Appendix 13.15-A-C Soil Management Plan

TELKWA COAL LIMITED

Tenas Project

Section 13.0 Management Plans
Chapter 15 Reclamation and Closure Plan
Appendix 13.15-A-C Soil Management Plan

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VERSION 1.0

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Tenas Project

Section 13.0 Management Plans
Chapter 15 Reclamation and Closure Plan
Appendix 13.15-A-C Soil Management Plan

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Abbreviations and Acronyms

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
A&P	Arya and Paris
ALR	Agricultural Land Reserve
AQMP	Air Quality Management Plan (S13.0-C2)
AWSC	available water-storage capacity
BC	British Columbia
BC MECCS	British Columbia Ministry of Environment and Climate Change Strategy
BC MEMLI	British Columbia Ministry of Energy, Mines and Low Carbon Innovation
BC MEMPR	British Columbia Ministry of Energy, Mines and Petroleum Resources
BC MOF	British Columbia Ministry of Forests
BC MOFR	British Columbia Ministry of Forests and Range
BMP	best management practices
C	Chapter
CCME	Canadian Council of Ministers of the Environment
CEMP	Construction Environmental Management Plan (S13.0-C4)
CEPA	*Canadian Environmental Protection Act*, 1999, SC 1999, c 33 (Government of Canada [GovCan] 1999)
Code	Health, Safety, and Reclamation Code for Mines in British Columbia (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] 2021)
CPP	Coal Processing Plant
EAA	*Environmental Assessment Act, SBC 2002, c. 43* (Government of British Columbia [GovBC] 2002)
EAC	Environmental Assessment Certificate
EC (only in table)	Environmental Coordinator
EMA	*Environmental Management Act*, SBC 2003, c 53 (GovBC 2003) (*EMA*)
EMS	Environmental Management System (S13.0-C1)
F	fermentation [soil horizon]
FRPA	*Forest and Range Practices Act*, RSBC 2002, c 69 (Government of British Columbia [GovBC] 2002)
GovBC	Government of British Columbia
GovCan	Government of Canada
H	humic [soil horizon]
JAIR	Joint Application Information Requirements for Mines Act and Environmental Management Act Permits (British Columbia Ministry of Energy, Mines and Petroleum Resources [BC MEMPR] and British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019).

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
L	litter [soil horizon]
LOM	life-of-mine
MA	*Mines Act,* RSBC 1996, c 293 (Government of British Columbia [GovBC] 1996)
MA/EMA	*Mines Act,* RSBC 1996, c 293 permit and *Environmental Management Act*, SBC 2003, c 53 permit
MIC	Mine Infrastructure Complex
ML/ARDMP	Metal Leaching (ML)/Acid Rock Drainage (ARD) Management Plan (S13.0-C12)
MP (only in tables)	management pond
OM	organic matter
OVB	overburden
Project	Tenas Project
PSD	particle-size distribution
QA/QC	quality assurance/quality control
QEA	quantitative ecohydrological analysis
QP	Qualified Professional
RCP	Reclamation and Closure Plan (S13.0-C15)
ROW	right-of-way
S	Section
S&R	Saxton and Rawls
SEMP	Socio-economic Management Plan (S13.0-C16)
SEPSCP	Surface Erosion Prevention and Sediment Control Plan (S13.0-C17)
SMP	Soil Management Plan
SMU	soil management unit
SPPs	Standard Practices and Procedures
TAC	Tenas Access Corridor
TARP	Trigger Action Response Plan
TCL	Telkwa Coal Limited
TCP	Tenas Control Pond
Tfc	field capacity tension
VMP	Vegetation Management Plan (S13.0-18)
VRMP	Visual Resources Management Plan (S13.0-C19)
WMP	Wildlife Management Plan (S13.0-21)
WRC	water retention curve

Units of Measure

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
>	greater than
<	less than
%	percent
cm	centimetre
dS/m	decisiemens per metre
ha	hectare
kg/m^3	kilograms per cubic metre
km/hr	kilometres per hour
kPa	kilopascal
m	metre
mm	millimetre
Mm^3	million cubic metres

EXECUTIVE SUMMARY

Using surface soils and other suitable materials as reclamation covers is a key component of successful reclamation of terrestrial ecosystems. Management of surface soil resources at the Tenas Project (Project) is critical to the success of the Construction Environmental Management Plan **(Section [S] 13.0-Chapter [C] 4) (CEMP)** where in this Phase, most surface soils will be salvaged ,and the **Reclamation and Closure Plan (Section [S] 13.0-Chapter [C] 15) (RCP)**. This Soil Management Plan (SMP) is intended to guide operations to maximize the retention and benefit of surface soil resources, and to provide a consistent approach to site-specific surface soil management.

