



Proposed Peavine Creek FSR Aggregate Pit Mine Management Plan

For submission to:
BC Energy, Mines and Natural Gas

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Section I-Statement of Objectives

The purpose of this management plan is to provide details on the use and final reclamation of a proposed aggregate pit located 0.4km east on Peavine Creek FSR. B.E. Civil Projects Ltd. is seeking approval from the regulatory authorities to establish a new 5 hectare aggregate pit site. Initial works will include fencing, stockpiling of overburden and establishment of a multiple bench aggregate pit. The main material being extracted will be pit run, which may be screened or crushed on site, and loaded and trucked off site for use in expanding markets.

Section II-Proposed Use

The intended end use for the aggregates from this proposed pit is to meet the demands of our civil construction division's needs for a cost effective source of raw building materials to be used for, provincial and municipal road projects, local and regional civil construction projects, as well as private construction projects in the Cranbrook area. Currently our needs vary from year to year, but over the last 20 years our organization has used a minimum of 5000m³ to a maximum of 15000m³ with 10000m³ being the median for annual aggregate consumption.

The expected mineable aggregates within this 8.95 hectare proposed pit would be estimated at approximately 380,000m³. B.E. Civil has applied with FLNRO for a 8.95 ha area (file #4405280) Replacement tenure for up to 30 years.

We have applied for the Occupant License to Cut (OLTC) with FLNRO and it will be issued in association with the land tenure. Currently there has been no investigative work performed on this site, however, surface exploration and geographic forms indicate a gravel deposit of considerable depth. There is no requirement for permits under the Water Act as there is no steams or washing of aggregate on the site. Mines permit will be issued in association with the land tenure.

Section III-Scope of Work

With a projected need for an average of 10000m³ of aggregates annually, the expected volume for the first 15 years of pit activity is approximately 150,000m³. Initial work will begin by clearing a fence line and installing an 8' tall fence on the perimeter of the 5ha area. It will complete a total containment of the site for safety purposes to keep humans and animals out of the site (required under the Mines Act). An internal road will be constructed inside the perimeter fence to provide access to the entire pit area, allowing us to stay off of the unnamed road to the south. Main gate will be at southwest corner and signage will be placed at the gate.

Access into this proposed tenure will be from the unnamed forestry road at the intersection of Peavine Creek FSR (0.4km east on Peavine Creek FSR from Highway 3/95). The access into the pit will begin at the southwest corner of the proposed tenure and proceed into the pit down to the working level of the single bench. Road width will be an average of 5 meters wide.

The existing range fence within the purposed quarry will be removed. We will use existing fencing materials to tie into future perimeter fence and to the cattle guard on unnamed road. Discussions have occurred with Harvey Bombardier RAN: 075121 on the matter of the range fence, and he is in agreement with our proposed fencing reconstruction. We will be working with the Range Section of the Ministry of Forest, Land and Natural Resource Operations to resolve any issues that may arise. An internal road system around the inside of the perimeter fence as shown on map will be used so that there is no effect on the Peavine FSR and the unnamed road adjacent to site. The cattle guard on the unnamed road will remain the same and fencing reconstruction will be tied into this cattle guard.

The organic topsoil and overburden would be stripped and stockpiled as indicated in site plan. A flat single bench gravel pit approximately 3000m² will be excavated by tracked excavator or wheeled loader. At this point materials can be loaded into conventional gravel trucks and delivered off site, or materials can be stockpiled as per the site plan. As the quality of material found and the need of our clients vary, the material may also need to be excavated, screened and sorted into separate stockpiles. In addition to produce some material, crushing and washing equipment may be required.

The working height of the face of the pit would be maintained at a height of 7m or less, which is anticipated to put all materials within reach of onsite loading equipment.

Signage will be placed at the main access gate to the site.

Washing on site will be conducted as laid out in Site Plan

A scale deck for more accurate weight measurement versus volume measurement may be necessary as volumes of material sold increase.

The proposed schedule for work is as follows:

- Replacement Land Tenure (up to 30 years):8.95 Ha, 3.95 ha new land. As use of pit aggregate materials approaches limits of existing clearing. The open face of the pit will be advanced east and north from initial single bench pit. As the pit face moves, reclamation will be completed on exhausted areas of the pit. If resources are still viable with more reserves of aggregates, mining will continue. If resources are depleted final site reclamation will commence and the site will be left in a clean and sanitary condition to Crown Lands and Mines.

