mitigation measures as necessary which may include the following:

- Watering of ramps and haul roads within the pit area to control dust generation.
- Water lubrication of blast hole drilling.
- Timing of blasting, particularly in exposed areas near or above the pit rim, for calm days or calm periods of the day, or use of delay blasting techniques.
- The use of blasting mats to suppress dust emission.

4.6.3 Quarry Roads and Mobile Equipment

The Site Supervisor/Shiftboss or Site Environmental Manager will visually monitor quarry road activity and implement mitigation measures as necessary which may include the following:

- A water truck will be utilized to water all quarry roads.
- Regular watering of site roads, particularly during summer dry periods.
- Alternate dust control measures, such as the application of a chemical dust suppressant (e.g., chloride salts, resins), may be considered on high traffic access roads for longer duration effectiveness. Considerations to this approach include: avoiding/minimizing impacts to the

receiving environment, low toxicity to aquatic life, cost, chemical composition, and effectiveness of the product.

- Impose and enforce speed limits on all quarry roads to minimize the effects of dust generation.
- Design and construct roads with the goal of keeping dust levels as low as reasonably achievable. This may include the use of coarser aggregate material on haul roads and/or pavement of high traffic areas close to residential areas.

4.6.4 Portable Primary Crusher

All components of the portable rock crushing plant including the pollution control equipment must be complete and in operation at all times while there is dust generation from the plant. The water spray system must be completely operational whenever crushing is occurring and must not generate surface runoff. The Site Supervisor/Shiftboss or Environmental Site Monitor will visually monitor the portable rock crushing plant for fugitive dust generation. Mitigation measures may include:

- Increased flow rate through the water spray system and/or installation of additional water spray nozzles.
- A chemical dust suppressant may be considered where water cannot be used or is not effective, such as during winter conditions.
- A fog cannon to knock down suspended fugitive dust.
- Establishment of windbreaks around processing equipment.
- Minimizing processing activity during periods of high wind.

4.6.5 Coarse Rock Stockpile

The water spray system listed above in Section 4.1.3 to control dust from the primary crusher also assists in minimizing dust generation from the conveyor drop onto the coarse rock stockpile by increasing the moisture content of the crushed rock. The following additional measures are in place to control fugitive dust generated by the conveyor drop:

- Operational procedure to reduce the distance the rock drops from the conveyor to the stockpile.
- Engineering controls to enclose or barricade (e.g., wind fencing) the drop point, if possible.

4.6.6 Soil Stockpiles

The natural moisture content of native soils will mitigate against any dust generation in the short-term, until these materials dry out at which point they will become more susceptible to wind erosion but only if non-vegetated. Soil stockpiles are located at highly visible areas around the quarry property and are therefore monitored throughout the day by employees (See ‘Training’ Section 6) working near or travelling through such areas. The Site Supervisor/Shiftboss or Environmental Site Manager will also visually monitor soil stockpiles and undertake mitigation measures as necessary which may include the following:

- Revegetation of soil stockpiles as soon as practical, as per Sinova’s Erosion and Sediment Control Plan, to minimize both wind and water erosion.
- Exposed soil stockpiles subject to erosion from the wind or water in the short-term may be tarped. Stockpiles may also be wetted, but only in a controlled manner with sediment erosion control measures in place to avoid release.

- Wind fences or barriers may also be erected around soil stockpiles to mitigate against dust generation.

4.6.7 Land Clearing, Grubbing, and Stripping

The natural moisture content of in-place native materials will mitigate against dust generation. The Site Supervisor/Shiftboss or Environmental Site Manager will visually monitor activity and implement mitigation measures as necessary which may include:

- Complete clearing, grubbing, and stripping activities on an area by areas basis in as efficient a manner as practical such that work is completed on fresh materials and not allowed to dry out unnecessarily.

4.7 Site Maps

Figure 7 displays the fugitive dust sources associated with the site, including the existing pit, the access road, and the proposed soil stockpile locations (Golder Associates, 2013). The figure also displays the nearest sensitive receptor locations for the quarry and adjacent community.

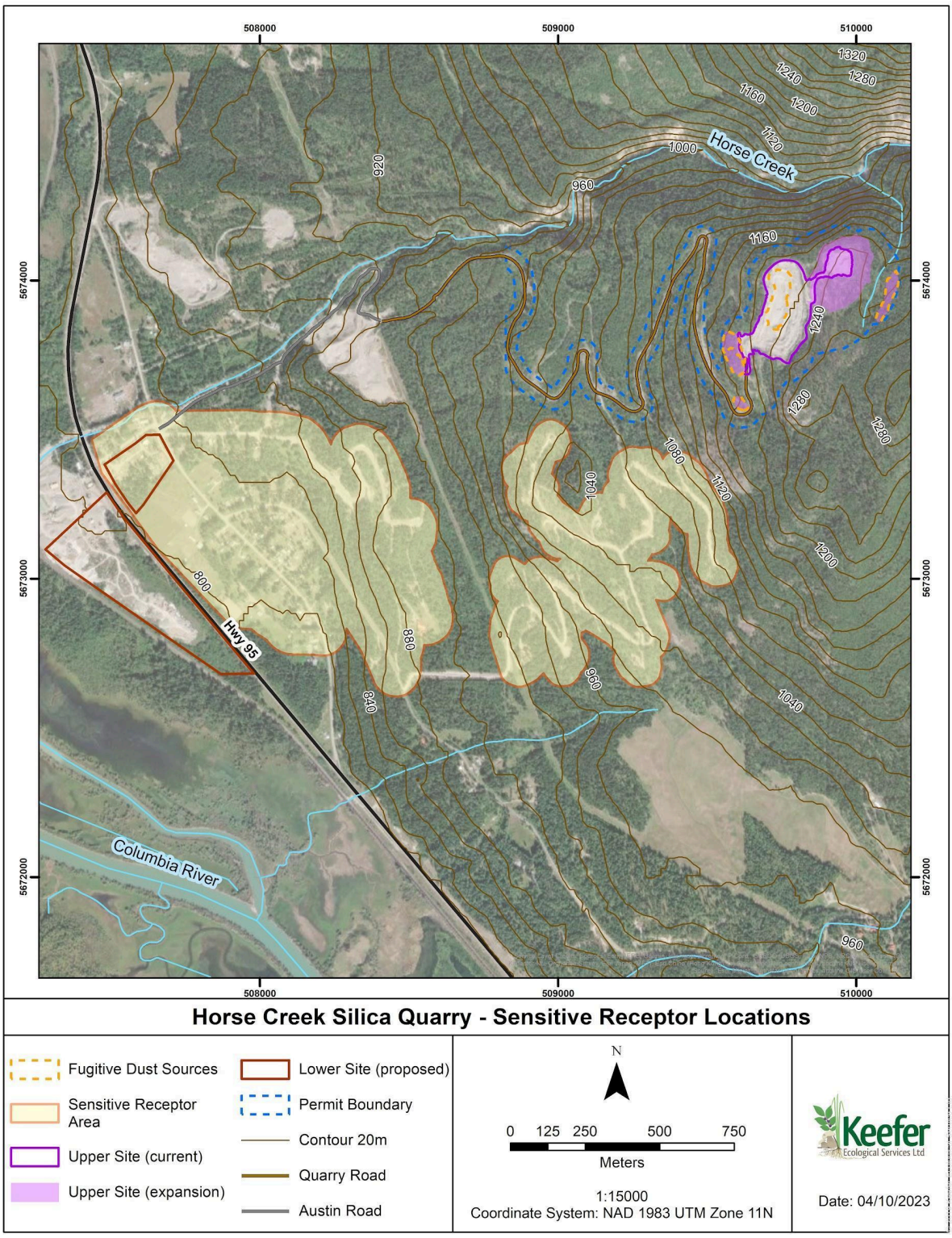

508000
509000
510000
5674000
5673000
5672000
Horse Creek
Hwy 95
Columbia River
920
960
1000
1040
1080
1120
1160
1200
1240
1280
1320
800
840
880
Horse Creek Silica Quarry - Sensitive Receptor Locations
Fugitive Dust Sources
Sensitive Receptor Area
Upper Site (current)
Upper Site (expansion)
Lower Site (proposed)
Permit Boundary
Contour 20m
Quarry Road
Austin Road
N
0 125 250 500 750
Meters
1:15000
Coordinate System: NAD 1983 UTM Zone 11N
Keefer Ecological Services Ltd
Date: 04/10/2023

Figure 7. Sensitive receptor locations for nuisance fugitive dust from potential stockpile sources.

4.8 Plan Implementation

4.8.1 Roles and Responsibilities

4.8.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

4.8.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs and permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups through their designated representatives, for permitting as well as invasive species or native vegetation issues.

Specific fugitive dust management responsibilities include:

- Ensuring the implementation of this plan.
- Where and if possible, assess local wind patterns on site for lee areas or wind speed up areas and plan activities accordingly (e.g., place soil stockpiles in naturally wind sheltered areas).
- Ensuring all site personnel are competent through training and awareness programs and adhere to all dust management protocols; and
- Keeping records of communication to employees and contractors of fugitive dust management concerns/actions and relevant weather forecast information.

4.8.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation.
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific fugitive dust management responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors of fugitive dust management concerns/actions and relevant weather forecast information.

4.8.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to the government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by the government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

4.8.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel, contractors, and visitors and will include the fugitive dust management actions specific to quarry activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of fugitive dust sources on site. A current map of all fugitive dust sources will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan;
- Gain and maintain competency through training and awareness programs.

4.8.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Identified fugitive dust sources within the project area,
- Operational requirements, including weather forecast and soil stockpile monitoring; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential invasive plant species occurrence during the course of their regular site activities. Sinova will provide all site employees or contractors with updated maps indicating areas of concern with respect to fugitive dust management.

4.8.3 Monitoring and Maintenance

The aim of the monitoring program is to control and assess the potential impacts of fugitive dust from extraction activities on the receiving environment through early detection of air quality conditions deemed to be unacceptable with the criteria set out by provincial and federal authorities (Table 6, Table 7), and provide escalating actions and responses to effectively manage fugitive dust emissions.

The weather at the site will have an impact on the dust generated at the site and its subsequent impact on sensitive receptors nearest the site (Figure 7). Dust generation is influenced by wind speed and recent precipitation, whereas the impacts to the receiving environment are influenced by wind direction. The upper site is located uphill (northwest) of a residential area, with prevailing winds most commonly originating from the southwest. However, impacts are still possible with frequent changes in wind direction in mountainous terrain. As such, Sinova will install a basic weather station at the site that reports (at a minimum) wind speed and direction, temperature, and measured precipitation. The weather station will be equipped with an on-site camera to record fugitive dust emissions and subsequent atmospheric movement. The location of the weather station will be chosen through consultation with subject matter experts prior to installation.

The Site Supervisor/Shiftboss or Environmental Site Manager will be responsible for checking and disseminating weather forecast information to all site personnel through daily site safety meetings. All site personnel will play a role in observing and reporting changes in fugitive dust emissions originating at the site. Furthermore, the Environmental Site Manager will regularly coordinate and carry out visual inspections and monitoring of fugitive dust sources (and their control equipment) at the site and within the receiving environment to qualitatively evaluate the effectiveness of dust control practices. Sinova will also establish a public complaint system for receiving, recording and addressing public complaints with respect to fugitive dust concerns. A summary of monitoring and maintenance requirements are provided in Table 9 and are intended to ensure that fugitive dust sources and their control methods are being implemented as described in this plan/or functioning according to manufacturer's specifications.

This management plan has been developed to outline specific environmental compliance monitoring requirements related to the management of potential environmental concerns during construction and operations of the Horse Creek Silica Quarry. An external Environmental Monitor(s) will be present during quarry construction and operations to mitigate potentially harmful environmental impacts and confirm regulatory compliance.

This plan will be reviewed and updated at least annually.

Table 9. Regular monitoring, and maintenance procedures.

Fugitive Dust Source	Minimum Inspection Frequency	Responsible Parties	Record Keeping Required?
Open Pit Extraction Area	Periodically throughout the day	All site personnel	Yes
Quarry Site Roads and Mobile Equipment	Periodically throughout the day	All site personnel, Environmental Site Manager	Yes
Primary Portable Crusher	Daily, when operational	Appropriately trained site personnel, Site Supervisor/ Shiftboss	Yes
Coarse Rock Stockpile	Daily	All site personnel, Environmental Site Manager	Yes
Soil Stockpiles	Daily until revegetated, then weekly	All site personnel, Environmental Site Manager	Yes
Land Clearing, Grubbing and Stripping	Daily	All site personnel, Environmental Site Manager	Yes
Public Complaints	As they are received	Site Supervisor/ Shiftboss, Environmental Site Manager	Yes

4.9 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 10.

Table 10. Trigger Response Action Plan for fugitive dust management throughout the project area.

	Trigger	Action Response
Normal	● Minor localized dust during work activities ● Localized dust confined to the site boundaries	● Conduct regular site inspections ● Continue to implement dust suppression mitigation measures

	Trigger	Action Response
	• Localized dust remains suspended for no more than 30 minutes during activity	• Monitor weather forecast to anticipate any necessary changes to operation
Level 1	• Localized dust not confined to the site boundaries • Evidence of minor off-site dust deposition (<50 m) through regular inspections of receiving environment • Public complaint of nuisance dust	• Notify Site Supervisor/ Shiftboss or Environmental Site Manager • Conduct site inspection, including receiving environment • Review dust suppression mitigation measures, consider increasing/changing suppression method and/or adjust operations • Maintain record of decision-making process and specific mitigations applied • Monitor effectiveness
Level 2	• Extensive areas of dust generation not confined to the site boundaries • Evidence of extensive off-site dust deposition (>50 m) through regular inspections of receiving environment • Public complaints	• Notify Site Supervisor/ Shiftboss or Environmental Site Manager • Conduct site inspection, including receiving environment • Review dust suppression mitigation measures, consider increasing/changing suppression method and/or adjust operations • Implement on- and off-site quantitative monitoring • Maintain record of decision-making process and specific mitigations applied • Monitor effectiveness
Level 3	• Evidence of particulate levels approaching or exceeding air quality guidelines • Potential for impact to human health • Regular public complaints of nuisance dust	• Notify Site Supervisor/ Shiftboss or Environmental Site Manager • Conduct site inspection, including receiving environment • Adjust operation, review and dust suppression mitigation measures, increase/change suppression methods • Implement on- and off-site quantitative monitoring • Maintain record of decision-making process and specific mitigations applied

4.10 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant onsite communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

4.11 Adaptive Management

Sinova will work towards continual improvement of fugitive dust management at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased inspections of fugitive dust sources and their controls;
- Implementing additional or adjusting mitigation measures;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures; and/or
- Scheduling of project activities.

4.12 Contingency Planning

If qualitative monitoring (visual observations or public complaints) indicates uncontrolled or insufficiently controlled fugitive dust emission concerns on- or off-site, Sinova will implement the following contingency plan:

1. Sinova will implement dustfall sampling/monitoring to address nuisance dust concerns (e.g., from visible dust plumes).
2. Sinova will implement quantitative monitoring through the establishment of non-continuous, filter-based sampling of $PM_{2.5}$ and PM_{10} concentrations at locations determined in consultation with subject matter experts and the appropriate government agencies, with consideration of public complaints (if received).

This monitoring approach will be implemented as a surveillance and assessment tool, and will be accompanied by a review and modification of the site-specific mitigation measures being implemented at the site. If levels of $PM_{2.5}$ and PM_{10} are found to approach or exceed provincial or federal guidelines and pose a risk to human health, Sinova will implement continuous, real-time monitoring of $PM_{2.5}$ and PM_{10} concentrations at locations determined in consultation with subject matter experts and the appropriate government agencies and will be accompanied by a review and modification of the site-specific mitigation measures being implemented at the site. Measures implemented to protect human health are also intended to protect wildlife health, although the impacts of PM on wildlife is not well understood.

Chapter 5: Erosion and Sediment Control Plan

5.1 Authorship and Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
2	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
	Updated company details. Reformatted version control. Separated upper from lower site. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES KES	2023-04-24
1	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2020-Aug-31

5.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2020-09-21

5.3 Purpose/Objectives and Scope

This plan is for the upper site only; the intent is to enable safe and efficient extraction while preventing adverse effects in the receiving environment resulting from erosion and sedimentation from the site. The receiving watercourse for the project is Horse Creek, which is located the north and west of the site and drains west into the Columbia River. Horse Creek parallels the site access road for approximately 400 m from the active gravel pit towards the intersection of Austin Road and Horse Creek Road. This plan provides strategies and mitigation measures for the ongoing management of erosion and sedimentation potential at the site and is based on guiding principles outlined in the *Technical Guidance 3: Developing a Mining Erosion and Sediment Control Plan* (MoE, 2015), the *Environmental Management Act* and the *Waste Discharge Regulation*.

The plan is designed to fulfill the guidance provided by provincial and federal statuses and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for erosion and sedimentation management.

The performance objectives of the plan are to:

- Enable safe and efficient extraction while preventing adverse effects in the receiving environment through the prevention of erosion (soil loss) and control of sediment transport;

- Minimize surface disturbance to the permitted area and restrict access to adjacent undisturbed areas;
- Utilize natural erosion controls (e.g., rough and loose surface preparation, mulching, revegetation) which provide environmental benefits;
- Construct and maintain ditch lines and culverts that are sufficient for the climate at the site (e.g., in consideration of rainfall and snowmelt events) that divert water away from sensitive receptors in the receiving environment;
- Reduce the likelihood of releasing significant amounts of sediment-laden water (unauthorized discharge) to the receiving environment;
- Allow for the immediate characterization and remediation of any unauthorized discharges.
- Time potential erosion/sediment generating operations to avoid wet weather to minimize storm water runoff and erosion risk;
- Avoid handling soil materials during prolonged periods of dry, windy weather to minimize wind erosion and generation of dust; and
- Effectively implement progressive reclamation.

5.4 Baseline Data & Risk Assessment

5.4.1 Soil Samples

Two representative samples were collected in 2018 from locations where the potential for erosion and sediment transport were identified at the site. Samples HCES-03 and HCES-04 were submitted to a third-party laboratory (Artech Consultants Ltd.) for gradation and their report is included as Appendix A.

Sample HCES-03 was obtained from the southwest corner of the upper pit area, representative of the topsoil surrounding the pit and what will be stockpiled during construction activities. The sample texture is approximated to be loam, containing 44.1% silts and clay (<0.075 mm), 42.1% sand (<4.75 mm and >0.075 mm), and 13.8% gravel as per the gradation report (Appendix A). The topsoil was collected from a gentle to moderately sloped area (5-25%).

The second sample, HCES-04, was collected from a roadcut adjacent to the access road. Throughout the upper portion of the access road materials were generally observed to be homogeneous. As a result, one sample was collected to classify the upper portion of the access road. Sample HCES-04 is a silt loam soil situated on a gentle to moderately sloping area (5-25%). This material may contribute to sediment transport in a snow melt or heavy rainfall event. The gradation report determined that the sample consisted of 55.6% silt and clay, 34.2% sand, and 10.2% gravel (Appendix A).

Glaciofluvial and fluvial deposits were observed on the lower portions of the access road, however no samples were collected as samples contained coarse sands and gravels.

5.4.2 Soil Loss Estimation

The Forest Practices Code of British Columbia *Hazard Assessment Keys for Evaluating Site Sensitivity to Soil Degrading Processes Guidebook* (FPC, 1999) and the Ministry of Forests *Basic Soil Interpretations for*

Forest Development Planning: Surface Soil Erosion and Soil Compaction (Ministry of Forests, 1991) were used to qualitatively estimate soil loss for distinct areas within the quarry footprint, including the pit area and access road (broken into sections of differing soil types). This indirect approach to hazard evaluation parallels the predictive approach used in the universal soil loss equation.

Soil Displacement Hazard

Soil displacement is the mechanical movement of soil materials. The site factors determining soil displacement hazards include slope gradient, slope complexity and soil depth to a restricting layer (e.g., bedrock, unfavourable subsoil, carbonates). Using the soil displacement hazard key, the soil displacement hazard was determined for the different site components (Table 11).

Table 11. Site wide soil displacement hazard ratings for exposed mineral soil.

	Slope Gradient	Slope Complexity	Subsoil Conditions	Total Points	Hazard Rating
Pit Area (Cleared)	1	0	8	9	Moderate
Pit Area (Developed)	0	0	N/A	0	Low
Access Road	3	2	8	13	Moderate
Upper	3	2	8	13	Moderate
Middle	4	0	8	12	Moderate
Lower	1	0	8	9	Moderate
Shared Road	1	0	8	9	Moderate

Soil Erosion Hazard

Soil erosion is the wearing away of the earth's surface by water and wind. Accelerated erosion is that which is caused by human activities, and that results in more than just geological erosion. It has the potential to cause both on-site (soil and nutrient loss) and off-site (reduced water quality, increased sedimentation) impacts. Using the soil erosion hazard key, the soil erosion hazard was determined for the different site components (Table 12).

Table 12. Site wide soil erosion hazard ratings for exposed mineral soil.