The SMP describes the salvage, stockpiling and replacement activities that will provide surface soils and overburden for Minesite reclamation. The SMP presents calculations of the projected volumes of overburden and surface soil available for salvage, accounting for suitability considerations so that reclamation materials (surface soils, overburden, woody debris) are salvaged and segregated appropriately for meeting cover-design specifications. Projected volumes of available reclamation materials (surface soils, overburden) are compared with volume demands for the designed reclamation covers in a reclamation-materials balance to verify that sufficient reclamation materials (surface soils, overburden) are available.

The use of salvaged reclamation materials (surface soils, overburden) aids in the successful re-establishment of native vegetation communities on the post-Decommissioning and Reclamation Phase landscape, thus the SMP supports the broader reclamation goal of restoring disturbed areas to self-sustaining conditions that can support diverse ecosystems and land uses like what existed on the landscape prior to the Project. Through implementation of this SMP and relevant Standard Practices and Procedures (SPPs), Telkwa Coal Limited (TCL) will salvage, stockpile, and replace surface soil resources in accordance with applicable regulations and best management practices (BMPs).

1. Introduction

The Tenas Project (Project) will require a program to salvage surface soils and overburden (reclamation materials) during the Construction, and Operation phases for use by future reclamation activities, including progressive reclamation during the Operation Phase, as described in the **Reclamation and Closure Plan (Section [S] 13.0-Chapter [C] 15) (RCP)**.

This Soil Management Plan (SMP) describes the surface soil management processes and procedures for the Project. The SMP will remain in place during the Construction, Operation, Decommissioning and Reclamation, and Post-closure phases of the Project and will be subject to ongoing management review and revisions as required.

2. Purpose and Objectives

Using surface soils and other suitable materials as reclamation covers is a key component of successful terrestrial ecosystem reclamation. The use of salvaged reclamation materials (surface soils, overburden) aids in the re-establishment of native vegetation communities on the post-Decommissioning and Reclamation Phase landscape, thus the SMP supports the broader reclamation goal of restoring disturbed areas to self-sustaining conditions that can support diverse ecosystems and land uses. The SMP is intended to guide the salvage, storage, and placement of surface soil materials to maximize the retention and benefit of surface soil resources and to provide a consistent approach to site-specific surface soil management.

The SMP describes the salvage, stockpiling and replacement activities that will provide surface soils and overburden (OVB) for Minesite reclamation. To guide these activities, the SMP provides sampling programs for evaluation of surface soil suitability and outlines best management practices (BMPs) to be implemented. A reclamation-materials balance is presented based on surface soils and OVB available for salvage within the Project and projected reclamation demands for these materials. The purpose of the reclamation-materials balance is to verify that sufficient reclamation materials (surface soils, overburden) are being salvaged to meet reclamation needs.

3. Scope and Scale

The scope of this SMP is defined within the Project Area and includes activities, as well as any operation and/or construction activities that are directly associated with the Project and exist outside of the Project Area. The SMP is in effect during the Construction, Operation, Decommissioning and Reclamation, and Post-closure phases and ceases to be in force at the final closure of the Project as approved by the regulatory authorities.

4. COMPLIANCE OBLIGATIONS

4.1 Regulatory Requirements

Several legislative requirements are applicable to this SMP. A concise list of these requirements and their major applicable components is provided in **Table 4.1-1** below.