Section IV-Surface Disturbance

The proposed Mine plan is illustrated on the site plan provided as an attachment to the tenure application. The mine plan details a multiple bench (minimum 8m wide benches) pit

with a maximum face height of no more than 2 meters above the reach of largest machine (Hitachi 270LC 10m reach). Overall depth of site excavation will be determined by safe slope requirements within working area. We will develop the entire 5 ha site as the market demands. This size disturbance is proposed due to the fact that it will be required to maintain a size of pit floor suitable for safe mine operation as per mines requirements. In addition to be able to utilize as much of the materials available on site, access to different areas will be required to achieve blended aggregate products. Overburden and topsoil removed will be stockpiled separately on the north and east side of the proposed tenure. The product stockpile will be kept as close to the western boundary of proposed tenure.

The total area for aggregate extraction is 8.95 hectare. As an area becomes depleted of viable aggregate material, reclamation will commence on the exhausted areas

The following section V was prepared for B.E. Civil Projects by Vast Resources for further clarification to the ALC and Mines.

Section V-Present state of land

Two professionals from VAST Resource Solutions (Ian Adams, RPBio and Aden Stewart, RTAg) inspected the subject property on January 16, 2013. Fresh snow hindered inspection of local flora but allowed a thorough inspection of winter wildlife usage. The site includes a small cleared field area seeded to agronomic species, primarily smooth brome and timothy, with the remainder being second growth Douglas fir and western larch (approximately 300 stems per hectare). Local flora identified during the site visit is listed in Table 1.

Table 1. Flora observed on the subject property.

Grasses and Forbs	Trees and Shrubs	Weeds
Slender wheatgrass	Douglas fir	Mullein
Rough fescue	Western larch	Downy brome
Quackgrass	Lodgepole pine	Bull thistle
Awned wheatgrass	Ponderosa pine	Spotted knapweed
Pinegrass	Snowberry	
Smooth brome	Bearberry	
Timothy	Kinnikinick	
Yarrow	Prickly rose	
	Oregon grape	
	Common juniper	
	Rocky Mountain juniper	

The area of the proposed tenure has approximately 20cm of silt-loam topsoil underlain by approximately 40cm of overburden covering most of the proposed site.

The proposed tenure site has an elevation range of 1000m ASL and 1012m ASL with an average site elevation of 1010m ASL. The terrain is primarily level to gently undulating

with two small dips, covered by open forest and an open field seeded to agronomic grass species.

There are no watercourses on or in close proximity to the proposed tenure. The depth of the water table is near 57 meters according to the information contained in the Ministry of Environment's B.C. Water resource atlas.

The proposed tenure area is bordered on all sides by crown land and is located with the Agricultural Land Reserve (ALR). An notice of intent for a Non-farm Use to Place Fill or Remove Soil under the Agricultural Land Commission Act is being filed concurrently with this application. There are no other known soil bylaws or licensing requirements for the proposed tenure and aggregate pit operations, required by the RDEK at this time.

Peavine Creek FSR is a local public maintained road presently used by area residents (not a primary access for any residence), recreational users, and industrial users including forestry and rock quarry operations. The road has a 5 meter running surface covered in gravel, and is suitable for use in all four seasons.

Section VI-Reclamation Plan

The long-term objective of the reclamation plan is to return the proposed tenure site to a stable non-eroding Interior Douglas Fir ecosystem that supports wildlife, domestic livestock grazing and wood production values equivalent to pre-disturbance capability. The key components of this program include:

- Controlling erosion and ensuring long term stability;
- Protection of soil resources;
- Managing and maintaining soil productivity;
- Preservation of native propagules and organic matter;
- Noxious/invasive weed control through a proactive weed control plan;
- Offsetting the loss of ungulate winter range by using forage species that will provide fall and winter grazing;
- Using a variety of reclamation species that will gradually decrease allowing ingress and recolonization by native flora from the surrounding area; and
- Providing grazing opportunities into the future.