	Climate	Slope Gradient	Length/ Uniformity	Depth to Restrict Layer	Surface Soil Detachability	Surface Soil Coarse Fragments	Subsoil Permeability	Hazard Rating
Pit Area (Cleared)	4	1	4	3	4	3	1	Moderate
Pit Area (Developed)	4	1	1	N/A	N/A	N/A	N/A	Low

Access Road	4	3	3	3	4	3	1	Moderate
Upper	4	6	3	3	4	3	1	High
Middle	4	6	4	3	8	3	1	High
Lower	4	1	4	3	4	3	1	Moderate
Shared Road	4	1	4	3	4	2	1	Moderate

Risk of Sediment Delivery to Streams

An evaluation of the risk of sediment delivery to streams was also completed for each of the different site components (Table 13). Both slope gradient and proximity to a stream can influence the likelihood of sediment delivery. When coupled with the soil displacement and soil erosion hazard ratings for the site, this evaluation of risk can inform high priority areas requiring mitigation and monitoring.

The majority of the access road (upper and middle portions) is not within close proximity to Horse Creek. Where the access road is the closest to the creek valley, the road is approximately 100 meters above the creek. The lower portion of the access road is also not within close proximity to Horse Creek with the exception of one switchback which is approximately 40 meters above the creek. Where the shared portion of the road begins (at the Golden Concrete Ltd. gravel pit) the road is in close proximity to Horse Creek, at times less than 10 meters from the high-water line and at approximately equal elevation.

Table 13. Site wide assessment of the risk of sediment delivery to streams.

Location	Proximity to Stream Channel	Slope Steepness to Stream Channel	Risk of Sediment Delivery
Pit Area (Cleared)	240 m	Steep	Very Low
Pit Area (Developed)	240 m	Steep	Very Low
Access Road	-	-	-
Upper	900 m	Gentle	Very Low
Middle	100 m	Moderate	Low
Lower	200 m	Moderate	Low
Shared Road	10 m	Gentle	Moderate

5.4.3 Risk Assessment

The site-specific risk assessment is a qualitative expression of possible loss that considers both the probability that a hazard will cause harm and the consequences of that event. In order to identify the appropriate level of effort for mitigating the risks of erosion across the site, the results of the qualitative erosion potential evaluation are combined with the potential consequences of erosion and sedimentation.

Table 14. Site specific erosion and sedimentation risk matrix.

Location	Risk Factors	Erosion Potential	Consequence
Pit Area (Cleared)	Low-moderate gradient, well-draining soils, no adjacent water features	Moderate	Very Low
Pit Area (Developed)	Depression, porous bedrock exposed, no adjacent water features	Low	Very Low
Access Road	-	-	-
Upper	Moderately steep slopes, compacted road surface, no adjacent water features	High	Low
Middle	Moderately steep slopes, compacted road surface, moderate proximity to presumed fish-bearing stream	High	Low
Lower	Low-moderate gradient, compacted road surface, moderate proximity to presumed fish-bearing stream	Moderate	Low
Shared Road	Low-moderate gradient, compacted road surface, increased industrial traffic activity, close proximity to presumed fish-bearing stream	Moderate	High

Potential consequences of erosion and sedimentation include:

- Environmental consequences: sediment adversely impacts the receiving environment.
- Project consequences: response and repair of erosion damage adversely impacts project timelines and costs.
- Regulatory consequences: the discharge of sediment to the receiving environment is a breach of permit conditions, regulatory compliance and legislative acts resulting in legal action/fines against the site.

5.4.4 Site-Specific Mitigation Measures

The site-specific mitigation measures for the Project area detailed below and relate directly to the Trigger Action Response Plan (TARP; Section 5.7). In general, the following site-specific control strategy and mitigation measures will be implemented.

5.4.5 Control Strategy

The most effective way to manage sediment transport is to limit the occurrence of erosion within active areas. In this approach, if areas with moderate to high erosion potential are controlled, then the need for sediment control will be greatly reduced. For the purposes of this plan, sediment control will focus on supplementing erosion control methods or when erosion has occurred in unexpected areas. Key areas of concern for the site include:

- Areas with moderate to high erosion potential, which have potential to impact downstream receivers.
- The site access road, which can be a continuous source of soil displacement through compaction and a reduced infiltration capacity, especially where the access road is adjacent to Horse Creek.
- Newly established soil stockpiles, which may erode by intermittent wind, water, or snowmelt events until they are revegetated or protected by another approved cover (e.g., tarps).
- Heavy rainfall events and snowmelt may create problem areas that are difficult to control if not effectively managed or planned for in advance.

5.4.6 Procedural Controls

The construction and initial operation phases of the project will encompass the majority of the planned land disturbance, including clearing, road expansion and maintenance, drilling, and blasting. Minimizing the total area of disturbance and staging vegetation removal to clear only areas that are scheduled for immediate development is a primary best practice for minimizing erosion. Disturbed landscapes will be stabilized using appropriate erosion control techniques and materials (e.g., silt fencing, rough and loose surface preparation, incorporation of woody debris). Revegetation using a site-appropriate seed mixture may be required if natural revegetation is delayed or if climatic conditions at the site dictate.

Minimizing Disturbance

Where possible, disturbance areas will be stripped progressively to reduce erosion and sediment generation and to reduce the extent of topsoil stockpiles in the early stages of quarry construction and operation. Extraction disturbances will be reclaimed as soon as practical to a stable, vegetated landform that is consistent with end land use objectives.

Scheduling

The scheduling of disturbances will consider the time of year to take advantage of the growing season and reduce the time between disturbance and revegetation, when practical. Site specific erosion protection needs associated with spring snowmelt or summer storm events will be factored into the construction and operation schedule.

Travel and Access Management

Traffic and vehicle access, including heavy machinery, will be restricted to designated work areas and travel corridors. Signage and/or physical barriers will be used to identify authorized travel routes and work areas and prevent access to undisturbed areas and non-work areas. This practice will minimize surface disturbance and preserve existing vegetation around the perimeter of the site.

Drilling and Blasting

Blast mats will be implemented to limit the dispersion of fine materials from the drilling and blasting operations at the site.

Soil Stockpiles

Slope inclination and length have the largest potential impact on erosion rates from sparsely vegetated surfaces, like stockpiles. To limit the likelihood of erosion from soil stockpiles, increased use of soil stabilization methods and sediment control structures may be implemented at the site. If natural revegetation is occurring at an insufficient rate and erosion and sedimentation concerns are observed, the slope will be broken up with erosion controls such as coir logs, straw wattles, or modified brush/rock layer installed along the slope contour appropriate intervals.

5.4.6 Erosion and Sediment Controls

All undisturbed land surrounding the project site is well vegetated and has varied slopes, with existing project infrastructure occurring within varied distances to Horse Creek. No major runoff channels have been observed and ditching along the access road is minimal, currently.

Pit Area

The existing pit area, which covers the majority of the quarry footprint, is comprised of silica ore represented in cobbles, which have a very low percentage of fine materials and therefore pose very low erosion potential.

The primary crusher, which will be situated in the pit, has the potential to produce finer materials that are more prone to displacement (by wind or water). Given that the pit is currently a depressional feature on the landscape and will continue to be mined bench by bench further lowering the pit floor beneath the surrounding natural land surface, the pit area becomes a low potential area for erosion and sedimentation. Furthermore, there is a very low risk of adverse impacts to the receiving environment (Table 6). In areas where erosion hazards are suspected or observed, controls such as silt fencing or ditching will be implemented.

Existing and New Stockpiles

The existing stockpiles in the pit area are included in the pit area soil loss estimation and risk assessment as they are predominantly composed of rock (overburden) and have naturally revegetated overtime. To date, no evidence of erosion and sedimentation off-site has been noted with respect to the existing stockpiles.

There are four proposed overburden stockpile locations in the *Mine Design* (Golder Associates, 2013), none of which are located on steep slopes or along ridge crests within the permitted disturbance area. To mitigate the erosion potential associated with newly developed soil and overburden stockpiles, a preliminary cover consisting of mulched and grubbed vegetation (excluding large woody debris) is to be created on the surface of the stockpiles immediately after stripping. Stockpiles are expected to naturally

revegetate; however, if revegetation has not occurred and erosion and sedimentation concerns are observed, the stockpiles will be seeded with a certified weed-free seed mix that is suitable for the site.

Soil stockpiles will be clearly marked and constructed in such a way that would allow for the prompt installation of silt fencing or other erosion controls if needed (e.g., access must be maintained to all sides of the stockpile). Over time, as the stockpiles are naturally (or otherwise) revegetated, their erosion hazard rating is expected to decrease.

Soil stockpiles and snow dumps (if applicable) will be inspected daily during rain events and the snowmelt period on site to ensure that no excessive sediment-laden runoff is observed. If excessive runoff is observed, remedial actions will be implemented immediately (see Section 5.4.7).

Access Road

The overall assessment of the erosional hazard for the access road is moderate; however, the upper and middle sections of the road (Figure 4) have slope gradient, length, and soil texture properties that increase their individual erosion hazard rating to high. Erosion controls to be implemented along these sections of the access road include rough and loose surface preparation and the incorporation of woody debris along road-cut contours to intercept erosion and create microhabitats for seed generation. If natural revegetation is not occurring at such a rate that erosion or sedimentation concerns are observed, seeding with a certified weed-free seed mixture appropriate for the site may be implemented. Despite a higher erosional hazard, these areas are generally not in close proximity to Horse Creek, a presumed fish-bearing stream; thus, the risk of sediment delivery to streams is generally low (Figure 9).

Ditches and culverts will be constructed and installed along the length of the access road and will be sufficient for the climate at the site. Ditches will be lined with coarse materials to reduce overall erodibility of the ditch surface. Ditches will be constructed with a minimum gradient of 2% to ensure water will flow and not pond. In locations where 2% is not achievable, more frequent routine inspections and maintenance will be required.

Where a cross-drain culvert is required, culvert inlet armouring will be implemented to protect the road fill from erosion as the water flows into the culvert. Cross-drain culverts may be used near the top of a steep road gradient, at seepage zones, and at low points in the road profile. Cross-drain culverts should be installed at a minimum gradient of 1%. Where a culvert or ditch line empties into the receiving environment (i.e., adjacent forested land), or if a culvert gradient exceeds 3%, outlet protection is required to prevent erosion at the outlet.

The shared portion of the access road has a moderate erosion hazard and moderate risk of sediment delivery to streams, given its proximity (<10 meters) to Horse Creek, resulting in a high consequence rating (Table 6). Additional protections, such as banking the road away from the creek, installing a permanent barrier between the road and the creek, and installing and maintaining silt fencing, straw bales or silt traps may be required.

5.4.7 Contingency Planning

The potential for water contamination through sediment transport is low given that there is no evidence of ground or surface water on site. Downslope runoff towards residential properties and associated water wells located approximately 1,500 meters southwest of the site is also unexpected as the site is porous and very well drained, confirmed by the lack of any significant runoff channels from the boundaries of the site (Golder Associates, 2013).

Best management strategies will be implemented to control erosion and sediment transport. Prompt initial response to emergencies can help to minimize potential effects to health, safety, and the environment. The quarry management team will be notified in a timely manner in the event of any monitoring exceedance, occurrence of non-compliance with terms and conditions of environmental approvals, non-conformance with project commitments and the *Mines Act* permit. The quarry management team will be responsible for relaying non-compliance issues to regulators, if required, during construction and operation phases.

Severe Weather

If a severe weather event occurs at the site (e.g., extreme or long duration rainfall), monitoring of ditches, culverts and stockpiles will occur on a more frequent basis throughout the duration of the event, from a minimum of once per day upwards of every few hours. Any concerns should be immediately communicated to the Site Supervisor/Shiftboss of Environmental Manager. A temporary shutdown of operations may be required given the severity of the weather event.

Spring Freshet

During spring freshet, monitoring of ditches, culverts, and water levels in Horse Creek will be monitored daily. Any concerns should be immediately communicated to the Site Supervisor/Shiftboss or Environmental Manager.

5.5 Site Maps

Figure 8 displays the soil erosion potential for the site and associated consequence ratings found in Table 14. The map displays the pit area separate from each section of the access road (upper, middle, lower and shared). The information displayed on this map represents an assessment of slope gradient and complexity/uniformity, soil conditions, climate factors and proximity to stream channels, and the consequence of uncontrolled erosion and subsequent sedimentation of surface waters.

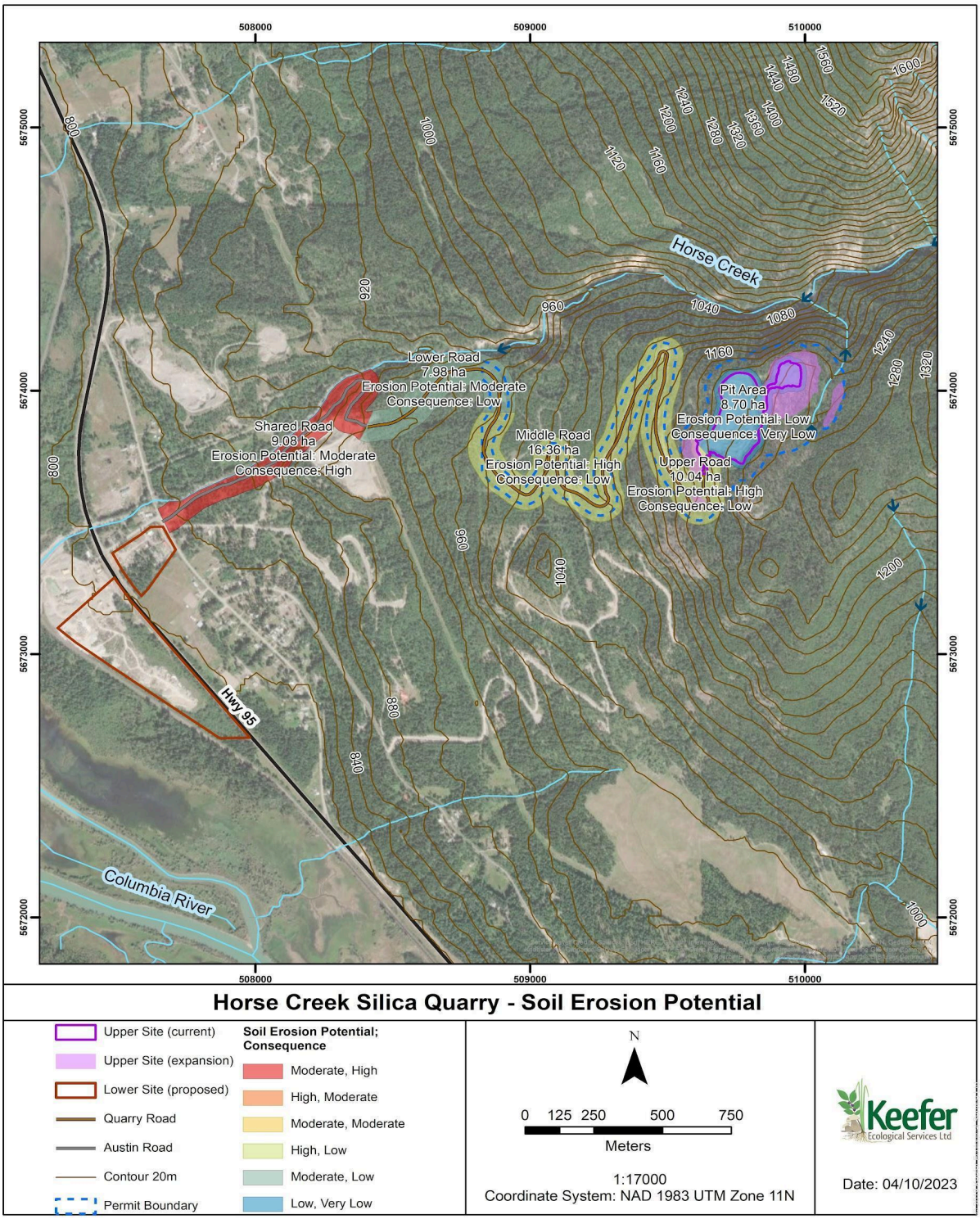


Figure 8. Soil erosion potential.

Figure 9 displays the risk of sediment delivery to streams (i.e., Horse Creek) which considers similar parameters but focuses on the likelihood of delivery of sediment-laden contact water to surface waters. This figure is particularly useful in prioritizing mitigation.

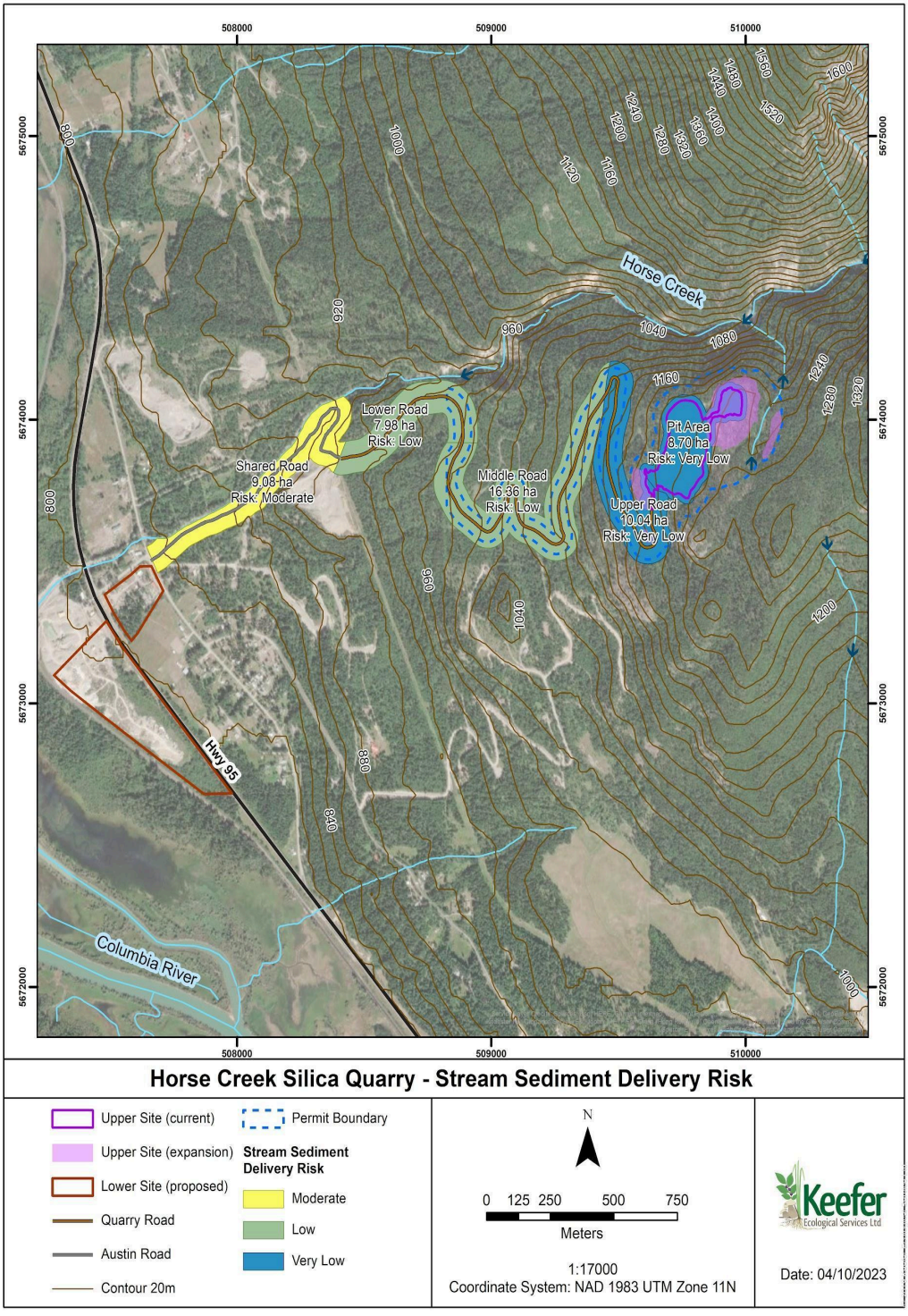


Figure 9. Risk of sediment delivery to streams.

5.6 Plan Implementation

5.6.1 Roles and Responsibilities

5.6.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

5.6.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives, for permitting as well as invasive species or native vegetation issues.

Specific erosion and sediment control responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of erosion and sediment control concerns/actions.

5.6.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific erosion and sediment control responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors of erosion and sediment control concerns/actions.

5.6.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to the government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by the government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

5.6.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include the erosion and sediment control actions specific to extraction activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of erosion and sediment control on site. A current map of all erosion and sediment control infrastructure (e.g., silt fencing, ditches, culverts) will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

5.6.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Current locations of erosion and sediment control infrastructure within the project area;

- Operational requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential erosion or sediment control issue during the course of their regular site activities. HiTest will provide all site employees or contractors with updated maps indicating areas of concern with respect to erosion and sediment control (e.g., ditches, culverts, silt fencing to monitor).