Final reclamation and closure will include:

- Removal of all equipment, machinery and structures, and improvements to restore the land to a safe and sanitary condition as required by crown lands.
- Leveling and contouring of any low grade area , unused stockpiles, pit walls and faces to stable slopes of 2H:V1;
- Contouring the pit floor to prevent ponding and restore natural drainage;
- Replacing stockpiled overburden and topsoil over all disturbed areas;
- Decompacting roads, stockpiles, and load out areas;
- Erosion prevention and sediment control measures;
- Seeding all exposed areas with a self sustaining grass seed mixture;

- Deactivation of all pit access roads sufficiently to prohibit motor vehicle access; and
- Posting of appropriate signage to restrict access.
- Drying of washed silt products and depositing with replaced overburden.

A review of the regional soil survey (Lacelle, 1990) indicates that the soils of the subject property belong to the Malpass (MS1) soil association (Figure 1). Malpass soils occur in the drier portions of the Purcell Mountains, within the lodgepole pine subzone of the Interior Rocky Mountain Douglas-fir Forest Zone. They have developed in gravelly silty morainal (till) deposits derived from fine to medium grained, non-calcareous bedrock. The materials are usually >1 m deep and occur on valley floors and lower valley walls. Slopes range between 10 and 60%, while elevations vary from 1050 to 1350 m ASL. Malpass soils are dominantly well drained and moderately to slowly pervious. Texture is usually silt loam with variation to very gravelly silt loam in some areas. Coarse fragment contents range between 20 and 60% and consist mainly of sub-angular and sub-rounded gravels with some cobbles and stones. A fibrimor forest floor layer up to 4 cm thick usually occurs at the soil surface and overlies a 20 to 30 cm thick, pale brown (dry) horizon (Bm) that is medium to slightly acid. Under this is usually a 20 to 30 cm thick, weakly developed clay accumulation horizon (Btj) that grades (BC) to similar appearing, medium acid parent material (C) at about 60 cm depth. Malpass soils are transitional to Brunisolic Gray Luvisols, but lacking well developed clay accumulation horizons (Bt), are classified as Orthic Eutric Brunisol.

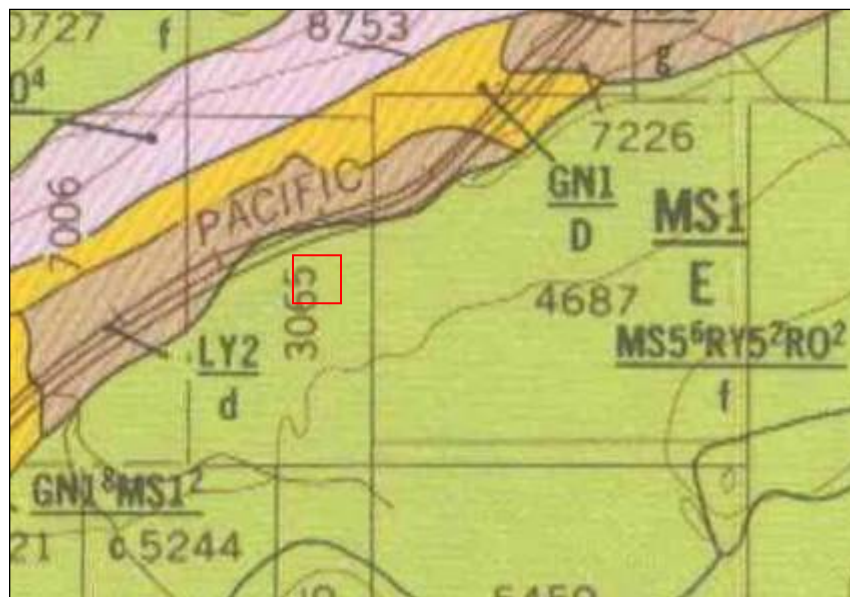


Figure 1. Soil survey map with approximate location shown in red

To protect these thin soils and preserve the native seed bank the overburden and topsoil will be stripped in two lifts. The first lift will remove the top 30 cm of material including the duff layer. This layer will be stored in a windrow separate from the second lift, which contains the remaining overburden. Records will be maintained detailing the depths of

overburden and topsoil removed. Topsoil and subsoil will be replaced sequentially according to their original position.

Soil Fertility and Productivity

Prolonged storage and handling can adversely affect the physical and chemical make up of topsoil. A pre-disturbance sample will be collected and analyzed for macro nutrients and physical parameters. The operator will ensure that final conditions meet or exceed baseline conditions. If the lab tests indicate that soils are deficient in essential nutrients the operator will enhance these to promote rapid establishment during reclamation.

Integrated Weed Control Program

While snow cover during the site assessment hindered the assessment of on-site flora, the subject property appeared to be relatively weed free (4 species detected). Most noxious weed species were observed proximal to transportation corridors.

The weed control program will consist of proactive measures designed to prevent the establishment and spread of invasive and noxious species:

- Traffic Control – The primary mechanism for transporting weedy species is on mechanical equipment. The operator will control access to topsoil and overburden stockpiles by utilizing fencing, signage and by educating operation staff. Topsoil and overburden stockpiles will be established away from primary travel routes.
- Early detection and identification – The operator will work with an agricultural professional to conduct bi-annual weed inspections to assist in identifying weed species before they can establish a large seed bank. As part of the weed control program the operator will keep a binder with a list of known weeds and weeds of concern in order to conduct inspections himself.
- Cultural control via establishment of competitive cover crops – The operator has prepared seed blends for temporary storage piles (Table 1) and final reclamation (Table 2). The operator will keep a stock of prepared seed on-site and apply the appropriate blend within one month of stripping or reclamation during the growing season or as snow cover permits during the winter.
- Herbicide application program – When deemed necessary, the operator will use an appropriate herbicide to control weed species along on-site transportation corridors and around the perimeter of the aggregate operation to provide a buffer against weed ingress. If weeds are identified within the operational boundaries, the operator will mechanically remove them or spot spray with herbicide. If weeds are removed mechanically or by hand, they will be bagged and land-filled to prevent potential seed release onto the property.

Reclamation Seed Blends

The objective of the reclamation program is to provide rapid establishment of desirable species that will control the ingress of weedy species while providing forage for a variety of wildlife and domestic grazing animals. The recommended species (Table 3) have been

selected on their ability to provide year round forage while allowing natural recolonization by native species as the reclaimed site transitions to an open forest.

- Annual ryegrass is an inexpensive, annual, agronomic seed that provides rapid establishment and serves as a cover crop during the establishment of other species. It has good palatability and will provide immediate forage while inhibiting the establishment of weeds.
- Perennial ryegrass is an inexpensive, agronomic seed that provides rapid establishment, but is short lived. It has good palatability and will provide forage for elk while inhibiting the establishment of weeds.
- Slender wheatgrass is a rapidly establishing, short lived native grass with good soil building properties. Slender wheatgrass is prominent for several years but eventually becomes secondary in the stand, making way for longer lived, slower establishing species.
- Russian wildrye grass is an agronomic species with good persistence for the first 8 to 10 years following establishment, after which it declines rapidly. It is moderately palatable and cures on the stem, providing excellent fall and winter grazing for elk.
- Dahurian wildrye grass is an agronomic species with good persistence for the first 5 to 8 years following establishment, after which it declines rapidly. It has very stiff, coarse foliage, which is not highly palatable. However, it cures on the stem and has high digestible fibre. The upright foliage of Dahurian wildrye remains accessible throughout the winter providing winter grazing for elk as well as valuable thermal and nesting cover for birds and small mammals.
- Canada bluegrass is a slow establishing, long lived native species that is very persistent although not strongly competitive. Canada bluegrass is recommended for the revegetation of poor soils in dry areas.
- White clover is a persistent agronomic, nitrogen fixing legume that provides excellent forage for cattle, deer, elk and small rodents. White clover is an excellent soil builder but will not provide significant competition for native colonizers.

Table 2. Recommended Seed Mix for temporary topsoil/overburden stockpiles

Species	% by weight	% by composition
Annual ryegrass	25%	28%
Perennial ryegrass	20%	26%
Slender wheatgrass	55%	46%

Table 3. Recommended Reclamation Seed Mix

Species	% by weight	% by composition
Slender wheatgrass	14%	15%
Russian wildrye grass	25%	29%

Dahurian wildrye grass	58%	30%
Canada bluegrass	1%	16%
White clover	2%	10%

Section VII-Environmental Impacts

Surface and Groundwater Quality

There are no streams, surface water bodies, or other aquatic habitat within the proposed tenure. Also, due to the vertical separation between the working surface and groundwater (over 50 meter), pit activities should have no affect on groundwater in the area. All wastewater from washing will be clarified in settling ponds. Silt washed from material will be dried and used for reclamation.