5.6.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the plan, to ensure that disturbance is limited to permitted boundaries, to avoid or minimize erosion or sedimentation at the site, and to ensure that effects of disturbances potentially increasing erosion and sediment concerns at the site are mitigated in a timely manner.

The following monitoring and maintenance procedures will be in place:

- All sediment controls will be constructed and operational prior to soil disturbance.;
- Regularly scheduled inspections will be conducted at the perimeter of the disturbance area, snow dumps (if applicable), soil stockpiles, along ditches and at culverts to ensure erosion and sediment controls are operational and to proactively adjust controls for future events, as needed;
- Inspections will be conducted daily at the perimeter of the disturbance area, snow dumps (if applicable), soil stockpiles, along ditches and at culverts during rain events and the snowmelt period;
- If excessive sediment-laden runoff is observed being released into the receiving environment, Sinova will characterize and report the release. This will include, at a minimum, flow, total suspended solids, turbidity, pH, conductivity, temperature, dissolved oxygen, and total and dissolved metals. Testing will be conducted on both the effluent (where possible) and the receiving waterbody;
- Blasting will not be rescheduled during wet weather periods;
- Sinova will continue to monitor the receiving environment (Horse Creek) quarterly and report the results annually; and
- Progressive reclamation will be initiated when and where possible to control erosion around the disturbance area.

This plan will be reviewed and updated at least annually.

5.7 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 15.

Table 15. Trigger Response Action Plan for erosion and sediment control throughout the project area.

Level of Risk	Trigger	Action/Response
Normal	Construction and operation of all site features (e.g., pit, stockpiles, access road)	• Limit disturbance to the permitted area, schedule, and phase clearing • Routine inspection and maintenance of ditches, culverts, and creek levels/ evidence of sedimentation adjacent to access road • Routine inspection of pit area perimeter • Routine inspection of stockpiles for evidence of erosion or integrity of erosion controls (if required)
Level 1	Erosion	• Implement mitigation measures for site feature of concern (e.g., silt fencing, seeding, engineering of ditches, culverts, armouring) • Maintain record of decision-making process and specific mitigations applied • Monitor effectiveness
Level 2	Sedimentation	• Implement additional mitigation measures for site feature of concern • Maintain record of decision-making and specific mitigations applied • Increase regular inspections of control features to monitor effectiveness
Level 3	Excessive runoff or un-authorized discharge released to the receiving environment	• Characterize with respect to extent and loading • Characterize (at a minimum) flow, total suspended solids, turbidity, pH, conductivity, temperature, dissolved oxygen, total and dissolved metals and nutrients of both the effluent and receiving waterbody • Implement and monitor control • Report to the Chief Inspector

5.8 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant onsite communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

5.9 Adaptive Management

Sinova will work towards continual improvement of erosion and sediment control at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/ Shiftboss.

Corrective actions may include:

- Increased inspections of erosion and sediment control features;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures; and/or
- Changes to operational procedures.

Chapter 6: Soil Management Plan

6.1 Authorship and Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
4	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
	Updated company details. Reformatted version control. Separated upper from lower site. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES KES	2023-06-13
3	Updated HiTest to Sinova	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-09
2	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2021-03-05

6.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2021-03-05

6.3 Purpose/Objectives and Scope

The intent of this plan is to ensure that the work conducted at the site is carried out in such a way that soil stripping, stockpiling and replacement procedures minimize soil degradation and maximize the availability of suitable growth medium for reclamation. This purpose of this plan is to:

- Identify salvage/stripping guidelines that:
    - Best suit the soil type and site conditions,
    - Ensure effective topsoil removal techniques,
    - Maximize the quality and volumes of suitable topsoil.
- Identify spatial and temporal soil handling protocols for reclamation use.
- Outline the scope of environmental monitoring required for successful implementation of the plan.

The plan is designed to fulfill the guidance provided by provincial and federal statutes and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for soil resource management.

The performance objectives of the plan are to:

- Ensure appropriate segregation of salvaged materials.
- Inventory and conserve adequate volumes of soil resources.
- Manage and protect soil against degradation during handling and storage so that:
    - Salvage is conducted under appropriate soil moisture/weather conditions,
    - Admixing of lower quality material with topsoil is prevented,
    - Soil is seeded with native species to reduce erosion potential if natural revegetation is occurring too slowly to prevent erosion,
    - Other erosion control is established on/around soil stockpiles in a timely manner so that the stockpiled soil will not experience uncontrolled erosion over time.
    - Stockpiles are clearly marked.

6.4 Baseline Data

6.4.1 Soil Quality

The Mine Plan (Golder Associates, 2013) describes surface soils at the upper site as very shallow sandy loam with thin, weakly decomposed organic horizons (LF) and shallow subsoil B horizons over bedrock. They classify the soils as Dystric Brunisols with a pH less than 5.5 and a poor nutrient regime (a qualitative observation, analytical testing was not completed). A representative sample for topsoil surrounding the pit, that will be stockpiled during construction, confirmed the soil composition to be predominantly silt/ clay (44%) and sand (42%), with some gravel (13.8%; Artech Consulting Ltd., 2018). Existing soil stockpiles located around the current pit extents were observed to include waste rock and woody debris, with some revegetation (alder, spruce, fir; Golder Associates, 2013). More recent site visits conducted by KES (2018, 2019, 2020) resulted in consistent observations.

6.4.2 Soil Removal and Salvage

The 1989 Mine Plan (Miller, 1989) estimated that 27,000 cubic meters (m^3) of topsoil would be salvaged and available for reclamation; the actual amount salvaged was not determined. Golder Associates (2013) estimated that only 8,000 m^3 was actually salvaged and stockpiled.

The pit and access road will be expanded in 2023 and the updated soil salvage area is estimated to be 53,640 m^2 (Figure 10). This includes site preparation clearing and grubbing of 4.40 ha and topsoil removal of 4,660 tonnes from stripping (Moose Mountain Technical Services, 2023). The estimated average soil depth of 16 centimeters (cm) will be verified through sampling in 2023. Given the assumed soil depth and projected topsoil removal, the total soil volume to be salvaged would be 8,584 m^3.

6.4.3 Soil Stockpiles and Replacement

There are four proposed soil stockpile locations around the site (Figure 11). Existing stockpiles will be moved and incorporated into any of these four proposed stockpile locations if needed to expand the pit. With an estimated 8,000 m^3 of existing stockpiled material and an additional 8,584 m^3 available from the pit expansion areas, the total soil volume in stockpiles at the end of operation will be approximately 16,500 m^3 (Golder Associates, 2013). This estimated final stockpiled volume is sufficient to replace soils in relatively flat areas of the site (e.g., pit floor and roadways; pit slopes and benches will not be reclaimed (as per the Health, Safety and Reclamation Code for Mines in BC, 2017) to a depth of 30 cm (Golder Associates, 2013).

6.4.4 Site-Specific Mitigation Measures

Sinova will salvage, segregate, and stockpile topsoil, overburden, and organic material (including woody debris) for use in reclamation under the supervision of a qualified person (QP). Stockpiles will be inventoried, clearly marked, and protected against erosion, degradation, and contamination.

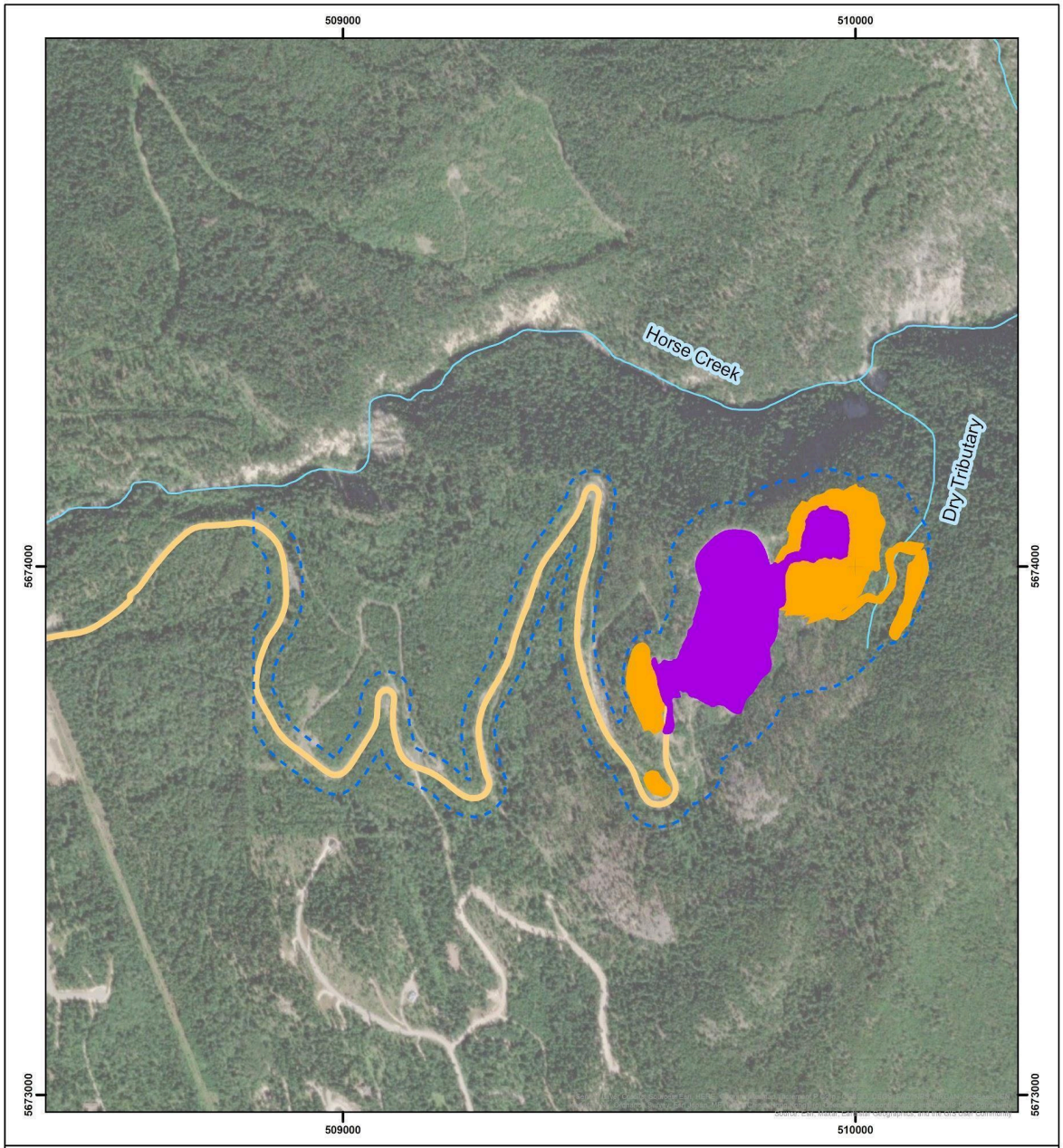
The site-specific mitigation measures for the Project area detailed below and relate directly to the Trigger Action Response Plan (TARP; Section 6.7). In general, the following site-specific mitigation measures will be implemented:

- Soil salvage will be limited to the permitted disturbance area; the extents of the disturbance area will be clearly marked prior to construction.
- Soil salvage activities will only be conducted in suitable weather conditions to limit the likelihood and amount of soil resources potentially lost during salvage (i.e., soil salvage will not take place during consistently windy and/or wet conditions).
- Salvage will be avoided during poor ground conditions when soil layers cannot be separated properly. If soil is frozen at soil depth, salvage will be stopped to avoid admixing.
- If snow is present at the time of soil salvage, it will be removed prior to salvage to reduce undesired settling.
- Topsoil, overburden, and organic material will be salvaged and stockpiled separately.
- Organic material (e.g., woody debris) will be incorporated into topsoil stockpiles to encourage decomposition and reduce risk for fires.

- Stockpiles will be designed to be geotechnically stable.
- Stockpiles will be located on stable foundations, on level ground, outside of active floodplain and riparian areas.
- A QP will direct and monitor soil sampling, salvage, segregation, and stockpiling activities on site on an ongoing basis to ensure all progressive construction and operation phases are observed and documented.
- All new and historic stockpiled soil resources will be characterized and evaluated for their suitability as reclamation materials.
- The Environmental Site Manager will maintain an inventory of stockpiles of salvaged soil, overburden, and organic material (including woody debris) specifying the location, origin, and quantity of material.
- Stockpiles will be protected from erosion, degradation and contamination through revegetation or other acceptable practices, if needed.
- If implementing seeding as a revegetation measure in the short-term (long-term goal is natural revegetation), only a certified weed-free native species seed mix will be used.
- Stockpiles will be accessible and clearly marked to ensure that they are protected during construction and quarry operation phases.

6.5 Site Maps

Figure 10 displays the estimated volumes of salvageable soil materials from the pit expansion areas proposed in the Mine Plan (Golder Associates, 2013). The total salvage area is estimated at 53,640 m^2 with an average soil thickness estimated at 16 cm. With overburden incorporated (up to 25 cm in diameter) the estimated volume of salvageable soil materials is 8,584 m^3.



Horse Creek Silica Quarry - Soil Salvage

Stripping and Salvage Areas

Access Road Salvage

Upper Site (current)

Permit Boundary

N

0 125 250 500

Meters

1:10000

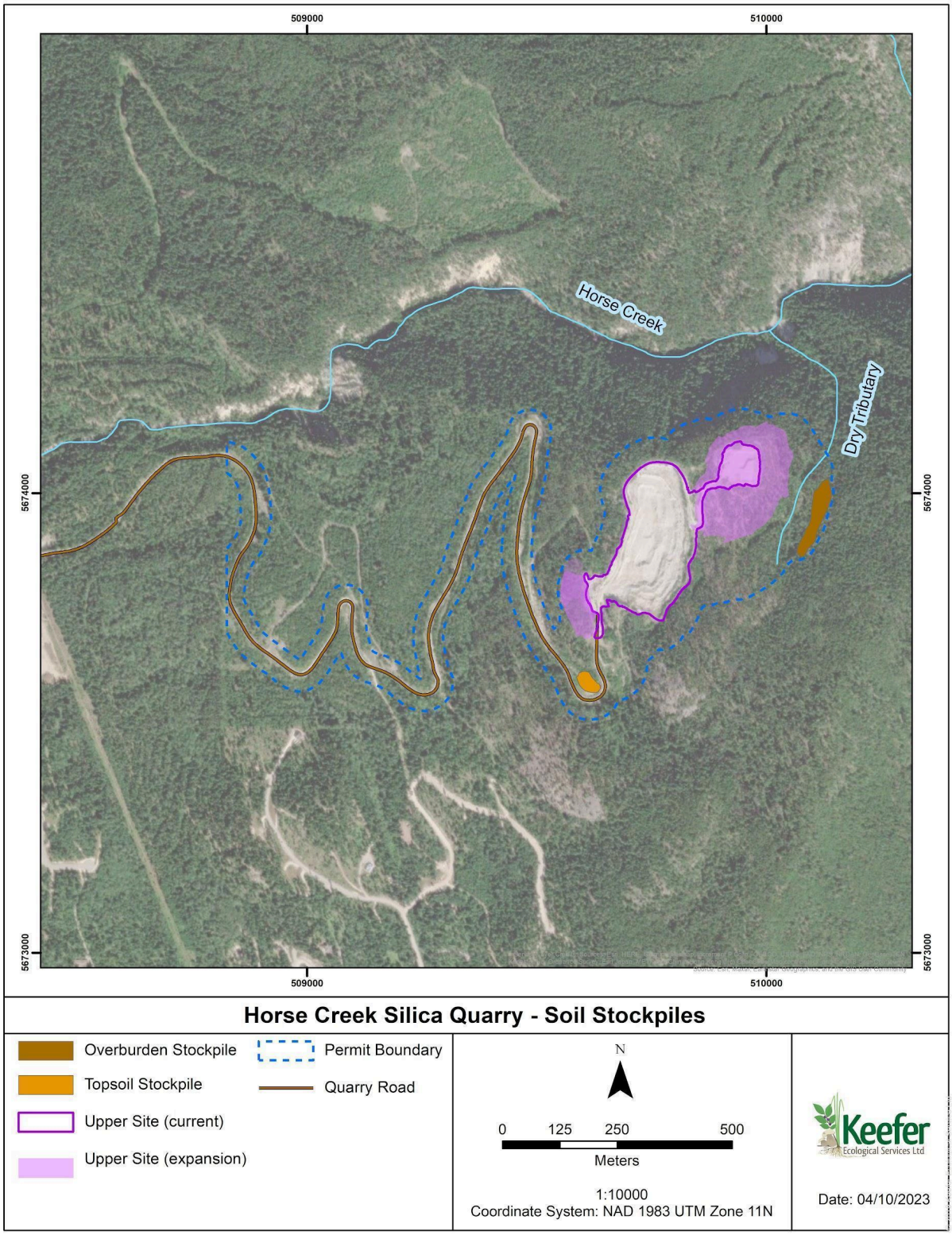
Coordinate System: NAD 1983 UTM Zone 11N

Keefer Ecological Services Ltd

Date: 04/10/2023

Figure 10. Soil stripping and salvage areas for the proposed quarry expansion areas stockpiles and potential salvage along access road during remediation.

Figure 11 displays the estimated volumes and approximate locations of topsoil stockpiles around the perimeter of the expanded pit area. It should be noted that the Mine Plan does not account for the salvage and stockpiling of organic material, including large woody debris. Organic material will be salvaged and stockpiled for use in reclamation as specified in the *Mines Act* permit. Stockpiles of organic material are anticipated to be stored adjacent to the soil stockpiles shown in Figure 11.



Horse Creek Silica Quarry - Soil Stockpiles

Overburden Stockpile
Topsoil Stockpile
Upper Site (current)
Upper Site (expansion)
Permit Boundary
Quarry Road

N

0 125 250 500
Meters

1:10000
Coordinate System: NAD 1983 UTM Zone 11N

Keefer Ecological Services Ltd

Date: 04/10/2023

Figure 11. Overburden and topsoil stockpile locations as proposed in the 5-year mine plan.

6.6 Plan Implementation

6.6.1 Roles and Responsibilities

6.6.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

6.6.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives.

Specific soil management responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of soil management concerns/actions.

6.6.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific soil management responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors of soil management concerns/actions.

6.6.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience, and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to the government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by the government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

6.6.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include all soil management actions specific to extraction activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of soil resources on site. A current map of all soil stockpiles will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

6.6.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- What types of soils are important for reclamation;
- How they are salvaged, stockpiled and inventoried;

- How to minimize stockpile erosion, protect stockpiles from contamination and machinery, and prevent the spread of invasive plants;
- Current soil stockpile locations within the project area;
- How to report observations of erosion at soil stockpiles;
- Operational requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential soil management concern during the course of their regular site activities. Sinova will provide all site employees or contractors with updated maps indicating areas of concern with respect to soil management (e.g., soil stockpile locations).

6.6.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the plan, to ensure that disturbance is limited to permitted boundaries, to avoid or minimize soil loss and to ensure that the effects of disturbance are mitigated in a timely manner.

The following monitoring and maintenance procedures will be in place:

- A qualified professional (QP) will monitor and direct sampling, soil salvage, segregation of topsoil, overburden and organic material including large woody debris, and stockpiling activities on site.
- A QP will ensure that materials salvaged for use in reclamation are segregated based on salvage origin and measured for suitability for use and potential for contamination.
- An inventory of stockpiles will be maintained, including locations, origins, and quantity of material present.
- All stockpiles will be clearly marked to ensure they are protected during construction and operation.
- All stockpiles will be monitored and protected against erosion, degradation and contamination through revegetation using a certified weed-free native species seed mix in place of natural vegetation, or other short-term practice, as necessary.

This plan will be reviewed and updated at least annually.

6.7 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 16.

Table 16. Trigger Response Action Plan for soil management throughout the project area.

	Trigger	Action Response
Normal	• Clearing and construction of site features • Dry, calm climatic conditions	• Limit disturbance to the permitted area, schedule, and phase clearing • QP to monitor and record all soil management works • Maintain record of decision-making and active work areas
Level 1	• Admixing with overburden • Light rain or wind • Snow present	• If rock greater than 25 cm diameter is observed in stripped soil, adjust procedures and segregate • QP to monitor and record all soil management works • Maintain record of decision-making and active work areas • Remove snow and monitor weather
Level 2	• Evidence of erosion during salvage • Heavy rain or high wind • Snow present	• QP to implement erosion and sediment controls • Clearing and construction activities may be suspended • Maintain record of decision-making and specific mitigations applied • Remove snow prior to salvage
Level 3	• Contamination of soil resources • Soil frozen at salvage depth	• QP to document potential impact, source, and extent • Quarry Manager to obtain QP advice on appropriate control and/or remediation measures • Report incident to appropriate authorities as listed in the MERP • Stop salvage until no longer frozen

6.8 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant onsite communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

6.9 Adaptive Management

Sinova will work towards continual improvement of vegetation management at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will

propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased routine inspections of soil stockpiles;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures; and/or
- Additional supervisory oversight and operational controls.