Air Quality, Noise, Dust and Vibration

Minimal impacts to air quality are anticipated. If excessive dust is noted, water trucks will be used to maintain safe and clean air quality around the proposed tenure area. Large equipment including crushers, conveyers and screeners will be utilized on site as needed. A vegetative buffer not less than 50 m wide will surround the proposed operation. This will reduce sound and dust migration and provide a visual barrier between the pit, Highway 3 and residences in the general vicinity of the proposed operation. The closest residence is a minimum 250 m from the proposed project site.

Soils and Vegetation

There are no anticipated impacts to surrounding terrain, soils, and vegetation. There has been an extensive walk through of the proposed site and there appears to be no known areas of archaeological significance. This is supported by a review of provincial records by the Ministry of Forest, Lands and Natural Resource Operations, Archeology Branch. In the event that excavation activities reveal any cultural or historical feature or artifacts, all activity will cease and the discovery will be reported as per the requirements set forth by the Heritage Conservation Act.

Aesthetic and Visual Considerations

As noted above, a vegetated buffer will be retained around the proposed operation to provide a visual barrier between the pit and the highway. Establishing a commercial operation in the area (security cameras and a daily presence) would help to prevent the polluting that is currently taking place in the area (illegally dumped garbage and construction waste).

Wildlife

Accounting for wildlife habitat and movements is important; however no known regional connectivity plan exists either within the Regional District of East Kootenay (see RDEK 2010) or the nearby City of Cranbrook. The current reclamation plan allows for movement of wildlife, including ungulates, parallel to Highway 3 on both sides of the proposed pit.

Moose

Moose (*Alces americana*) winter range in the East Kootenay region is primarily determined at a broad scale by low elevation and relatively open canopy closure (Poole and Stuart-Smith 2006). While these two attributes fit the description of the subject property, more fine scale foraging requirements are not met on the property. The three main winter forage species for moose in the East Kootenay are willow (*Salix* spp.), red-osier dogwood (*Cornus*

stolonifera) and Saskatoon (*Amelanchier alnifolia*) (Poole and Stuart-Smith 2005). These species are largely absent from the subject property. The presence of slightly wetter site conditions close by may have influenced the biophysical mapping of these areas (Demarchi et al. 1983), but the subject property and surrounding areas should not be considered moose winter range.

Elk and Deer

Elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*) may be expected to occur on the subject property and in the surrounding area. These species are generally considered to be common to abundant in the region and utilize a wide variety of habitats. These species readily move through a variety of habitat conditions, mostly wherever suitable forage exists. Current conditions on the site vary from open, mature forests of Douglas-fir (*Pseudotsuga menziesii*) and western larch (*Larix occidentalis*) to younger stands dominated by Douglas-fir. During our site visit on January 16, 2013, there was moderate amount of ungulate use in the mature stand and very little in the younger stand. Very little suitable forage was observed. Creating End Leave conditions suitable for ungulate use requires planting suitable native forage and browse species (grasses, shrubs).

Grizzly Bear

In the Kootenay Region, grizzly bears (*Ursos arctos*) occur primarily at higher elevations, away from human development and urban centres, including the subject property. Grizzly bear management in British Columbia is based on population units that have discrete population estimates and are divided by known dispersal barriers. Highway 3 is a known significant movement barrier to grizzly bears (Proctor et al. 2008; 2012). Habitat mapping for grizzly bears in the area shows valley bottom areas close to Cranbrook, including the subject property, as not suitable. The most likely areas for grizzly bears to approach or cross Highway 3 between Cranbrook and Creston are much farther west, either in the Hazel - Kidd Creek area west of Yahk or the Irishman Creek / Ryan area between Moyie and Yahk (Proctor et al. 2008).

The relative small size of the proposed development and its location close to an urban centre at low elevation makes the probability of individual grizzly bears occurring on the property, or having their movements significantly altered by the pit development, very low.

Black Bear

Black bears (*Ursus americanus*) are more numerous and tolerant of human activity than grizzly bears. Black bears regularly occur within urban settings and are highly likely to occur on or near the subject property. However, given the species' broad movement capabilities, the relatively small nature of the proposed gravel pit development is not expected to affect black bears at the population level. Occasional bears may wander through the area, but with appropriate management of attractants, most are likely to avoid the development. There are ample alternative habitat and movement options in the area for black bears.