Chapter 7: Vegetation Management Plan

7.1 Authorship and Version Control

Version #	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
3	Updated company details. Reformatted version control. Updated permitting, baseline and mitigation. Added 3.2.2 invasive plan and 3.2.3 SAR mitigations. Plan is operations ready.	Sarah Hirschfeld, PAg Michael Keefer, PAg	KES KES	2023-05-29
2	Separated upper from lower site. Updated HiTest to Sinova	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-09
1	Prepare for operations.	Jessica Lowey, PAg Michael Keefer, PAg Hilary Baker, PAg	KES KES KES	2020-08-31

7.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2020-09-21

7.3 Purpose/Objectives and Scope

The intent of this plan is to ensure that the work conducted at the site is carried out in such a way that minimizes adverse effects to ecosystem extent and function while trying to avoid the introduction and spread of invasive plants as a result of the proposed quarry work. This plan provides strategies and mitigation measures for the ongoing management of native ecosystems and invasive plants at the site

and is based on guiding principles outlined in the Invasive Species Strategy for British Columbia, the Pest Management Plan for Invasive Alien Plants on Provincial Crown Lands in the Southern Interior as well as the Invasive Alien Plant Program (IAPP).

The plan is designed to fulfill the guidance provided by provincial and federal statuses and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for ecosystem and vegetation management.

The performance objectives of the plan are to:

- Minimize vegetation disturbance to the permitted area (see Figure 1).
- Avoid the introduction and spread of invasive plants through ecology-based management of the Project activities;
- Remove invasive plants that are present at the site or become introduced using non-toxic means wherever appropriate;
- Prevent invasive plant establishment through maintenance of ecosystem integrity outside the disturbance area, such that the composition, structure, function and resilience are retained;
- Avoid burning and/or disposal of woody debris suitable for use in reclamation;
- Prepare to restore the site according to ecosystem-based management, including consideration of successional processes such as: disturbance type, extent and intensity, dispersal mechanisms, site history, competition, and germination; this will be completed through consultation with qualified personnel; and
- Restore ecosystem integrity at sites altered by Project activities.

7.4 Baseline Data

The site underwent natural revegetation while non-operational (1999-2022). In 2015, native species data was collected by KES from five plots located throughout the project area. Observation locations included the upper pit, spoil stockpiles, and access road. In summary, the following native species were most abundant:

Trees:

- Lodgepole pine (*Pinus contorta*)
- Douglas-fir (*Pseudotsuga menziesii*)
- Black cottonwood (*Populus balsamifera* sp. *trichocarpa*)
- Trembling aspen (*Populus tremuloides*)

Shrubs:

- Saskatoon (*Amelanchier alnifolia*)
- Falsebox (*Paxistima myrsinites*)
- Thimbleberry (*Rubus parviflorus*)
- Willow species (*Salix* spp.)
- Soopolallie (*Shepherdia canadensis*)
- Birch-leaved spirea (*Spirea lucida*)

Forbs and Graminoids:

- Pearly everlasting (*Anaphalis margaritacea*)
- Fireweed (*Epilobium angustifolium*)
- Yellow mountain avens (*Dryas drummondii*)
- Junegrass (*Koeleria macrantha*)
- Twinflower (*Linnaea borealis*)
- Aster species (*Aster* spp.)

7.4.1 Invasive Species

Invasive plant surveys were completed in 2015 and 2019 by KES crews following the IAPP methodology for estimating and recording density and distribution of invasive species occurrences. A summary of these surveys is provided in Table 17. Additional baseline vegetation and invasive plant surveys were completed in 2023 to update the density and distribution data of species at the upper site and for management and reclamation planning however this updated information will be included in the next revision of this management plan. To date, Sinova has not implemented invasive species control or other vegetation management at the site. The site is not known to contain species of cultural significance; Shuswap Band has committed to providing KES with a list of culturally important species to look for and record during baseline surveys.

Table 17. Invasive plant species occurrences (2015 and 2019).

2015					2019				
Common Name	**Latin Name**	**IAPP Code**	**Density**	**Distribution**	**Common Name**	**Latin Name**	**IAPP Code**	**Density**	**Distribution**
spotted knapweed	*Centaurea stoebe*	SK	3-6	2-3	oxeye daisy	*Leucanthemum vulgare*	OD	2-8	2-4
Canada thistle	*Cirsium arvense*	CT	2	1	bladder campion	*Silene vulgaris*	BC	4-6	3
oxeye daisy	*Leucanthemum vulgare*	OD	4-8	2-3	common mullein	*Verbascum thapsus*	MU	2-4	1-3
baby's breath	*Gypsophila paniculata*	BY	3	2	bull thistle	*Cirsium vulgare*	BT	1-2	1-2
sweet clover	*Melilotus spp.*	-	6-8	2-3	yellow salsify	*Tragopogon dubius*	WG	2-4	1-2
burdock	*Arctium minus*	BU	3	2	spotted knapweed	*Centaurea stoebe*	SK	1	1
yellow salsify	*Tragopogon dubius*	WG	-	-					
annual hawksbeard	*Crepis tectorum*	HB	3	1	**KEY to colours:**				
bull thistle	*Cirsium vulgare*	BT	2-6	2-3		Provincially Noxious			
yellow hawkweed	*Hieracium spp.*	YH	2	1		Regionally Noxious			

common mullein	*Verbascum thapsus*	MU	2	1		Unregulated

7.4.2 Species at Risk (SAR)

No listed at-risk species have been identified on-site to date. A Clark's nutcracker (*Nucifraga columbiana*) bird was observed by KES during a site visit on May 12, 2023 suggesting that Whitebark pine (*Pinus albicaulis*) may be growing nearby. If species from this list are discovered on-site, additional mitigations are triggered (see 7.5.3).

7.5 Site-Specific Mitigation Measures

7.5.1 General Mitigations

General mitigations apply to all vegetation management on-site, including but not limited to: clearing and grubbing, timber cut and trim, access road maintenance, and control of invasive species. Baseline, pre-clearing, and annual invasive plant surveys will be conducted to determine the presence and distribution of plant species on-site. These surveys will be completed to identify any site-specific vegetation concerns prior to new disturbances or work commencing and establish baselines for reclamation research (as per the Reclamation Research Plan). Annual surveys will enable tracking and dictate treatment plans for invasive plants to minimize potential for further spread. If culturally important plant species are identified during vegetation surveys the Environmental Site Manager (or delegate) will, as requested by the Nation during engagement, invite the Shuswap Band to site to salvage those species prior to or during pre-clearing surveys. Where vegetation serves as wildlife habitat (e.g., wildlife trees), additional mitigations provided in the Wildlife Management Plan must also be followed. No work is currently planned for Riparian zones; should such work be proposed, it will follow recommendations provided by the Riparian Management Area Guidebook (Ministry of Forests, 1995).

The site-specific mitigation measures for the Project area detailed below, are applicable to all vegetation management activities, and relate directly to the Trigger Action Response Plan (TARP; Section 7.8). In general, the following site-specific mitigation measures will be implemented:

- Coordinate clearing activities with other management and monitoring plans;
- Provide appropriate education and training for site personnel;
- Stage and minimize clearing dimensions during construction activities and avoid ground disturbance where possible;
- Survey and clearly demarcate (e.g., flag) clearing limits in the field prior to undertaking any clearing work to minimize unnecessary vegetation removal or ground disturbance;
- Salvage and stockpile topsoil, overburden and organic material (including woody debris), with all stockpiles clearly labeled and revegetated utilizing best management practices (see Soil Management Plan);
- All trees and other vegetation, clay, earth, sand, gravel, loose rock, or other unconsolidated material laying within 2 m of the rim of a working face or wall in a surface quarry shall be removed, and beyond this distance all unconsolidated material laying shall be sloped to an angle less than the natural angle of repose;

- Avoid the burning and/or disposal of woody debris suitable for use in reclamation;
- Stockpiles of woody debris shall be retained for reclamation and shall be placed 2 m from the edge of standing timber and laid as flat as possible to reduce fire hazard (i.e., track walking, limbing);
- Implement a fugitive dust management plan to avoid and/or minimize soil loss and impact to existing vegetation;
- Restrict vehicle and heavy machinery use (i.e., fueling, parking, laydown areas) to designated areas and established roads/trails;
- Revegetate with a certified weed-free seed mix only if natural revegetation is not establishing, and;
- Install and maintain erosion and sediment control features until vegetation has established and soils are stabilized.

7.5.2 Invasive Plant Management

The Weed Control Act and Weed Control Regulation requires landowners and occupiers (public and private lands) to control provincially listed noxious weeds, as well as additional species that are identified as noxious within specified Regional Districts. Regulated weed species are listed in Appendix B (Schedule A of the Regulation) and priorities specific to Golden are detailed in Appendix C.

The BC *Weed Control Act* (RSBC 1996) states:

- "noxious weed" means a weed designated by regulation to be a noxious weed, and includes the seeds of the noxious weed;
- Duty to control noxious weeds 2: In accordance with the regulations, an occupier must control noxious weeds growing or located on land and premises, and on any other property located on land and premises, occupied by that person.
- "occupier" means a person who (a) is in physical possession of land, premises or property, or (b) is responsible for, and has control over, the condition of, the activities conducted on and the persons allowed to enter or use, land, premises or property.
    - (2) For this Act (a) there may be more than one occupier of land, premises or property, (b) a municipality may be an occupier of land, premises or property, and (c) the government may be an occupier of land, premises or property.

The BC Reg. 66/85 *Weed Control Regulation* states:

- Movement of machinery or vehicles 6: No person shall move on a highway (a)any vehicle that has any knapweed on it, or (b) any (i) agricultural equipment or implement of husbandry, (ii) construction machinery, (iii) recreational vehicle, or (iv) horse trailer that has any noxious weed on it.
- Seeds, fertilizer, etc. 8: Where a noxious weed is not established in an area, no person shall (a) within that area (i) sow any grain or other seed that is intermixed with seeds of the noxious weed, or (ii) apply fertilizer, lime, topsoil or other substance that contains the noxious weed or seeds of the noxious weed

Invasive plant species rapidly establish on new sites through abundant seed production, aggressive rooting structures, high adaptability, or other characteristics, which lead to invasive plants out-competing other vegetation (Fraser Basin Council, 2004). Extraction operations provide an ideal

environment for the establishment of invasive plant species as they flourish in disturbed areas (Polster, 2003). Movement of machinery and humans also increases the risk of invasive plants entering the site and establishing (Polster, 2003). Further, reclamation work on sites with little to no vegetative competition disrupts soil, and may involve the application of fertilizer, which encourages invasive plant growth (Polster, 2003).

To develop an appropriate management plan, an assessment to determine locations of invasive plant infestations within the property is essential. Detecting new infestations quickly is critical in reducing time and resources spent on controlling and eradicating populations as infestations can quickly expand over time, increasing control costs. Invasive plant management is a long-term commitment in which continued monitoring and adaptive management are necessary. The presence of seed banks and the viability of those seeds in the soil can lead to new plants germinating in subsequent years. Invasive plant surveys are conducted annually to monitor treatment success and plant regrowth.

Prevention Strategies

Preventing new infestations and the spread of existing infestations are imperative for effective management of invasive plants and will significantly reduce future treatment costs. To limit the introduction or spread of infestations on site, the following actions will be implemented.

- Prior to ground disturbance/construction activities on site, Sinova will complete invasive plant surveys and any follow up treatment throughout the project as required;
- Eradicate invasive plant material appropriately;
- Ensure all soil and/or fill materials and seeds/seedlings coming onto site are free of invasive species, and;
- Require machinery entering site to be cleaned and free of organic material.

The contract miner must clean all vehicles and equipment brought to site prior to entering the site. Movement in weed-infested areas should be avoided or minimized. Contractors and employees working in known infestations are advised to wash the under carriage of their vehicle at the end of the day and when travelling between sites throughout the day. Crews travelling on foot within infestation sites are advised to wash their boots before moving to a new site to prevent spread and check clothing for weed seeds and plant parts. Proper disposal of weed seed and plants parts found on clothing and equipment should be performed. Proper disposal may include landfill-bound garbage or composting and is species-specific (see Control Strategies). Further, ensure sources of sand, gravel and fill maneuvered on site are weed-free and stockpiles are maintained in a weed-free condition.

Training contractors and employees in recognizing the various invasive species present on site will improve prevention efforts. It is suggested that during site orientation contractors and employees should be instructed in the identification of invasive species present on site so they can avoid travelling through infestations, report new infestations, and be able to recognize invasive plant parts on clothing and equipment which will need to be properly disposed of. A map of the locations of major infestations will be available for reference.

During reclamation efforts, invasive plant prevention includes ensuring seed mixes (if used) for revegetating sites are weed-free. The Canada Seed Act ensures seeds sold in, imported into, and exported from Canada meet prescribed standards and are marked, packaged, and properly labelled. To know what seed contaminates are present within a seed mix, a Certificate of Seed Analysis should be requested. Seed should not be applied before the Certificate of Seed Analysis for each species are reviewed and approved.

Control Strategies

Integrated Pest Management (IPM; also known as Integrated Weed Management, IWM) is defined by the Invasive Species Council of BC (2019b) as: "a decision-making process that includes identification and inventory of invasive plant populations, assessment of the risks that they pose, and development of well-informed control options that may include a number of methods, site treatments, and monitoring." (Figure 2). An IPM/IWM plan emphasizes prevention as it is the most cost-effective method to managing invasive plants (Province of BC, 2023). In addition to prevention, a variety of control and treatment options can be used to manage invasive species (Province of BC, 2023) currently present on site, including:

- Mechanical control (digging, hand-pulling, mowing, etc.)
- Biological control

Multiple treatment options may be utilized to control infestations based on an assessment of the characteristics of the infestation. Figure 12 outlines the integrated weed management approach. Sinova will opt for non-toxic treatments to prevent contamination of the receiving environment. Mechanical controls will be prioritized.

Mechanical: When mowing or brushing, begin in "invasive plant free" areas and end in infested areas. Implement full width mowing around wells. Avoid mowing grasses and vegetation lower than 15cm above ground level. Mow or brush invasive plants *prior* to seed set and not after. Shut-off and raise equipment when selectively cutting areas.

Biological, Grazing, Fire: Biological controls should be used cautiously. Other species-specific control methods may include grazing and fire.

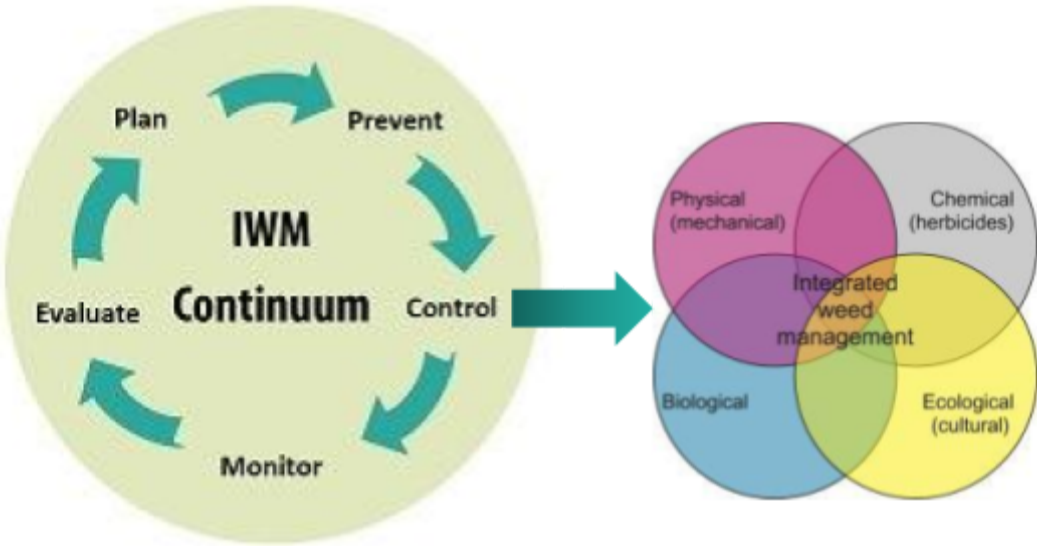


Figure 12. Integrated Weed Management approach (Merfield, 2019 and Clark County Washington, 2023)

Of the invasive plant species identified, the BC Ministry of Forests, Lands and Natural Resource Operations (BCMFLNRO), the Ministry of Agriculture (2015) considers spotted knapweed to be one of the top 25 most noxious weeds in BC and the Columbia-Shuswap Invasive Species Society (2023) deems baby's breath to be one of the top 10 most invasive plants within the Columbia-Shuswap region. These noxious weeds should be actively treated and monitored as follows.

Spotted Knapweed (*Centaurea biebersteinii DC.*) – Provincially Noxious

Eradication of spotted knapweed infestations within the lease area is advised to prevent further spread. Monitoring is also crucial to detect new infestations and subsequently eradicate them (Figure 13).

Figure 13. Spotted knapweed flower.

Spotted knapweed is a short-lived perennial weed that blooms from July to October, preferring to grow in open areas and well-drained soils (BCMA, 2015). This quarry property presents ideal conditions for spotted knapweed infestation. It is a highly competitive plant that can establish dense colonies on disturbed sites and can also invade undisturbed natural habitats. Seeds germinate in the fall and early spring and one plant is able to produce over 400 seeds under range conditions and over 25,000 seeds under irrigated conditions (BCMA, 2015). Spotted knapweed's seed bank decreases by 95% over a 7-year period; however, the remaining seed, which can range up to 400,000 seeds per hectare, can remain viable for many years (Davis et al., 1993). Knapweed is also known to be allelopathic, inhibiting the growth of competing plants (Scott and Robbins, 1999).

Recommended treatments follow BC Invasive Species Council (2019a) guidelines for Knapweeds.

SAFETY: Spotted knapweed can cause skin irritation; PPE should be worn when surveying or handling to prevent contact. Hands and exposed skin should be washed with soap and water following contact with this plant.

Mechanical: Containment and eradication of spotted knapweed is imperative to prevent its spread. Physical control of the plant is labour intensive. Cutting, mowing, or pulling spotted knapweed can be effective on a local basis for small populations and is most effective when completed prior to seed set. Wherever possible, the entire root system should be removed to prevent re-sprouting; however, stem removal and prevention of seed set is most important. If the plants have not yet flowered, the removed plants can be left onsite, but stems should be twisted, bent or otherwise crimped. If treatment is performed while flowers are present on stems, the plants must be bagged and removed from the site to prevent production of viable seeds. Follow-up treatments will be required as knapweed has an extensive, long-lived seed bank. Hand-pulling may be required up to three times per year (Scott and Robbins, 1999).

Biological: Twelve biocontrol agents have been released in the province for managing spotted knapweed and several agents show promise for a variety of habitats: *Agapeta zoegana* (moth), *Chaetorellia acrolophi* (fly), *Cyphocleonus achates* (weevil), *Larinus minutus* (weevil), *Larinus obtusus* (weevil), *Metzneria paucipunctella* (moth), *Pelochrista medullana* (moth), *Puccinia jaceae* (stem and leaf rust), *Sphenoptera jugoslavica* (beetle), *Terrellia virens* (fly), *Urophora affinis* (fly), *Urophora quadrifasciata* (fly) (Powell et al. 1994). Currently, there is no single biological control agent that effectively manages this weed and biocontrols are most effective when used in combination. Evidence strongly points to a suite of biocontrol agents (seed feeders and root feeders) as the primary drivers of knapweed decline in British Columbia's Southern Interior. The most promising agents thus far are the root-feeding insects *Agapeta zoegana* and *Cyphocleonus achates*. Other species, such as the seed head weevils, *Larinus minutus* and *Larinus obtusus*, and the seed head flies, *Urophora affinis* and *Urophora quadrifasciata*, may be having an impact on seed production. Seed-reducing flies (*Urophora* spp.) have successfully established within infested areas and have been found to reduce 95% of knapweed's seed production (BCMA, 2015).

Grazing: Cattle and sheep will graze spotted knapweed, although sheep appear to be the more effective control animal. Olson et al. (1997) found that sheep would graze on spotted knapweed rosettes and seedlings when associated grasses were dormant. No similar work has been done in the province, however.

Fire: The role of fire as an effective management tool is unclear. Watson and Renney (1974) report there was some success in Russia where grasses replaced the knapweed.

Canada thistle (*Cirsium arvense*) – Provincially Noxious

Canada thistle is a provincially noxious perennial that was found in 2015 but not in 2019. Continued monitoring is required to determine if treatments are necessary (Figure 14).

Figure 14. Canada thistle flower.

Canada thistle is found in almost every plant community over a wide range of elevations where there is soil disturbance or bare ground including roadsides, railway embankments, lawns, gardens, cultivated and non-cultivated fields, margins of forests, meadows, wetlands, and native plant communities. It is best adapted to rich, heavy loam, clay loam, and sandy loam. It grows poorly in shaded conditions. It can tolerate saline, wet, or dry soils, but does not tolerate waterlogged or poorly aerated soils. Canada thistle reproduces by seed and vegetatively through creeping, horizontal roots, the fragments of which are capable of forming new plants. Seed viability may be low; mature seeds germinate most readily in mid-spring. Non-germinated seeds may remain dormant for up to 3 years. Canada thistle develops seed sparingly and may produce 1,000 to 1,500 seeds per flowering shoot. Dispersed primarily by wind, seeds can also be dispersed by water, animals, clothing, equipment, and vehicles. Generally, vegetative reproduction from its root system contributes to local spread and seed to long distance dispersal. Single plants can spread rapidly (up to 5.5 m per season) and form dense patches, particularly in riparian areas, thus out-competing native plants.

Recommended treatments follow BC Invasive Species Council (2019b) guidelines for Canada Thistle.

Mechanical: Mowing is most effective when completed at the bud stage. Regular cutting or tillage can help wear down plant reserves, reduce plant growth, and reduce populations, but is not likely to kill the plant. Disposal: If plants are cut prior to flowering, the plant material can be left on the site to decompose. If plants are cut post flowering, all plant parts, including flower heads, should be bagged and deeply buried at a landfill. Care should be taken to ensure that plant parts are not distributed during transport.

Biological: A seed weevil (*Larinus planus*), stem gall fly (*Urophora cardui*), leaf-eating beetle (*Altica carduorum*), and stem and root mining weevil (*Hadroplontus litura*)have been released. *L. planus* is showing particular promise in suppressing Canada thistle.

Chemical: 2,4-D is effective when used in the spring on new germinants and will achieve suppression of mature plants with repeated treatments. Picloram and glyphosate give good control when applied in the fall after the first hard frost. Spring applications of aminopyralid or clopyralid give good control and suppression of top growth. Applications of metsulfuron-methyl give good control up to the early bud stage.

Burdock (*Arctium minus*) – Regionally Noxious

Figure 15. Burdock leaves.

Figure 16. Burdock seedheads.

Burdock is a regionally noxious species that was found at the site in 2015 but not in 2019. Continued monitoring is required to determine if treatments are necessary. Integrated management efforts must include the elimination of seed production and the depletion of the seed bank. Regardless of the control method(s) used, it is paramount to also remove all seedheads; note that it will likely take several years to exhaust the seed bank.

Burdock is generally considered a biennial plant: it forms a rosette of leaves in the first year, and flowers in its second year before dying off (Figure 15). However, observations show that some plants are adopting a perennial life cycle. Burdock thrives in moist, fertile, and nitrogen-rich soils of disturbed areas such as roads, ditches, and riparian areas. Burdock is known for its clinging burrs that were the inspiration for the product named Velcro (Figure 16). Each individual plant can produce up to 16,000 seeds, during its typical life span of four years. Seeds are shed throughout the fall, winter, and following spring, while the majority of seeds germinate in early spring. Common Burdock spreads by its clinging and prickly burs, which attach themselves to animals, clothing, and equipment. The burs can remain on animals for several weeks and be carried more than 10 kilometres. Birds and bats can become trapped by the sticky burrs and die.

Recommended treatments follow *Sea to Sky Invasive Species Council Factsheet* (2022) and Province of BC (2002) guidelines in *Guide to Weeds in British Columbia*.

> **Mechanical**: While sources typically recommend severing the taproot below the root crown to kill the plant at the first-year stage (rosette), this is rarely done properly, leading to greatly diminished efficiency with this approach. A better approach is to remove the taproot in its entirety by digging it up. Cutting above-ground vegetation when the plant is in its second year of growth can be a stopgap control method, but carefully consider the timing of mechanical control efforts: cutting Burdock after seedheads develop compounds the problem and risks spreading the seeds. Burdock also tends to branch out when the leaves are cut but the taproot is not removed. Remove all plant material from the site to avoid Burdock's allelopathic effects. Lastly,

remove all seedheads, including previous years. Use sealed garbage bags or tarp plants and seeds before transporting to a designated disposal site; DO NOT COMPOST.

Biological: There is no official biocontrol for Burdock in BC. However, a seedhead-feeding moth (*Metzneria lappella*) is among the 13 insects that are known to attack Burdock and is present in BC after arriving here adventitiously from other parts of North America. This moth greatly reduces the number of viable seeds in a plant.

7.5.3 Species at Risk (SAR) Management

It is prohibited to kill, harm, capture, possess, collect, buy, sell, trade, or take an individual of a native plant species that is listed as extirpated, endangered, or threatened Federally while on Federal lands. It is further prohibited to damage or destroy the habitat of one or more individuals of that species that is on federal lands in the province.

The SAR list will be reviewed and updated annually against the B.C. Conservation Data Centre (i.e., BC Species and Ecosystems Explorer application) to remain compliant with status changes.

If any listed plant species are discovered at site, they will be:

- Photographed;
- marked or flagged;
- location mapped; and
- the observation will be reported to the Environmental Site Manager.

Additionally, the following mitigation measures may be implemented at the direction of the Environmental Site Manager:

- Reduce the impact of disturbance and fugitive dust on listed plants and ecosystems at risk through adherence of established no-work-zones and dust control measures;
- Salvage listed plant species where practical (by a QP), in accordance with the species-specific Government of Canada Recovery Strategy, and re-establish in suitable natural habitats that are undisturbed by Project activities prior to disturbance.

7.6 Site Map

Figure 17 includes a map that displays invasive species occurrences at the site, current to 2019. This map will be updated prior to the start of construction and at least annually thereafter. A record of all invasive species control measures implemented at site will also be maintained.

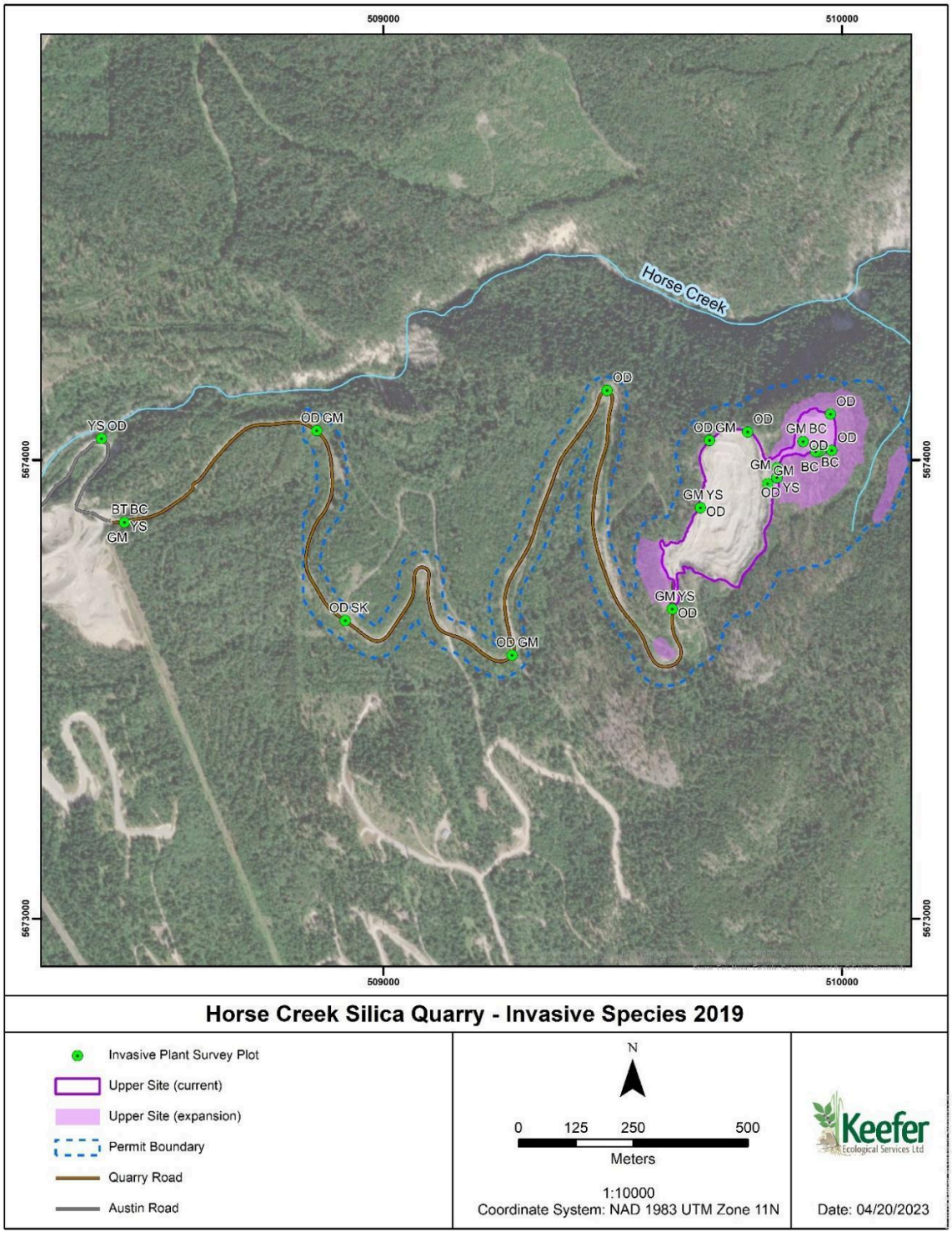


Figure 17. Invasive plant species occurrences at the upper site (2019). Invasive species identified were: bladder campion (BC), bull thistle (BT), great mullein (GM), oxeye daisy (OD), yellow salsify (YS), and spotted knapweed (SK).

7.7 Plan Implementation

7.7.1 Roles and Responsibilities

7.7.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives, for permitting as well as invasive species or native vegetation issues;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

7.7.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives, for permitting as well as invasive species or native vegetation issues.

Specific invasive plant and vegetation management responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of invasive species and other vegetation management concerns/actions.

7.7.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific invasive plant and vegetation management responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors of invasive species and other vegetation management concerns/actions.

7.7.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

7.7.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include the invasive plants and vegetation management actions specific to quarry activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of vegetation and the avoidance of invasive species on site. A current map of all invasive plant infestations and their associated species and training will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

7.7.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Current known invasive plant infestations within the project area;

- Reporting requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential invasive plant species occurrence during the course of their regular site activities. Sinova will provide all site employees or contractors with updated maps indicating areas of concern with respect to vegetation management (e.g., invasive and at-risk plant species).

7.7.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the plan, to ensure that disturbance is limited to permitted boundaries, to avoid or minimize establishment and spread of invasive species and to ensure that effects of disturbance are mitigated in a timely manner.

Evaluation of the effectiveness of sites actively treated can be assessed by continued monitoring. Invasive plant inventories should also be done each summer to assess whether new infestations have established and whether present infestations of all invasive plants detected in the area has increased, declined or remained the same. Monitoring stockpiles is also important to ensure they remain weed-free, which limits the spread of invasives when soil from stockpiles is used. The presence of an invasive plant expert on site during monitoring and treatment is advised to ensure monitoring is complete and comprehensive. An ongoing monitoring program is imperative in the success of the invasive plant management plan.

The following monitoring and maintenance procedures will be in place:

- Equipment inspections will be completed as new pieces of equipment are mobilized to the site. Equipment with soil and/or plant material from another location will not be permitted to enter the site in order to limit the potential for introduction of foreign plant material to the site, potentially including invasive plant species.
- Pre-construction surveys will be completed prior to ground disturbance at the site to limit the spread of established invasive plant species throughout the site.
- Annual invasive plant and general vegetation monitoring (including but not limited to quarry infrastructure area, soil and woody debris stockpiles and undisturbed areas immediately adjacent the site) will be conducted.
- Invasive plant control (e.g., manual, chemical) will be implemented at the site as needed.

This plan will be reviewed and updated at least annually.

7.8 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 18.

Table 18. Trigger Response Action Plan for vegetation management throughout the project area.

Level of Risk	Trigger	Action/Response
Normal	Vegetation clearing	• Environmental monitor to perform pre-clearing survey • Documentation of species found, track walked, support of decision to allow clearing • Clear only within permitted boundaries • Phased clearing for areas to be developed immediately
Level 1	Undesirable species and/or nuisance weeds detected	• Consult with Quarry Manager on potential for realignment of clearing activities or need for control before clearing • Maintain record of decision-making process and mitigations applied
Level 2	Noxious weed species detected	• Consult with Quarry Manager on need for control before clearing • Identify applicability of types of control (i.e., manual, chemical) • Maintain record of decision-making process and mitigations applied
Level 3	Prohibited noxious weed or at-risk species detected	• Consult with Quarry Manager on potential for realignment of clearing activities • Implement best management practices for control or protection • Maintain record of decision-making process and mitigations applied

7.9 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant on-site communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

7.10 Adaptive Management

Sinova will work towards continual improvement of vegetation management at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be

studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased inspections of vehicles entering site;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures; and/or
- Additional supervisory oversight.

Chapter 8: Wildlife Management Plan

8.1 Authorship and Version Control

Version #	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
3	Updated company details Reformatted version control Separated upper from lower site Expanded data collection Expanded mitigations Plan is operations ready	Sarah Hirschfeld, PAg Michael Keefer, PAg Dr. Steve Ross, RPBio Isobel Phoebus, MSc	KES KES KES KES	2023-04-24
2	Updated HiTest to Sinova	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-07
1	Prepare for operations	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2020-08-31

8.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2020-09-21

8.3 Purpose/Objectives and Scope

The plan has been developed to minimize the potential effects on wildlife during the construction and operation of the project while considering operational requirements and the safety of site personnel. This plan focuses on reducing the risk of direct wildlife mortality, mitigating the potential for human-wildlife conflicts, and minimizing the level of disturbance to wildlife. This plan incorporates

adaptive management strategies and best management practices; all of which will be reviewed and updated based on the outcomes of initial management practices.

The plan is designed to fulfill the guidance provided by provincial and federal statuses and best management practices and the information requirements for the *Mines Act* permit. The plan is designed to provide environmentally responsible, realistic, and operationally feasible guidelines for wildlife management.

The performance objectives of this plan are to:

- Reduce disturbance and mortality during sensitive wildlife periods.
- Reduce disturbance and mortality related to roads and traffic.
- Reduce disturbance and habitat avoidance related to project disturbances.
- Reduce human-wildlife conflicts.
- Monitor project effects on wildlife.

8.4 Baseline Data

Limited wildlife baseline data exists for the site (see Table 19). A Species Inventory Web Explorer (SIWE) desktop review of publicly available and secured data for wildlife species and habitat information was completed in 2018 and yielded no recorded observations of species at risk or critical habitat polygons overlapping the upper site footprint. Due to past activities on-site (forest harvesting and extraction) there are few wildlife inhabiting the area and wildlife habitat could be described as marginal during the Care and Maintenance period (pre-2023). Baseline wildlife data collection was not a requirement for permitting but was implemented to assist with wildlife management and monitoring on-site as well as reclamation planning. Baseline data collection included wildlife camera trapping and acoustic bat detectors, alongside wildlife and habitat feature surveys, to establish presence and distribution of wildlife species across the Project footprint.

Table 19: Reported wildlife observations at the upper site (2015-2022).

Year	Wildlife Observations
2018	Common Nighthawk (threatened)
2021	Dark-eyed Junco, American Robin, Yellow-rumped Warbler, Chipping Sparrow, Red-breasted Nuthatch, active Common Nighthawk and nest, active Swainson's Thrush nest with four eggs, active flycatcher nest with four nestlings in the nest.
2021	Black bears, deer
2022	Ungulate browsing and tracks

8.4.1 Baseline Data Collection

Wildlife and habitat features, camera trapping, and bat acoustic recording surveys were conducted in late spring 2023. Results from data collected will be included in the next version of this management

plan. A QP revisited the site in advance of and during spring 2024 pre-clearing activities to ensure monitoring methods are performing as intended.

The objectives are:

- to provide baseline data on wildlife presence and distribution across the Project footprint for disturbance and reclamation planning,
- to facilitate ongoing monitoring, and
- to inform adaptive management for wildlife found on Site to ensure mitigation measures are effective.

Wildlife and Habitat Feature Surveys

Under the *Forest and Range Practices Act* (FRPA 2002), the Government Actions Regulation (GAR) supports decisions that trigger requirements to protect wildlife and wildlife habitat features from being damaged or rendered ineffective. Furthermore, the BC Ministry of Environment and Climate Change Strategy (ECCS) Ecosystems Branch issued the Wildlife Habitat Features Order for the Kootenay Boundary Region (ECCS 2019a). A wildlife habitat feature is a feature used by one or more wildlife species to meet their life history requirements and that requires special management to ensure protection and maintain their function. Under the *Wildlife Act* and the Order, the following are identified as wildlife habitat features:

- a nest of:
    - a Flammulated Owl
    - a Western Screech Owl
    - a Lewis's Woodpecker
    - a Williamson's Sapsucker
- an American badger burrow
- a grizzly bear den
- a significant mineral lick
- a significant wallow
- a bat hibernaculum
- a bat nursery roost
- a hot or thermal spring

These are high-priority features associated with species of special management concern that are potentially affected by industry practices, and for which no other means exists to provide special management. Sometimes, it may be impractical or unrealistic to adhere to the regulations that protect wildlife habitat features; The *Forest and Range Practices Act* can permit exemptions from the obligation to protect such features depending on the circumstances or conditions related to the area in which the feature occurs. To grant an exemption, the responsible ministry decision maker must be satisfied that meeting the requirements is not possible.

Tracking baseline data and new wildlife habitat feature locations is important to ensure effective management. This information will assist operational plans and for compliance and effectiveness

evaluations. Wildlife and habitat feature surveys were conducted concurrently with wildlife camera trapping and bat acoustic surveys. These surveys aimed toidentify and record the presence of wildlife (track and sign) and wildlife habitat features listed above on-site. Walking surveys were conducted using a systematic approach to locate potential wildlife, covering habitats according to availability and in a spatially distributed way (prior to going on-site). Results from the wildlife and habitat feature surveys will be included in the next version of this management plan. There is also no fencing surrounding the upper site, with only a security gate on the access road and no fencing beside it; this allows for continued wildlife movement through the site.

Camera Trapping Survey

In 2023, ten camera traps were deployed across the Project area for a three-month period (Figure 18). These cameras were moved to different sampling locations for a subsequent three months. This rotational camera trapping procedure provided coverage across the Project area during multiple seasons to better baseline and monitor species presence and distribution.

Camera placements were strategically selected to best cover the entire Project area and account for diversity in habitats and site features. The first deployment in spring 2023 prioritized the permitted quarry area (i.e., upper site), to better understand if and how wildlife (e.g., ungulates and furbearers) have been using this area while the quarry was non-operational during the Care and Maintenance period. The second deployment during summer 2023 provided improved baseline coverage of the lower site (see Lower Site Wildlife Management Plan). Initial camera locations were selected to sample across different habitat types with consideration to topography, elevation, infrastructure, and disturbance intensity. Examples of prioritized features included common wildlife travel routes, such as tracks, streams and roads, and intact adjacent forests. Actual camera locations were modified during deployment based on field observations of wildlife habitat suitability and sign. The field team accessed the predetermined camera sampling locations on foot, and conducted sign and wildlife habitat feature surveys while accessing wildlife camera locations. Camera positions weremodified based on observations while walking into camera sites to best monitor wildlife. Rationales for modifying planned camera trap sites (e.g., observations of wildlife signs, trails, or habitat features) were recorded. This approach allowed both systematic surveys, while maintaining expert opinion when actually placing the camera. Results from the camera trapping surveys will be included in the next version of this management plan.