Bear Mitigation

Both bear species may occur on the subject property, but the greatest likelihood is for black bears. All bears have very large home ranges and easily move through a variety of habitats.

Most bears in the area of the pit will readily move around it as well as other rural developments in the area, to the east / south of Highway 3. During operation of the pit, eliminating bear attractants (primarily food-based garbage) is the best way to ensure bears are not impacted by the operations. Ensuring all employees properly dispose of garbage in bear-proof container should eliminate most likelihood of bear encounters.

End Leave Habitat Recommendations

Habitat requirements for ungulates should follow approved Ungulate Winter Range (UWR) guidelines under the *BC Forest & Range Protection Act* (BC Ministry of Water, Land & Air Protection 2005). The subject property occurs in both Open Forest and Managed Forest (dry) UWR zones (Figure 2). Forest management prescriptions for these sites include specific stocking standards and cover attributes (Table 4). Note that moose is not a target species for these stand types. The UWR map shows some small, isolated Managed Forest (transitional) habitat fragments in the vicinity of the subject property. This habitat type does have moose as a target species. However, these fragments are well removed from areas considered to be moose habitat and the likelihood of moose occurring on the subject property is very low. As such, accounting for moose in the end leave habitat conditions is not required.

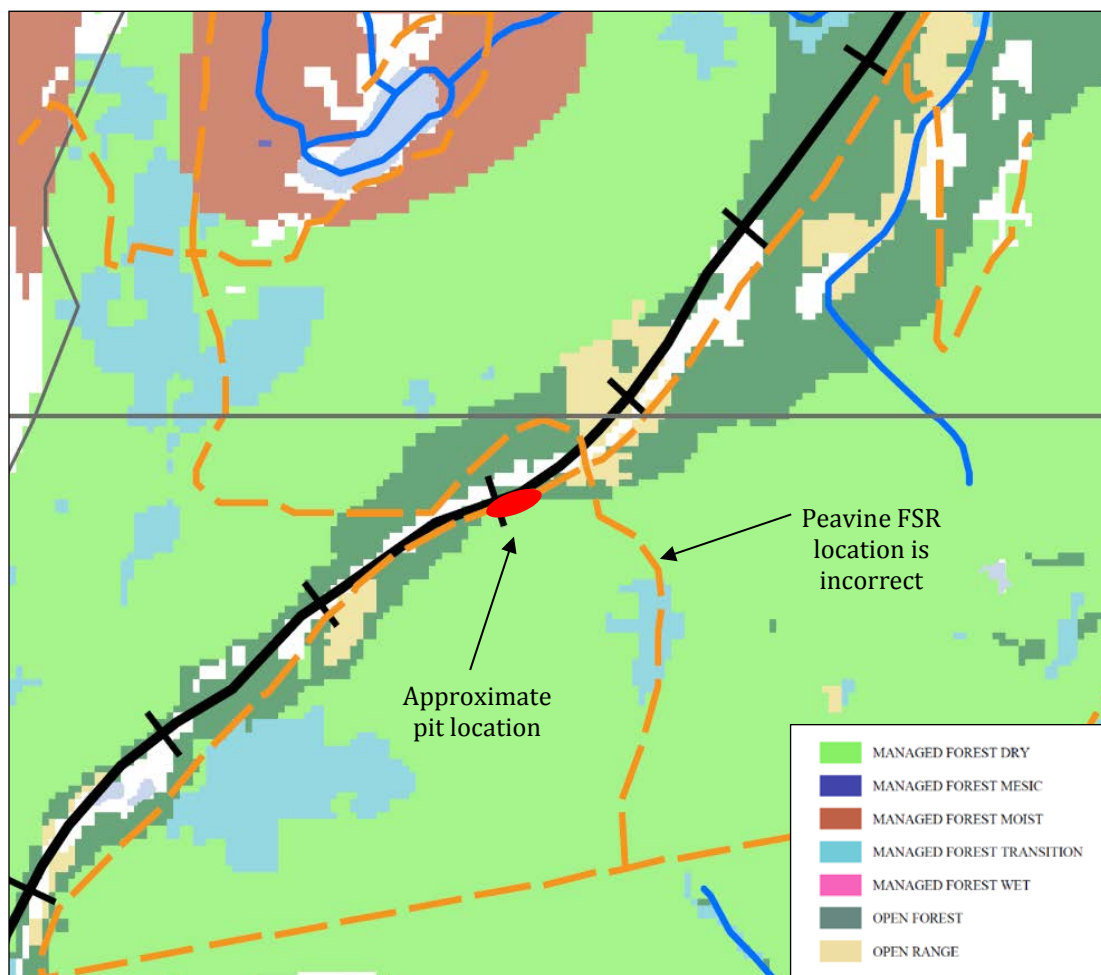


Figure 2: Ecosystem-based Ungulate Winter Range mapping in vicinity of proposed Peavine FSR aggregate pit. Source: BC Ministry of Water, Land & Air Protection 2005.

Table 4: Approved ungulate winter range guidelines for stand types occurring on proposed Peavine FSR Sand & Gravel Pit.

Habitat Type	Ungulate Species	Stand Level Requirements	Forest Cover
Open Forest	Elk, Mule Deer, White-tailed Deer, Bighorn Sheep*, Mountain Goat*	76-400 stems / ha	
Managed Forest Dry	Elk, Mule Deer, White-tailed Deer, Bighorn Sheep*	Mature Cover: 10% minimum Stocking Standards: Multi-layered stocking standards – provincial standard	

* species does not occur on subject property

Given the proximity of the subject property to Highway 3, creating ideal conditions for ungulates is not recommended. Attracting animals to areas beside the highway will lead to increased road mortality and safety risks to motorists. The reclaimed site should permit movements through it, but not be an attractant to local ungulate populations.

The approved UWR guidelines are designed for forest management activities where stands are being harvested. End leave reclamation activities work from the other way, in recreating habitat following resource extraction. Meeting mature forest cover requirements is therefore not applicable. Efforts should be put forth to protect and maintain as many large diameter, mature trees on site as possible for the lifetime of the sand and gravel pit. But recognition of pit design and worker safety will take precedence. Currently, there are very few high value wildlife trees on site.