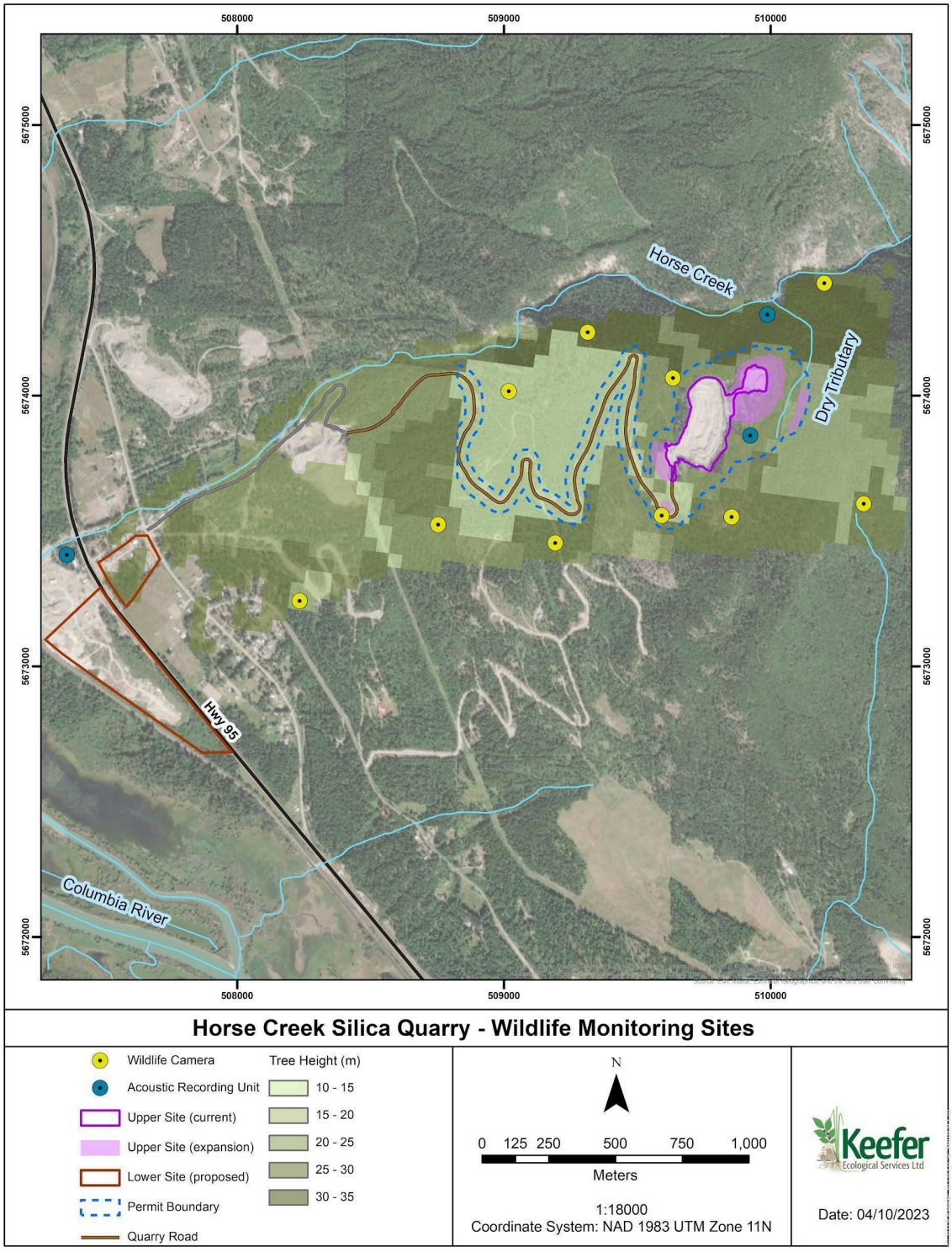


Figure 18. Planned layout for wildlife monitoring sites including baseline camera traps and bat acoustic recording surveys.

Bat Acoustic Surveys

Two Song Meter SM4 bat acoustic monitors were deployed in the upper site during 2023. Target sites were the stream channel in the north of the Project area and along the open Pit area as an edge foraging habitat (i.e., forest to open). Song Meters were deployed for one month. The data, which will be analysed using Kaleidoscope Software to produce a species list, will be included in the next version of this management plan. Based on initial investigations, further deployments may be scheduled.

8.5 Site Specific Mitigation Measures

The site-specific mitigation measures for the project area are detailed below and relate directly to the Trigger Action Response Plan (TARP; Section 8.8). In general, the following site-specific mitigation measures will be implemented:

- Avoid and/or reduce human-caused disturbance in identified sensitive habitat areas;
- Minimize the loss of high-quality habitat and disruption to movement;
- Identify, map, and post signage of wildlife habitat features;
- Maintain known and potential mineral licks;
- Avoid the destruction of active dens, roosts or nests; and
- Avoid mortality of wildlife.

Priorities and follow-up action for any wildlife or habitat features identified on-site will be based on the wildlife found, the species and protection status, and if it is an active or inactive feature, etc. Where possible, project activities will avoid disturbing wildlife during critical time periods, particularly for any activities that require the disturbance of vegetation or soil. If avoiding an area entirely within critical windows is not possible, pre-clearing surveys will be conducted (Section 8.5.1). Appropriate buffers can be assigned by a QP or stop work orders announced for required time periods (e.g. until wildlife relocates or a nest is no longer active). Quarry activities will also avoid disturbing movement corridors and critical habitats when possible, which will minimize disruption to wildlife movement.

Sightings of wildlife will be recorded by all employees and contractors on site using a standard wildlife reporting template. Any problem/unusual interactions with wildlife should be reported immediately to the Environmental Site Manager (or delegate) and a Conservation Officer Service (e.g., nuisance, habituated or injured wildlife). The intention of this “observe, record and report” policy is to:

- Identify species presence and abundance on and near site;
- Identify locations where species most often interact with project activities;
- Highlight areas of potential risk to wildlife and employees;
- Highlight possible waste management issues;
- Identify locations of animal-vehicle near misses and mortality;
- Provide monitoring data for the Reclamation Research Program; and
- Over time, provide an indication of possible Project-related avoidance effects.

8.5.1 Pre-Clearing Surveys

Pre-clearing surveys will be completed to identify and recommend mitigation measures for any previously unidentified habitat features or important habitat types, including, but not limited to: wildlife trees, mineral licks, dens, nests or hibernacula (Demarchi et al. 2013; Site C, 2015). Surveys are to be conducted by a trained individual and signed off by a Qualified Professional (QP). The Environmental Site Manager will continue to monitor for new wildlife habitat features and communicate action and mitigation required by staff on a case-by-case basis. Pre-clearing surveys are required when disturbances occur during critical or sensitive time windows (8.5.2) and may be used outside these periods for baseline or ongoing monitoring.

Pre-clearing surveys will act to minimize the loss of high-quality and important habitat features. Important habitats and features will be avoided so that the activity does not damage or render ineffective the wildlife habitat feature. If or when identified, a significant habitat feature (e.g., wallow or at-risk bird nest) will be documented (GPS location, data record, photo) and appropriate signage posted on-site. These surveys will additionally identify potential wildlife paths and movement corridors that may be disturbed by quarry activities. Wildlife pathways will be described according to species and habitat. Paths will be recorded and marked.

Employees and contractors will be informed of identified wildlife habitat features to avoid and prevent any damage or destruction. Impacts will be mitigated by minimizing disturbance, e.g., active nests or suspected nest areas discovered during pre-clearing surveys may be allocated an appropriately sized no-work buffer as determined by the QP (see Section 8.5.2). The Environmental Site Manager and/or Site Supervisor will be notified immediately. General mitigation measures to be implemented include installing signage, establishing a reduced speed limit, and wetting the road surface to minimize dust.

Wildlife trees are standing live or dead trees that provide valuable habitat for wildlife species. Wildlife trees must be protected as per the BC *Wildlife Act*. Wildlife trees within riparian setbacks must not be removed (Ministry of Environment, 2009). If a wildlife tree is considered hazardous, a wildlife tree hazard assessment must be completed to determine the habitat value of a tree prior to removal. If given a low wildlife value, the tree may be felled; however, if in a setback area it should be left as coarse woody debris (CWD). High wildlife value trees (including nests of at-risk birds) must be marked and left in place. A no-work zone must be established around the tree, typically one or two tree lengths depending on the wildlife tree size (Ministry of Environment, 2009).

8.5.2 Species-Specific Timing Windows

There are time frames during which wildlife are particularly sensitive to disturbance and habitat alteration. Where possible, project activities will avoid disturbing wildlife during sensitive periods, particularly during construction (e.g., vegetation clearing). If avoidance is not possible, pre-clearing surveys will be conducted (8.5.1). During the construction phase and as required during operation, a QP or the Environmental Site Manager will be available to come to site to identify sensitive wildlife features and implement appropriate procedures to minimize potential adverse effects to these areas. Table 20

outlines the species that are most likely to be encountered on site and their species-specific least risk timing windows.

Table 20. Summary of site-specific and species-specific timing windows.

Species	Least Risk Timing Windows
Moose, Deer, Elk	The calving or fawning period from mid-May to mid-July for moose, deer and elk has been identified as critical. The winter rut and late winter period when forage species are sparse have been identified as a cautionary period (BC MFLNRO, 2014).
Grizzly and Black Bears	Mid to late winter for birthing as well as the full denning period are considered critical periods for Grizzly Bear. Cautionary periods apply to feeding activities and are specific to habitat features in which bears congregate or which form important local food sources (BC MFLNRO, 2014).
Furbearers	The critical period for Wolverine spans the natal, early rearing and late winter periods, generally occurring between February and the end of June. Wolverine are sensitive to disturbance, particularly from roads and recreational activities. Suspected or known denning sites and suitable habitat (e.g., classes 1-3 coarse woody debris or rocky colluvium) should be maintained wherever practicable. Wolverine are more sensitive to human disturbance between March and June (Weir, 2004). American marten cautionary period encompasses the natal denning and early rearing to late winter period when dens are established and marten kits are still in the den (e.g., March through September). There are no critical periods for marten (BC MFLNRO, 2014).
Migratory Birds	To avoid contravention of both the *Wildlife Act* and the *Migratory Birds Convention Act*, vegetation clearing will be conducted as described in this section. The nesting window for breeding migratory birds in the northern Rockies spans approximately from April through September (Zone A4).
Raptors	Critical periods for raptors include the nesting period, courtship, nest initiation, egg laying and young-in-nest periods (BC MFLNRO, 2014). The periods vary based on raptor species, but generally include March through September (Birds Canada, 2023). Raptor nests are protected year round, and a permit is required to remove/relocate empty nests.
Bats	Critical timing windows exist where winter hibernation and summer birthing sites exist. Clearing activities will be scheduled outside the sensitive hibernaculum (October to May; if identified) and maternity roosting (June to August) windows, whenever possible (BC MoLWRS 2022). If clearing activities are not able to be scheduled around these times, pre-clearing surveys will be conducted to identify bat habitat features within the proposed footprint.

Moose, Deer, and Elk

Ungulates in the area include moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), mule deer (*O. hemionus*) and elk (*Cervus canadensis*). Wildlife crossing signs and speed limit signs will be placed

along the length of the access road. Workers are to obey the speed limit and respect the wildlife crossing signs. Workers are not to feed ungulates and are to pack out what was packed in concerning food and associated garbage with no garbage to be left on site, unless secured in a bear-proof container (e.g., within a trailer). Ungulates are to be respected and given space. Young fawns and calves are not to be disturbed, and mother and young are to be given a wide berth. Avoid ungulates during rutting season as they can become very aggressive and charge. Be aware of the animals' body language. A threatened animal may lower its head and flatten its ears before it charges. If these behaviours are observed, find an escape route. Workers are to report any ungulate sightings to the Quarry Manager and/or Environmental Site Manager.

Grizzly and Black Bears

The following is not intended to replace bear awareness training, which is a key component of the safety protocol for this site and is required for all site personnel. Workers are required to carry bear spray when working away from equipment and vehicles. Workers must be trained on its proper use. Workers should be vigilant, watching for bear grizzly (*Ursus arctos*) and black bear (*Ursus americanus*) signs, such as scat, tracks, signs of grazing, overturned logs, and claw marks. Workers should be particularly vigilant when working alongside running water, in thick bush, or if a strong wind is blowing as this reduces a bear's ability to hear and smell, increasing the possibility of a surprise encounter. Bear attractants should not be present on site for prolonged periods. Workers are to pack out what was packed in concerning food and associated garbage, with no garbage to be left on site, unless secured in a bear-proof container (e.g., within a trailer). Workers are to immediately report any bear sightings to the Quarry Manager and/or Environmental Site Manager.

Furbearers

In addition to bears, other furbearers may use the site such as cougar (*Puma concolor*), Canada lynx (*Lynx canadensis*), American marten (*Martes americana*), wolverine (*Gulo gulo*), weasel species (*Mustela spp.*), wolves (*Canis lupus*), and coyote (*Canis latrans*). Scent reduction is critical to avoid habituation. Attractants should not be present on site for prolonged periods. Workers are to pack out what was packed in concerning food and associated garbage, with no garbage to be left on site, unless secured in a bear-proof container (e.g., within a trailer). Workers are to immediately report any furbearer sightings to the Quarry Manager and/or Environmental Site Manager.

Nesting Migratory Birds and Raptors

Active bird nests may occur within or near potential development or operational activity areas. Rescheduling activities to minimize risks to birds and their habitats is recommended. Nesting surveys shall be designed and conducted by a QP to determine potential nesting activity within the quarry area (Figure 1). If active nests are observed, a suitable avoidance buffer or restrictive construction timelines shall be imposed by the QP during relevant development phases, where applicable. Several factors will determine the size and shape of the buffer, including the topography of the site, the proximity of the nest to naturally open areas, the type and amount of surrounding vegetation cover, the nesting period, the sensitivity of a particular species to disturbance, the rarity of the species in the local/regional area,

and the type and extent of clearing activities that will take place adjacent to the buffer. Most bird nests require a 30 m buffer but can range up to 300 m (Site C, 2015).

While determining the presence of nests using active search techniques is generally not recommended, it may be appropriate when conducted by skilled and experienced observers and using appropriate methodology, especially when clearing outside of the nesting window is not possible on a site (e.g., due to site seasonality and access limitations). A combination of point count surveys and active search techniques are recommended and have been proven to be successful at other similar sites. Surveys will be completed by a trained individual and signed off by a QP, those belonging to legislated self-regulating associations and with extensive experience with bird identification (audible and visual), throughout the nesting window for the region, from late-April until mid-August. Once nest sweep surveys have been completed, best practices recommend the site be cleared within 3 days (Site C, 2015). If an area is not cleared within this timeframe, a second nest sweep survey must be completed. Where appropriate, buffer zones and setback distances may be recommended based on guidance from Environment and Climate Change Canada. Raptor nests are protected year-round and a permit is required to remove/relocate empty nests.

Bats

Active maternity roosts or hibernacula may occur within or near potential development or operational activity areas. Rescheduling activities to minimize risks to bats and their habitats is recommended. Pre-clearing surveys will be conducted by a QP to identify potential species present and their roosting habitats within and adjacent to the proposed expansion area (Figure 18).

8.5.3 Effective Waste/Attractant Management

Attractants should not be present on site for prolonged periods. Workers are to pack out what was packed in concerning food and associated garbage with no garbage to be left on site, unless secured in a bear-proof container (e.g., within a trailer). Workers are to immediately report any nuisance wildlife sightings to the Site Supervisor or Environmental Site Manager, who will contact the BC Conservation Officer Service as required.

All workers will be educated on waste management policies that are intended to limit human-wildlife interactions and will assist in keeping the risk of encounters to a minimum. For each case where misdirected waste is observed, the location, date, and time of the observation as well as the type and amount of waste will be recorded. If wildlife is observed interacting with waste, the species observed, number of individuals, behaviour, and condition of the animal(s) will be recorded.

When monitoring identifies situations where wildlife are accessing waste, a management response will be triggered. The response will assess the situation and determine the cause of the problem. Adaptive management will be developed on a case-by-case basis when waste misdirection is identified. Problem wildlife must be reported to local wildlife authorities. Additional measures should include:

- Dispose of refuse/garbage appropriately;

- Manage roadway vegetation to allow for increased visibility and re-vegetating roadsides with suitable species mixes to limit attracting wildlife;
- Remove carrion from work areas and roads; and
- Avoid creation of standing pools attractive for amphibians as frogs and toads can breed in various freshwater bodies, including temporary pools on-site during the breeding season.

If any wildlife is found sick, injured or dead, provincial guidelines of handling and reporting will be followed (BC Government, 2023). If handling the animal is required protective clothing and equipment such as leather gloves to avoid bites or scratches will be worn and hands washed after handling the animal. In the rare case of a wildlife mortality and the need to dispose of carrion or carcasses, employees and contractors will advise the Environmental Site Manager or Site Supervisor, who will report to appropriate contacts based on the case (e.g. Conservation Officer Service). Proper disposal can also be completed in an approved landfill location (e.g. Golden Landfill); the landfill office must be notified in advance of transport. Mortalities may not be disposed of in a designated gravel pit or carcass pit; these pits attract grizzly bears, wolves and other predators, leading to public safety issues.

8.5.4 Road and Traffic Management

The objectives of road and traffic management as it applies to wildlife, are to avoid vehicle/wildlife interactions and minimize disturbance to wildlife. The following protocols will be implemented to achieve these goals:

- Wildlife will be given the right-of-way along the access road.
- Speed limits will be posted and enforced. Road signs will be posted along the access road to alert drivers of speed limits and of sensitive wildlife areas, such as crossings (if discovered). Workers will be informed about potential wildlife travel corridors along the access road and applicable mitigation.
- Collisions between vehicles and wildlife will be documented and will include information on the location of the collision. All information on collisions and carrion spotted along the access road will be shared with relevant government agencies (e.g., Ministry of Transportation and Infrastructure). Locations where wildlife collisions take place will be prioritized for adaptive management. Road kills will be reported and disposed of as quickly as possible to avoid the attraction of carrion feeders to the road. Carcasses will be disposed of appropriately or moved as far away as possible from the roadside.
- Any encounters with wildlife (including observations) will be reported and recorded. Reports should be made over the radio to alert other operators. These records will be used to identify locations of considerable risk to wildlife and for developing appropriate mitigation strategies.
- Ditches and culverts along the length of the access road will be designed and maintained to minimize the pooling of water.
- Vegetation management along the length of the access road will be done in such a manner that reduces attractiveness and increases visibility of wildlife to drivers.
- Existing trails and access roads will be used to the maximum extent possible across the Project area to reduce further habitat fragmentation or destruction.

If repeated wildlife conflicts or observations are found in particular areas along the access road, this plan will be reviewed and adapted as necessary. Additional mitigation measures could include increasing signage, improving the line-of-sight, altering speed limits, adjusting vegetation and/or dust management practices.

8.5.5 Blasting and Noise Management

Blasting will occur on an as needed basis and will not occur full time throughout the working hours of the quarry site. The size and precise frequency of blasts will be determined by the Contract Miner, in alignment with the Five Year Mine Plan (Golder Associates, 2013 to be updated by Moose Mountain Technical Services, 2023). A Terrestrial Receptor Blasting Impact Test will be conducted by a qualified professional (QP) during 2023 to determine the zone of influence including Vibration Peak Particle Velocity (PPV) and Overpressure (decibels). The results of this blasting test will guide mitigation measures for both worker safety and wildlife. The Environmental Site Manager or other QP will be on site during the Blasting Test to conduct concurrent wildlife incidence and response surveys.

Noise is typically monitored as sound pressure level in A-weighted decibels (dBA), where the A-weighting is designed to match the average frequency response of the human ear. Some typical noise levels are provided below for context (in dBA) (ERM Rescan, 2015).

- rustling leaves: 20
- refrigerator humming: 40
- normal conversation: 60
- business office: 65
- average city traffic: 80 to 85
- jackhammer: 100
- jet take-off at 100 m distance: 130
- thunder at close proximity: 120 to 160
- motorcycles, firecrackers, small arms fire: up to 140

Increased or continuous noise from quarry operations may impact wildlife biodiversity and populations through chronic reduction of habitat quality or acute responses to a blasting event such as flight, freeze, or startle. Continuous noise level during the night exceeding 45 to 55 dBA is considered a wildlife disturbance. A peak noise level of 108 dB is considered a wildlife disturbance and 120 dB is considered to be functional habitat loss (ERM Rescan, 2015).

Blasting has a very high impact on bat roosts, a sensitive wildlife habitat feature. Outside of the sensitive period for bats (June to August), blasting is acceptable with caution within a buffer zone between 50 m and 100 m from the roost. Extra caution is required adjacent to the roost and if in doubt, a bat specialist should be consulted (ECCS, 2019a). Past the 100 m buffer and within an additional one kilometer, blasting is acceptable. Within the sensitive time period, blasting may only be acceptable if bats and roost will not be negatively affected by the disturbance generated.

The following protocols will be implemented to minimize potential effects of noise disturbance on wildlife:

- The impact of noise will be managed and minimized on the environment wherever possible;
- If concerns arise regarding noise exposure, the Site Supervisor/Shiftboss can conduct an instantaneous noise reading to determine if additional controls are required for the task in question;
- Noise pathways will be controlled through the use of barriers (e.g., noise reducing enclosure for generator) wherever possible;
- Equipment will be regularly maintained to reduce noise (e.g., lubrication, replacement of worn parts);
- Equipment will be turned off when not in use to avoid unnecessary noise; and
- Sound-muffling additions will be added to equipment where possible to reduce noise. Any machinery or equipment which, when operating, exposes the operator or persons in the vicinity to noise levels in excess of those prescribed in the Health, Safety and Reclamation Code for Mines in British Columbia (EMLI, 2022), for unprotected ears, shall, if practicable, be fitted with a properly maintained muffler or other noise reducing device.

8.5.6 Lighting Management

Lighting requirements will be restricted to loading and unloading stations. The access road and pit will not be lit at night. Lighting will avoid bat disturbance during the winter as they are in hibernation and not active.

The following protocols will be implemented to minimize potential effects of light disturbance on wildlife while ensuring safe working conditions:

- Light operational areas will use the minimum level of illumination required to safely operate;
- Use direct lighting when possible, shielding it to illuminate only the work area and limit light dispersal;
- Motion sensor and timer lighting systems will be used, when possible, to limit light disturbance;
- Avoid short wavelength lighting systems; and
- Illumination should use light-emitting diodes (LED) to limit heat given off and therefore reduce insect activity that may attract bats.

8.5.7 No Hunting/Fishing/Shooting Policies

Sinova will implement and monitor compliance with a no hunting and shooting policy for the permitted site area (Figure 1). Furthermore, Sinova will implement a no fishing and hunting policy for all employees and contractors while on company business or while commuting to and from the site.

Signage will be posted on site and all site personnel will receive training (Section 8.7.2) that includes an overview of this policy.

8.6 Site Maps

A current map of wildlife monitoring sites (Figure 18) will be provided to the Quarry Manager and Site Supervisor to advise others on site as needed. Site maps will be updated as needed to show wildlife survey results, habitat buffers, and no-work zones and used as training materials for employees and contractors.

8.7 Plan Implementation

8.7.1 Roles and Responsibilities

8.7.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this plan.

8.7.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives, for permitting as well as wildlife issues.

Specific wildlife management responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping records of communication to employees and contractors of wildlife management concerns/actions.

8.7.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies or Indigenous groups on the aspects of this plan.

Specific wildlife management responsibilities include:

- Monitoring the implementation of this plan; and
- Keeping records of communication to employees and contractors regarding wildlife management concerns/actions.

8.7.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

8.7.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include the wildlife management actions specific to quarry activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management of wildlife and the avoidance of negative interactions from the site. Training will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

8.7.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Current wildlife management concerns within the project area, including any new wildlife observations or habitat features;
- Reporting requirements; and
- General roles and responsibilities under this plan.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the plan, all site personnel will be aware that the plan exists and the appropriate person to contact in the event that they observe a potential wildlife management concern during the course of their regular site activities. Sinova will also provide all site employees or contractors with updated maps indicating areas of concern with respect to wildlife management (e.g., problem areas along the access road, waste disposal/storage areas, areas to avoid disturbing, identified wildlife habitat features if mitigations are required).

A QP, the Site Supervisor, or the Environmental Site Manager will communicate required action and mitigation related to wildlife and wildlife habitat features identified at any time on Site (e.g. wildlife camera surveys, pre-clearing surveys, etc.).

8.7.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the plan, to ensure that effects of extraction activities are mitigated in a timely manner. The following monitoring and maintenance procedures will be in place:

- Pre-clearing surveys will be completed prior to ground disturbance at the site to identify any wildlife habitat features that may be disturbed (e.g., dens, roosts, nests) within critical timing windows.
- Clearing activities will be supervised to ensure no accidental losses of wildlife.
- A standardized reporting template for all wildlife sightings and encounters.
- A periodic review of all reported wildlife sightings and encounters to ensure an efficient adaptive management response.
- A standardized reporting template for all misguided waste concerns.
- A periodic review of all reported misguided waste concerns to ensure an efficient adaptive management response.

This plan will be reviewed and updated at least annually.

8.8 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 21.

Table 21. Trigger Response Action Plan (TARP) for wildlife management throughout the project area.

Level of Risk	Trigger	Action/Response
Normal	Vegetation clearing and construction activities	• Avoidance of sensitive windows, when possible • Pre-clearing surveys to be completed by QP • Documentation of critical habitat features identified, track walked, decision to allow or redirect clearing activities
Level 1	Wildlife observation/ sighting	• Report observation/sighting to Site Supervisor/ Shiftboss and/or Environmental Site Manager • Record observations on the wildlife sighting log • Monitor reports to apply adaptive management (e.g., signage)
Level 2	Wildlife encounters due to misdirected waste	• Report issue to the Site Supervisor/Shiftboss and/or Environmental Site Manager • Monitor reports to apply adaptive management (e.g., improved operational controls)
Level 3	Wildlife mortality or other human-wildlife conflict Habituated wildlife	• Report issue to the Site Supervisor/ Shiftboss and/or Environmental Site Manager • Report issue to appropriate government agency • Remove/dispose of carrion/carcass appropriately • Implement adaptive management plans and review current practices to ensure human-wildlife conflict does not repeat

8.9 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant on-site communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

8.10 Adaptive Management

Sinova will work towards continual improvement of wildlife management at the site. The Environmental Site Manager will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased signage, improved line-of-sight, reduction of attractants in problematic areas;
- Additional training of employees and contractors;
- Enhancement of maintenance or monitoring measures;
- More frequent reviews of the plan and ongoing reporting; and/or
- Additional supervisory oversight.

Chapter 9: Archeological Management Plan

9.1 Authorship & Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
3	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Micahel Keefer, PAg	KES KES KES	2024-12-27
	Updated company details. Reformatted version control. Plan is operations ready.	Sarah Hirschfeld, PAg Micahel Keefer, PAg	KES KES	2023-06-19
2	Separated upper from lower site. Updated HiTest to Sinova	Michael Keefer, PAg	KES	2022-02-04
1	Prepare for operations.	Michael Keefer, PAg Brett Watson, BSc, RPCA	KES Core Heritage Consulting Ltd.	2020-09-08

9.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31

9.3 Purpose/Objectives and Scope

More than 50,000 archaeological sites are currently recorded in BC, with many more being added to the provincial inventory every year. This protocol has been established to increase awareness of this vital resource and assist in development planning.

This plan has been developed in coordination with the *United Nations Declaration on the Rights of Indigenous Peoples Act*, S.C. 2021, c. 29 and the *Declaration on the Rights of Indigenous Peoples Act*, SBC 2019, c. 44. Sinova recognizes that the quarry site is located within the Traditional Territories of the Secwepemc peoples and the Ktunaxa Nation. As such, Sinova is committed to respecting the cultural heritage of the Indigenous Nations and agrees to align the Archaeological Management Plan and Chance Find Procedures with any conditions put forward by the affected Nations. The scope of this plan covers all quarry-related areas for the duration of the quarry's operation and closure and the actions of all

employees, contractors, and third-party experts. Presently, there are no known archaeological or cultural heritage sites at the quarry.

The performance objectives of the plan are to:

- Promote best practices regarding archaeological and cultural heritage sites;
- Ensure that all quarry-related users follow specified Chance Find Procedures;
- Comply with the *Mines Act* and *United Nations Declaration on the Rights of Indigenous Peoples*; and
- Prevent unauthorized use of archaeological and cultural heritage sites.

9.4 Archeological Assessment

Brett Watson of Core Heritage Consulting Ltd., a Professional Member of the BC Association of Professional Archaeologists, reviewed the existing and proposed site features and mineral lease boundaries for overlaps with existing Archaeological Overview Assessment (AOA) polygons. Figure 1 displays the same site area used during the 'Archaeological Potential Reviews' conducted by Core Heritage Consulting Ltd.

Upper Site - Existing Permit Boundary and Mineral Lease

No overlaps were observed, and given the topography at the site, no further recommendations were made regarding conducting field surveys (see Appendix D for details).

Based on these observed characteristics, the Subject Property was assessed as having very low archaeological potential; therefore, no formal assessment was recommended for proposed works within the Subject Property (see Appendix E for details).

9.5 Identifying an Archaeological Find

The remnants of BC's earliest cultures are represented in today's landscape by a wide variety of site types, most of which are related to art, habitations, resource gathering and production, toolmaking, and traditional ceremonial or ritual activities. Some sites that may be immediately visible to a non-archaeologist include:

- Rock art, including pictographs and petroglyphs.
- Tree art and Culturally Modified Trees (CMTs), including bark stripping and planks.
- Surface features such as depressions created by former habitations, earthen fortifications, rock cairns, fish traps, clam gardens, burned rock, and middens.
- Artifacts that have become visible on the land surface due to erosion or recent land-altering activity. These may be produced in various materials such as stone, bone, antler, wood, or shell.
- Buried cultural remains in a cut-bank, excavation, eroded shoreline, or exposed deposit.

9.6 Chance Find Procedure

Sinova will implement the following chance find procedure at the site.

9.6.1 Upon Discovery

If you discover what you suspect may be a possible archaeological site:

- Stop all work in the area.
- Do not disturb any archaeological remains that you may encounter.
- Report your discovery to the Site Supervisor/Shiftboss or Environmental Site Manager, who will provide further instructions.
- The Site Supervisor/Shiftboss or Environmental Site Manager will report the finding to the Quarry Manager.
- The Quarry Manager will contact the BC Provincial Archaeology Branch at 250-953-3334 and the affected Nations.

9.6.2 Possible Discovery of Human Remains

If you discover what you suspect may be possible human remains:

- Stop all work in the area.
- Do not disturb any potential human remains that you may encounter.
- Report your discovery to the Site Supervisor/Shiftboss or Environmental Site Manager, who will provide further instructions.
- The Site Supervisor/Shiftboss or Environmental Site Manager will report the finding to the Quarry Manager.
- The Quarry Manager will contact the RCMP (regardless of suspected age of human remains).
- The Quarry Manager will contact the BC Provincial Archaeology Branch at 250-953-3334 and the affected Nations.

9.6.3 Human Remains Discovery Follow-Up

The following actions will follow a discovery of suspected human remains:

- The Coroner's Office and local policing authority are notified, and the Coroner's Office determines whether the matter is of contemporary forensic concern.
- If the remains are not of forensic concern, the Archaeology Branch will attempt to facilitate the disposition of the remains.
- If a cultural affiliation for the remains can be determined, the Archaeology Branch will contact an organization representing that cultural group. If the remains are of aboriginal ancestry, the Archaeology Branch will contact the relevant First Nation(s).
- Generally, if remains are still buried and are under no immediate threat of further disturbance, they will not be excavated or removed. If the remains have been partially or entirely removed, the Archaeology Branch will facilitate disposition in coordination with the relevant Indigenous group(s).
- The Archaeology Branch may arrange for a qualified anthropologist or archaeologist to

assess the remains.

9.7 Plan Implementation

9.7.1 Roles and Responsibilities

9.7.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to meet objectives.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this plan; and
- Be accountable for the site's overall performance, including the outcomes of this plan.

9.7.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's programs and permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required permits to be stored on site.
- Be responsible for the implementation of management plans;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups through their designated representative.

Specific Archaeological Management Plan responsibilities include:

- Ensuring the implementation of this plan;
- Ensuring all site personnel are competent through training and awareness programs; and
- Keeping communication records for employees and contractors of archeological concerns/actions.

9.7.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) monitors compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager will:

- Act as a resource to the extraction team by providing guidance relating to permit

conditions, commitments, regulation, acts and interpretation of legislation.
- Be responsible for monitoring the implementation of management plans and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this plan.

Specific Archaeological Management Plan responsibilities include:
- Monitoring the implementation of this plan; and
- Keeping communication records for employees and contractors of archeological concerns/actions.

9.7.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to the government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by the government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a particular type of work may include registration with a professional association. Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

9.7.1.5 Employees and Contractors

A Chance Find Procedures orientation will be developed for site personnel and contractors and include the conditions within this plan. A vital component of this orientation is a clear explanation of each individual's role and responsibility in managing archaeological and cultural heritage sites. A map of any known archaeological sites will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:
- Ensure the implementation of this plan; and
- Gain and maintain competency through training and awareness programs.

9.7.2 Training

Training will be provided to all employees and contractors performing work on site. Training will focus on the following aspects:
- Awareness of the Chance Find Procedures requirements appropriate for the work activity being undertaken.
- Emergency contact information and procedures.
- General roles and responsibilities under this plan.

Training will be provided to all employees and contractors before entering the site for the first time and annually. Employees and contractors away from the site for more than six months will be required to

update their training. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. All site personnel will know the plan procedures and the appropriate person to contact if they discover a potential archaeological or cultural heritage site during their regular site activities. Sinova will provide all site employees and contractors with updated maps indicating known archaeological or cultural heritage areas.

9.7.3 Monitoring and Maintenance

The monitoring program aims to evaluate the plan, and to ensure that Chance Find procedures are followed appropriately to maximize the protection of archaeological and cultural heritage sites. Should an archaeological or cultural heritage site be discovered, regular monitoring of the site by a QP will ensure it remains intact and unaffected by the Quarry activities. Conditions for monitoring and additional measures will be coordinated with the relevant Indigenous group(s). Should impacts be observed, Sinova will contact the Archeology Branch and appropriate Indigenous group(s) to discuss mitigation measures.

This plan will be reviewed and updated at least annually by a QP.

9.8 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant on-site communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager. Monitoring data will be kept and maintained per government requirements and available on request. Records will include:

- Site photographs;
- Coordinates;
- Details of actions taken to mitigate disturbance; and
- Recommendations for further protective measures.

9.9 Adaptive Management

Sinova will work towards the continual improvement of the Archaeological Management Plan and Chance Find procedures at the site as necessary. The Environmental Site Manager will investigate improvements in any trends and assess whether the practices responsible for the improvements can be applied to other site areas. Trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Additional training of employees and contractors,
- Enhancement of maintenance or monitoring measures; and/or
- Changes to operational procedures.

Chapter 10: Reclamation Research Program

10.1 Authorship and Version Control

Version	Purpose/ Change	Author(s)	Organization	Effective Date (yyyy-mm-dd)
4	Annual Review - no changes	Sarah Hirschfeld, PAg Emma Bradshaw, MSc Michael Keefer, PAg	KES KES KES	2024-12-27
	Updated company details Reformatted version control Separated upper and lower Expanded data collection Added Figure 2 Plan is operations ready	Sarah Hirschfeld, PAg Tom Braumandl, RPF Michael Keefer, PAg	KES KES KES	2023-06-14
3	Separated upper from lower site Updated HiTest to Sinova	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2022-02-09
2	Prepare for operations	Jessica Lowey, PAg Michael Keefer, PAg	KES KES	2021-03-05

10.2 Submitted To

Recipient	Date (yyyy-mm-dd)
Chief Inspector of Mines	2025-01-31
Chief Inspector of Mines	2021-03-05

10.3 Purpose/Objectives and Scope

The intent of this program is to ensure that the reclamation research requirements specified in the *Mines Act* permit for this site (Section 1.2) are achieved, including the provision of a schedule for implementation and description of how the results will be utilized and reported. Permit condition 2(a) Land Use states:

> *The Permittee shall ensure that the land surface is reclaimed with the intent of re-establishing average pre-extraction capability to the following end land use objectives: wildlife habitat, in particular mountain goats, deer, moose, other ungulates, and species at risk, and opportunities for traditional use of the land by the ?Akisq'nuk, Lower Kootenay, Aq'am and Tobacco Plains Bands (represented by the Ktunaxa Nation Council) and the Shuswap Indian Band.*

In order to achieve the approved end land use for the site with average pre-extraction capability and functional wildlife habitat, particularly for local ungulate species and species at risk, the following performance objectives will be met:

- Assessment of pre-extraction ecosystem composition and structure through field assessment of areas yet to be disturbed and assessment of imagery dating from prior to the initial disturbance.
- Reduced erosion through landform configuration, development of maintenance-free vegetation cover, and the development of stable, self-sustaining drainage control features and watercourses.
- Revegetation to a self-sustaining state using appropriate and/or native plant species, including culturally important native species that will contribute to opportunities for traditional use of the land by the local Indigenous groups.
- Adequate soil replacement (quality and quantity) and associated decompaction in a manner that supports end land use objectives and erosion control.

The purpose of the reclamation research program is to:

- Identify appropriate parameters to be researched, including:
    - How these parameters will be measured,
    - How often measurements will be recorded and by who,
    - How this data will be managed and reported.
- Establish the time frame during which reclamation research will be conducted in order to collect sufficient relevant data.

This plan is designed to provide direction for reclamation activities to be implemented on a wider scale post closure.

10.4 Reclamation Research Program

There are two focuses of the reclamation research program prior to closure.

1. The first is monitoring natural regeneration of native species on previously mined areas that have not had soil replacement.
2. The second is establishing small scale trials investigating the effect on vegetation reestablishment of depth of soil replacement, addition of organic debris into salvaged soil, planting of native plant seedlings and seeding native grass species.

10.5 Baseline Data

10.5.1 Surface and Ground Water

The upper site is situated on the top of a ridge on the south side of Horse Creek. There are no significant surface or groundwater sources entering the sites; the primary water source is precipitation. No established surface water channels have been observed. The original Reclamation Plan (Nugget, 1989) indicated that there were no accumulations of water in the quarry pit (Golder, 2013). Further site visits by KES (e.g., 2015 following a substantial rain event) noted the same observations. For these reasons, minimal runoff is expected from the site. Baseline receiving environment water quality monitoring has

been conducted by KES since 2018 to meet the requirements of Discharge Permit #108864 issued under the *Environmental Management Act*. No groundwater has been encountered to date at the site.

10.5.2 Growth Medium

The 2013 Mine Plan (Golder Associates, 2013) describes surface soils at the upper site as very shallow (average depth of 15 cm) sandy loam with thin, weakly decomposed organic horizons (LF) and shallow B horizons over bedrock. They classify the soils as Dystric Brunisols with a pH less than 5.5 and a poor nutrient regime (a qualitative observation, analytical testing was not completed). Additional quantitative baseline metal and nutrient sampling and analysis will be completed in 2023 at the site to establish growth medium conditions. Soil material has been salvaged from the initial quarrying and is estimated to total approximately 8,000 m^3. A similar amount of soil material is estimated to be available for salvage in the area of the new pit expansion.

10.5.3 Vegetation

Ecologically, the site footprint and majority of the access road falls within the MSdk biogeoclimatic (BGC) subzone (MacKillop et al., 2018). The plant community in the undisturbed areas that surround the site footprint most closely resembles the MSdk/105 site series, consisting of Douglas-fir and lodgepole pine leading stands and a well-developed herb layer of pinegrass, showy aster and twinflower (MacKillop et al., 2018). The site has partially and naturally revegetated while the quarry was non-operational (1999-2022). In 2015, native species data was collected by KES from five plots located throughout the project area and compiled into a database for Sinova. Observation locations included the upper pit, spoil stockpiles, and access road. In summary, the following native species were most abundant:

- Trees
    - Lodgepole pine (*Pinus contorta*)
    - Douglas-fir (*Pseudotsuga menziesii*)
    - Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*)
    - Trembling aspen (*Populus tremuloides*)
- Shrubs
    - Saskatoon (*Amelanchier alnifolia*)
    - Falsebox (*Paxistima myrsinites*)
    - Thimbleberry (*Rubus parviflorus*)
    - Willow species (*Salix* sp.)
    - Soopolallie (*Shepherdia canadensis*)
    - Birch-leaved spirea (*Spirea lucida*)
- Forbs and Graminoids
    - Pearly everlasting (*Anaphalis margaritacea*)
    - Fireweed (*Epilobium angustifolium*)
    - Yellow mountain avens (*Dryas drummondii*)
    - Junegrass (*Koeleria macrantha*)
    - Twinflower (*Linnaea borealis*)

- Aster species (*Aster* sp.)

Invasive plant surveys were completed in 2015 and 2019 by KES crews following the Invasive and Alien Plant Program (IAPP) methodology (Ministry of Forests and Range, 2010) for estimating and recording density and distribution of invasive species occurrences. In summary, several invasive plant species have been identified at the site; most notably oxeye daisy (*Leucanthemum vulgare*).

To date, Sinova has not implemented invasive species control or other vegetation management at the site. The site is not known to contain culturally important plant species. A baseline, pre-clearing, invasive species surveys wasconducted in 2023 to further understand the composition and extent of natural revegetation on this site prior to new disturbances or work commencing. Data collected during the survey will be added to the following plan during the next revision.

10.5.4 Wildlife Habitat

Limited wildlife baseline data exists for the site (see Table 22). A Species Inventory Web Explorer (SIWE) desktop review of publicly available and secured data for wildlife species and habitat information was completed in 2018 and yielded no recorded observations of species at risk or critical habitat polygons overlapping the upper site footprint. Due to past activities on-site (forest harvesting and extraction) there are few wildlife inhabiting the area and wildlife habitat could be described as marginal. Baseline wildlife data collection was not a requirement for permitting but is now being implemented to assist with wildlife management and monitoring on-site as well as reclamation planning. Baseline data collection will include wildlife camera trapping and acoustic bat detectors, alongside wildlife and habitat feature surveys, to establish presence and distribution of wildlife species across the Project footprint.

Table 22. Reported Wildlife Observations at the upper site (2015-2022).

Year	Wildlife Observations
2018	Common Nighthawk (threatened)
2021	Dark-eyed Junco, American Robin, Yellow-rumped Warbler, Chipping Sparrow, Red-breasted Nuthatch, active Common Nighthawk and nest, active Swainson's Thrush nest with four eggs, active flycatcher nest with four nestlings in the nest.
2021	Black bears, deer
2022	Ungulate browsing and tracks

Pre-clearing surveys will be conducted by the Environmental Site Manager, delegate, or other qualified professional (QP) to identify and recommend mitigation measures for any previously unidentified habitat features or important habitat types, including but not limited to dens, nests or hibernacula. Baseline wildlife and habitat features, camera traps, and bat acoustic recording surveys will be completed during the spring and summer of 2023, as detailed in the Wildlife Management Plan. The results of this monitoring will then be incorporated into reclamation planning such that functioning wildlife habitat can

be re-established at the site. Coarse woody debris will be measured using provincial methodology (Ministry of Forests and Range and Ministry of Environment, 2010) in conjunction with vegetation monitoring transects.