There are no specific habitat requirements for bears. Black bears, the species most likely to occur in the area, are generalists and will utilize a wide variety of habitats. The end leave conditions created for domestic livestock and wild ungulate use will be suitable for black bears as well. Grizzly bears are very unlikely to occur in the area and do require species-specific habitat conditions for this location. Given the proximity of the site to Highway 3 and neighbouring residences, attracting bears to the site is not desired. Specific zones that facilitate bears crossing Highway 3 are desirable (Proctor et al. 2012) to permit genetic movement; however this area is not a primary regional linkage option.

Report Limitations

BE Civil Projects (the client) and the Ministry of Energy, Mines and Natural Gas are hereby advised of the following conditions and limitations regarding the technical input provided by VAST Resource Solutions:

- The work performed in this report was carried out in accordance with the terms and conditions specified in our Project Work Agreement (PWA) with the client. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations approved by the client and described in the PWA. Since site conditions may change over time, the report is intended for immediate use only.
- Services provided by VAST Resource Solutions Inc. for this report have been conducted in a manner consistent with the level of skill, care and competence ordinarily exercised by members of the profession currently practicing under similar conditions and like circumstances in the same jurisdiction in which the services were provided. Professional judgment has been applied in developing any conclusions and/or recommendations in this report. No warranties, expressed or implied, are made as to the professional services provided under the terms of the PWA and included in this report.
- The report is based on and limited by circumstances and conditions referred to throughout the report and on information available at the time of the site investigation. The conclusions of this report are based in part on information provided by others. VAST Resource Solutions Inc. believes this information is accurate but cannot guarantee or warrant its accuracy or completeness.
- The information presented in this report was acquired, compiled and interpreted exclusively for the client for the purposes described in this report. VAST Resource Solutions Inc. does not accept any responsibility for the use of this report, in whole or in part, for any purpose other than intended or to any third party for use whatsoever.
- The conclusions and/or recommendations provided in this report do not relieve the client or their agents or representatives of the responsibility to comply with applicable Acts, regulations, bylaws and/or decisions of any authorities that have jurisdiction under an enactment.

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This is to certify that **Brad Scriver** has received a
Record of Completion
For the Supervisor Safety Training Course – Module 1
Health Safety and Reclamation Code for Mines in BC

Expires May 9,2018

Valid only upon proof of current First Aid and WHMIS certificates