10.6 Research Variables of Interest

10.6.1 Growth Medium

Additional soil baseline field surveys will be conducted to support this program and determine which parameters should be monitored. Qualitative and quantitative measurements of soil quality and quantity will be inventoried following the Canadian System for Soil Classification (CSSC; Agriculture and Agri-Food, 1998) and other provincial standards (Ministry of Forests and Range and Ministry of Environment, 2010; Province of BC, 2013, 2020).

Information gathered through these baseline studies will be used to assess whether the salvaged soil is of sufficient quality and quantity to fulfill end use objectives. This assessment will guide whether soil amendments may need to be added to the salvaged soil, to estimate the depth and area of replaced soil, and establish if supplemental soil will need to be imported. Additional sampling will be completed prior to the replacement of salvaged to ensure that stockpiled soil resources have maintained their quality.

Prior to soil replacement, site features that are not bare bedrock surfaces (e.g., the access road, ramps) will be decompacted to ensure that compaction that exists on site is reduced to achieve end land use objectives. Decompaction will be accomplished using heavy equipment on site (e.g., dozer with straight ripping shank, rough and loose surface preparation via excavator) to a depth that is sufficient for the establishment of a suitable growth medium (e.g., more than 20 cm depth) as outlined in A Guide to Soil Decompaction (Natural Resources Canada, 2017). The bulk of the quarry ground surface at closure will be bedrock and therefore will present no opportunity for decompaction.

Soil quality and quantity will be measured through the collection of relevant field data and analytical laboratory analyses, including:

- Variable: Soil Quality
    - Trace metals (analytical lab analysis)
    - Plant-available nutrients (analytical lab analysis)
    - Particle size (analytical lab analysis)
    - pH (analytical lab analysis)
- Variable: Soil Quantity
    - Soil horizons (field; CSSC, 1998)
    - Depth to bedrock (field)
    - Coarse fragments (field)

Parameters will be measured prior to salvage and again prior to replacement by a QP with soil suitability results being reported by an accredited analytical laboratory. All data will be maintained by the

Environmental Site Manager and used to inform updates to this program, relevant management plans, and reported in the Annual Reclamation Report for the site.

10.6.2 Vegetation

As vegetation is the habitat component most critical to achieving end use objective, vegetation response is the major feature being assessed in the two focuses of the reclamation research program conducted prior to closure.

1. The first is monitoring natural regeneration of native species on previously mined areas that have not had soil replacement.
2. The second is establishing small scale trials investigating the effect on vegetation reestablishment of depth of soil replacement, addition of organic debris into salvaged soil, planting of native plant seedlings and seeding native grass species.

The viability of revegetation with native plant species, including culturally important species that will contribute to the achievement of end land use objectives for the site, will be assessed using monitoring plots located across the site. Natural revegetation by native plant species (including those listed in Section 3.1.3.) have been observed on site including the pits, spoil piles, and salvaged soil piles. This demonstrates the natural ability of the site materials to support revegetation by native plant species, despite shallow depth and relative infertility.

Much of the site is expected to naturally revegetate given regrowth observations during the two decades of care and maintenance since previous quarrying ceased (1999-2022). Natural regeneration has the advantage of being more locally adapted in comparison to planting or seeding commercially available plant material. However, where natural regeneration is sparse or absent, supplemental planting and/or seeding using the master species list for the site (Section 3.1.3) may be necessary. Where required to accelerate the reclamation process, sites may be planted or seeded at high density to account for the expected mortality or failed germination of native grasses.

The following vegetation variables will be assessed:

- Vegetation cover, height, and vigor
- Presence of disease, insect, or herbivore damage

These variables will be measured on-site within reclamation trial areas to evaluate the efficacy of the implemented approach. These variables will also be measured at reference (or control) test plots in adjacent undisturbed ecosystems to establish local land use capability targets and confirm that on-site ecological trajectories are consistent. Vegetation will be measured using a transect method with permanent marks for remeasurement at specified time intervals. Linear transects 30 m in length will be installed with at least 3 replicates within the quarry. Cover and height of herbs, graminoids, and bryophytes will be measured using a 25 cm by 50cm Daubenmire frame (Daubenmire 1968) at 3 m intervals along the transect for a total of 10 quadrats per transect. Shrub intercept and height will be measured along the length of the transect in order to estimate percent cover and modal height. Tree

cover, diameter at breast height, and total height will be measured in three 5 m by 5 m quadrats along the 30 m transect (Figure 19). Photographs will be taken at the start and end of the transect, along the line of the transect, and at the 15 m mark.

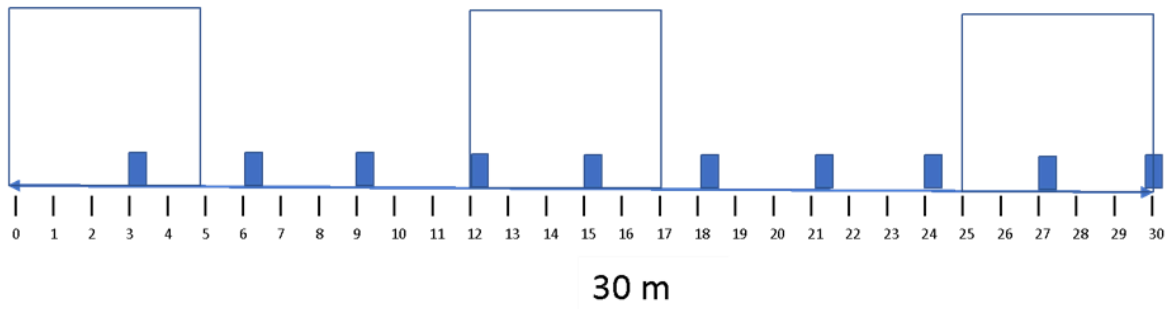


Figure 19. Vegetation Monitoring Transect Layout. Herb and graminoid sample frames are shown in solid blue, shrubs are measured along length of transect. Tree quadrats are the blue outlines.

Vegetation monitoring to inform reclamation research will occur in concert with the Vegetation Management Plan for the site. All data will be maintained by the Environmental Site Manager or delegate and used to inform updates to this program, relevant management plans, and reported in the Annual Reclamation Report for the site.

Small-scale trials will be conducted in areas that are adjacent to the quarry site that will not be disturbed by future quarry operation. Locations for the trials will be established in the first year of operations; e.g., potentially adjacent to existing soil stockpiles. Treatments to be tested may include:

- Soil replacement depth (e.g., 5 cm, 15 cm, 30 cm)
- Soil organic matter incorporation into replacement soil
- Nitrogen-fixing shrub planting
- Native grass seeding

Response variables will be vegetation species, cover, height, and vigor assessed using the transect method described above.

10.6.3 Wildlife Habitat

Wildlife habitat quality will be monitored through an assessment of vegetation structure and composition and through the incorporation of previously salvaged coarse woody debris (CWD) in the reclamation process (see Soil Management Plan). The management of CWD is important for its impact on productivity, soil function, and habitat quality as it provides a source of food and energy for insects, bacteria and fungi, and a source of shelter for amphibians, reptiles, birds and small mammals (Ministry of Forests, 1995; Stone et al., 2012). Wildlife trees (i.e., standing dead or live defective trees) are also a

vital component of biodiversity and should be retained whenever possible and safe to do so around the site.

Coarse woody debris transects, and wildlife tree assessments will be measured at reference (or control) test plots in off-site ecosystems to inform CWD placement for the purposes of reclamation at the site. Coarse woody debris transect methodology and field data collection will follow the guidance provided in Land Management Handbook 25 (Ministry of Forests and Range and Ministry of Environment, 2010) and wildlife tree assessments will follow the guidance provided in the BC Wildlife/Danger Tree Assessor's Course Workbook (ECCS, 2019b). In order to assess the reclaimed landscape against average pre-extraction conditions, CWD transects will be completed in undisturbed ecosystems immediately adjacent to the quarry and immediately following reclamation (on site). All sampling will be completed in the field by a QP. All data will be maintained by the Environmental Site Manager and used to inform updates to this program, relevant management plans, and reported in the Annual Reclamation Report for the site.

10.7 Measurement Timeframes

10.7.1 Growth Medium

Variables affecting growth medium on site, as noted in section 10.6.1, will be measured within the first year of operations (baseline) and again prior to the replacement of material (reclamation and closure). Additional monitoring of soil resources is outlined in the Soil Management Plan.

10.7.2 Vegetation

Variables describing vegetation (species, cover, height, vigor) will be measured, within the first year of operations, to establish reference ecosystem test plots against which on site vegetation and reclamation success will be compared. Monitoring of natural regeneration on the previous quarry will be measured every three years throughout the life of the quarry. Sites for monitoring vegetation natural regeneration will be selected in areas that are not slated to be disturbed after their establishment. Small scale research trials will be measured annually for the first three years after establishment and then on a three-year interval. Invasive species monitoring is expected to occur at least annually, or more frequently as conditions require (e.g., to control invasive plant species). Additional on-site vegetation monitoring is outlined in the Vegetation Management Plan.

10.7.3 Wildlife Habitat

Variables affecting wildlife habitat off site (CWD and vegetation composition and structure) will be measured prior to the commencement of work to establish reference ecosystem test plots to compare to on site variables and reclamation success. Variables affecting wildlife habitat will also be measured on site prior to the commencement of work through pre-clearing surveys. Direct wildlife monitoring on site will be baselined using surveys, observation reporting, and camera traps. Direct wildlife monitoring and variables affecting wildlife habitat will be assessed again following the reclamation of the site, prior to closure. Additional monitoring of wildlife species and their habitat is outlined in the Wildlife Management Plan.

10.7.4 Climate Change

Vegetation and soil, and hence biogeoclimatic (BGC) units, across the province will change as temperatures and precipitation amounts change in the future. The changes in the species composition and vigor of ecosystems at the quarry are difficult to predict. Potential changes include displacement or reduced vigour of species, such as lodgepole pine, thimbleberry and twinflower and the increase of pinegrass and the appearance of common juniper and bluebunch wheatgrass or the appearance of novel combinations of species as changes in climate have varying effects on species ability to adapt.

The Reclamation Research Program proposed for the Project is inherently flexible in its prescriptions in that it prioritizes natural revegetation of the Project area (as opposed to relying solely on seeding and planting). Such an approach will allow for the monitoring of natural succession throughout the life of the Project and the adaptation of final reclamation prescriptions to suit the current and predicted local climate.

10.7.5 Site-Specific Mitigation Measures

On and off-site reclamation research test plots will be protected from disturbance/interference through carefully planned placement around the site and the implementation of fencing and/or signage and informing contractors of the locations of these plots if activities are to be conducted in the vicinity of the test plots. Additional controls may be implemented to mitigate against excessive environmental impacts such as erosion and dust, but only if the impacts observed are in excess of those experienced by the site over time so as not to introduce bias.

10.7.6 Program Success

The reference ecosystems (off site test plots) will be used in the assessment of reclamation success on disturbed areas through the establishment of permanent monitoring plots; thus, providing the basis of re-establishing average pre-extraction capability and achievement of end land use objectives. It is not envisaged that on-site reclaimed conditions will precisely match adjacent undisturbed conditions. However, broadly similar ecosystem structure, diversity, and composition will be sought. With the creation of novel features through quarrying, e.g., steep pit walls, and rock terraces, the potential exists for the creation of habitat that is absent from the area at present, e.g., cliff nesting sites.

This program requires the ongoing monitoring of on-site reclamation trials (test plots), as detailed in Sections 3.2 and 3.3. Such an approach will ensure that adaptive management strategies (Section 5) can be implemented and used effectively to improve reclamation practices at the site.

10.8 Program Implementation

10.8.1 Roles and Responsibilities

10.8.1.1 Quarry Manager/Delegate

The Quarry Manager (or delegate) bears overall responsibility for the extraction work and responsibility for on-site environmental monitoring and compliance relating to extraction activities. The Quarry Manager (or delegate) will coordinate with the appropriate staff to ensure that objectives are being met.

The Quarry Manager (or delegate) will:

- Be the liaison for government agencies for permitting and non-compliance incidents;
- Be the liaison for Indigenous groups, through their designated representatives;
- Ensure adequate resources are available to enable implementation of this program; and
- Be accountable for the overall environmental performance of the site, including the outcomes of this program.

10.8.1.2 Site Supervisor/Shiftboss

The Site Supervisor/Shiftboss is responsible for the day-to-day management of the site's environmental programs, the implementation of management plans, and relevant permits. The Site Supervisor/Shiftboss reports to the Quarry Manager. If no Site Supervisor is appointed, the Quarry Manager will also be responsible for these tasks.

The Site Supervisor will:

- Act as a resource to site personnel by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for obtaining copies of the required environmental permits to be stored on site;
- Be responsible for the implementation of management plans and programs;
- Be the liaison for government agencies for permitting and non-compliance incidents; and
- Be the liaison for Indigenous groups, through their designated representatives, for permitting as well as reclamation issues.

Specific reclamation responsibilities include:
Ensuring the implementation of this program;
Ensuring all site personnel are competent through training and awareness programs; and
Keeping records of communication to employees and contractors of reclamation program concerns/actions.

10.8.1.3 Environmental Site Manager/Delegate

The Environmental Site Manager (or delegate) is responsible for monitoring compliance with environmental programs, the implementation of management plans, and relevant permits. The Environmental Site Manager (or delegate) reports to the Quarry Manager and Site Supervisor/Shiftboss.

The Environmental Site Manager (or delegate) will:

- Act as a resource to the extraction team by providing guidance relating to permit conditions, commitments, regulation, acts and interpretation of legislation;
- Be responsible for monitoring the implementation of management plans and programs and making recommendations; and
- Assist the Quarry Manager or Site Supervisor/Shiftboss in liaising with government agencies and Indigenous groups on the aspects of this program.

Specific reclamation responsibilities include:
Monitoring the implementation of this program; and
Keeping records of communication to employees and contractors of reclamation research concerns/actions.

10.8.1.4 Qualified Persons

A Qualified Person (QP) has the specified knowledge, skills, training, experience, and other requirements to perform a specified type of work as set out in legislation, set out in government policy or required by an organization satisfactory to government that has the responsibility for specifying requirements. The requirements include holding an accreditation bestowed by government, a professional association constituted by an Act or other organization satisfactory to the government.

The qualifications required to perform a certain type of work may include registration with a professional association and Sinova will require that all QPs signing off on work for the site are professionals registered with a relevant legislated self-regulating association in BC.

10.8.1.5 Employees and Contractors

A safety and environmental orientation will be developed for site personnel and contractors and will include all reclamation research actions specific to quarry activities. A key component of this orientation is a clear explanation of each individual's role and responsibility in the management and maintenance of reclamation research areas on and off site. A current map of all reclamation research trials/areas and training will be provided to all site employees and contractors at the kick-off meeting or before new employees or contractors access the site periodically throughout the year.

Employees and contractors will:

- Ensure the implementation of this program; and
- Gain and maintain competency through training and awareness programs.

10.8.2 Training

Training will be provided to all employees and contractors that will be performing work on site. Training will focus on the following aspects:

- Current reclamation research trials/areas within and outside the project area;

- Operational requirements (e.g., relating to protection of these areas); and
- General roles and responsibilities under this program.

Training will be provided prior to arriving on site each year. Training schedules will be flexible to allow for changes in site personnel throughout the year, if and when applicable. While not all site personnel will be involved directly in the implementation of the program, all site personnel will be aware that the program exists and the appropriate person to contact in the event that they observe a potential concern during the course of their regular site activities. Sinova will provide all site employees or contractors with updated maps indicating areas of concern with respect to reclamation research (e.g., trial locations).

10.8.3 Monitoring and Maintenance

The aim of the monitoring program is to evaluate the success of the reclamation research program, specifically, the success of revegetation, habitat restoration, soil development and erosion control, using performance criteria based on pre-extraction (or adjacent) ecosystem benchmarks in permanent monitoring plots located off site.

The following monitoring and maintenance procedures will be in place:

- Pre-disturbance inventories of variables and associated parameters for determining the viability of revegetation with native plant species, including culturally important species (which may be provided by local Indigenous groups).
- Ongoing monitoring and adaptive management of on-site growth medium and vegetation variables to confirm that ecological trajectories consistent with the land use capability targets are capable of being achieved.
- Ongoing monitoring of erosion on disturbed sites (including reclamation trails/areas) resulting from environmental impacts at the site (e.g., water, wind).
- Pre-disturbance surveys of variables for determining the pre-extraction capability of the land as wildlife habitat such that average pre-extraction ecosystems and habitats can be restored through reclamation activities or protected when adjacent the project area.
- Maintain controls implemented to eliminate likelihood of disturbance/interference (e.g., fencing, signage).

This plan will be reviewed and updated at least annually. Other monitoring and maintenance requirements are presented in the Erosion and Sediment Control Plan, Soil Management Plan, Vegetation Management Plan, and Wildlife Management Plan.

10.9 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) outlines specific triggers, actions to be taken, and reporting protocols relative to the requirements of this plan. The TARP framework to be implemented as a part of this plan is provided in Table 23.

Table 23. Trigger Response Action Plan for reclamation research at on-site research plots.

Level of Risk	Trigger	Action/Response
Normal	Measured parameters indicate positive trend towards reclamation success	• Ongoing monitoring and maintenance of reclamation research trials
Level 1	Evidence of erosion as a result of delayed natural revegetation on certain site features	• Implement planting/ seeding with native species on site features • Maintain record of decision-making process and specific mitigations or changes in program applied (e.g., application rates, species) • Monitor effectiveness and conduct additional sampling, if needed
Level 2	• Measured parameters indicate negative changes in trend towards reclamation success (e.g., poor growth/ survival of native species (natural or planted/ seeded), invasive plant encroachment) • Soil resources salvage volume and/or characterization unsuitable for reclamation of the site	• Assess measured parameters to determine limiting factor(s) contributing to negative changes • Maintain record of decision-making process and specific mitigations or changes in program applied • Monitor effectiveness and conduct additional sampling, if needed
Level 3	• Measured parameters indicate no trajectory towards reclamation success • Vegetation structure not suitable for desired wildlife habitat • Establishment of invasive species	• Reassess site conditions (e.g., soil, climate, aspect) which may contribute to ecosystem development • Assess measured parameters to determine limiting factor(s) • Reassess variables and parameters to accurately capture limiting factor(s) • Maintain record of decision-making process and specific mitigations or changes in program applied • Restart monitoring program

10.10 Record Keeping

Records, including formal reports, field notes and other communications (e.g., recommendations and relevant on-site communications), will be maintained by the Quarry Manager with the help of the Environmental Site Manager.

10.11 Adaptive Management

Sinova will work towards continual improvement of reclamation practices at the site. The Environmental Site Manager (or delegate) will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the site. Deteriorating trends will be studied to determine the root cause. When the cause is identified, the Environmental Site Manager will propose a suitable corrective action to the Quarry Manager and/or Site Supervisor/Shiftboss. Corrective actions may include:

- Increased routine inspections of trials/areas;
- Re-evaluation and enhancement of maintenance or monitoring measures;
- Redevelopment of practices being implemented to address concerns;
- Additional training of employees and contractors; and/or
- Additional supervisory oversight and operational controls.

Chapter 11: Conclusion

11.1 Reporting

Reporting by Sinova and KES will ensure consistent implementation of this plan. Summary reports of monitoring activities and results will be compiled and reviewed annually. Compliance reporting will be subject to *Mines Act* permit conditions. For the reclamation research program and soil management plan, the information gathered during monitoring practices will be summarized and included in the Annual Reclamation Report (to EMLI) for the site. For wildlife management, additional reporting to the appropriate government authorities will occur as necessary.

Information gathered during archeological management, water management, and erosion and sediment control monitoring practices will additionally be included in the Annual Water Quality Report (to ENV) for the site. Furthermore, as part of water management reporting requirements, a dedicated database will be maintained for all water quality sampling results. This database currently exists to maintain and compare quarterly surface water sampling in Horse Creek (2018-present).

All new observations of invasive plants, or observations of noticeable stand expansion, will be recorded and reported to the Environmental Site Manager (or delegate). The Environmental Site Manager (or delegate) can report observations of new noxious species on-site to the province using the following contacts:

- Report observances using the online database at: www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species
- Call the local Regional Invasive Species Committee
- Call the Invasive Species Council of BC 1-888-933-3722

Reporting by Sinova and KES will ensure consistent implementation of the fugitive dust management plan and compliance with regulatory requirements. Summary reports of monitoring activities and results will be compiled and reviewed annually. Reports of inspections and monitoring will be developed for

each fugitive dust source or specific mitigation measure, where needed. An example of an inspection report is provided in Table 24.

Table 24. Example of fugitive dust inspection report.

Date and Time	Weather Conditions	Area/Source Inspected	Visible Dust Controlled?	Further Actions Required?	Name
01/01/2020	20°C Wind SW, 8km Sunny	Pit Area	Yes	Move blast mats in preparation for blasting	Jane Doe

Compliance reporting will be subject to *Mines Act* permit conditions. The information gathered during monitoring practices will be summarized and included in the Annual Reclamation Report (EMPR) for the site.

11.2 Qualified Professionals

These management plans have been prepared and reviewed by the following QP:

Prepared by:

Michael Keefer, MSc, PAg

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