Table 4.1-1: Legislation and Guidelines Relevant to the Soil Management Plan (SMP)

Legislation, Regulations, and Guidelines	Applicable Information
Bulkley Land and Resource Management Plan (Government of British Columbia [GovBC] 1998)	The Bulkley LRMP identifies visual quality as an important consideration for resource development projects and as such, this relates to reclamation, surface soil salvage and closure management.
Canadian Environmental Protection Act, 1999, SC 1999, c 33 (Government of Canada [GovCan] 1999) (*CEPA*)	Aims at preventing pollution and protecting the environment and human health from the effects of deleterious substances.
Environmental Assessment Act, SBC 2002, c. 43 (GovBC 2002a) (*EAA*)	Assesses potential positive and negative environmental, social, economic, health, and cultural effects, and impacts to Indigenous groups and rights of Indigenous peoples for major projects.
Environmental Management Act, SBC 2003, c 53 (GovBC 2003) (*EMA*)	Authorizes discharges to water, land and air, storage/treatment of wastes, disposal of solid waste to the land and, along with the *Mines Act*, RSBC 1996, c 293 (GovBC 1996), authorizes Joint Applications for *EMA* permits at mines in British Columbia (BC).
Forest and Range Practices Act, RSBC 2002, c 69 (GovBC 2002b) (*FRPA*)	*FRPA* assesses the effectiveness of maintaining wildlife habitat and species across their natural ranges and over time in BC.
Health, Safety and Reclamation Code for Mines in British Columbia (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] 2021) (Code)	The Code stipulates the permitting, reclamation, and closure requirements for Mines in BC and the reclamation standards within Part 10 of the Code.
Joint Application Information Requirements for *Mines Act*, and *Environmental Management Act* Permits (British Columbia Ministry of Energy, Mines and Petroleum Resources [BC MEMPR] and British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019).	Provides guidance for what is to be included in reclamation and closure chapters and environmental management plans.
Mines Act, RSBC 1996, c 293 (GovBC 1996)	This Act requires that mining operations comply with the Code. Permits under this Act stipulate an Annual Reclamation Report and a mine plan and reclamation program that is updated every five (5) years.

The Joint Application Information Requirements for *Mines Act* and *Environmental Management Act* Permits (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] and British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019) (JAIR) provides direction in developing Reclamation and Closure Plans (Section 4) and Soil Management Plans (Section 9.3), which were used do develop this SMP**.** The **RCP** and this SMP are designed to fulfill the requirements of *Mines Act*, RSBC 1996, c 293 and *Environmental Management Act,* SBC 2003, c 53 (*MA/EMA*) permits for British Columbia (BC).

The JAIR requires that the SMP direct implementation of BMPs during surface soil salvage, stockpiling, and application operations, and guide salvage monitoring and stockpile maintenance provisions, training, supervision, and quality assurance/quality control (QA/QC). This SMP describes in detail the surface soil handling practices for activities related to salvage, stockpiling, and application in reclamation, based on information collected in accordance with baseline data and provides figures showing surface soil ratings, proposed salvage depths and stockpile locations.

This SMP also addresses Section 10.7.8 of the Health, Safety, and Reclamation Code for Mines in British Columbia (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC MEMLI] 2021) (Code):

> *"On all lands to be re-vegetated, the growth medium will satisfy land use, capability, and water quality objectives. All surficial soil materials removed for mining purposes will be saved for use in reclamation programs unless these objectives can be otherwise achieved."*

4.2 Guidelines and Best Management Practices (BMPs)

Management guidelines and BMPs that are applicable to this SMP are summarized in **Table 4.2-1.** Additional guidance was obtained from review of peer-reviewed publications, such as Rokich et al. (2000) and Paterson et al. (2019).

Table 4.2-1: Management Guidelines and Best Management Practices (BMPs) Applicable to the Soil Management Plan (SMP)

Guideline and BMP	Description
A Guide to Soil Salvage (Natural Resources Canada [NRCAN] 2017)	The Guide provides pre-development steps to salvage surface soil and subsoil to improve reclamation outcomes.
Best Management Practices for Conservation of Reclamation Materials in the Mineable Oil Sands Region of Alberta (Mackenzie 2011)	Provides leading practices to help operators optimize the use of available reclamation materials (surface soils) on a site-specific basis.
In situ oil sands extraction reclamation and restoration practices and opportunities compilation (Mackenzie and Renkema 2013)	Summarizes current knowledge and practices employed for reclamation of in-situ oil sands extraction facilities (in-situ facilities) and identifies knowledge gaps, shortcomings, and areas of improvement.

4.3 Standard Practices and Procedures (SPPs)

Telkwa Coal Limited (TCL) Standard Practices and Procedures (SPPs) will conform to the Code. In addition to regulatory requirements, the Project will implement SPPs that meet or exceed the required laws and regulations.

5. RELATIONSHIP TO OTHER MANAGEMENT PLANS

The Project is governed by an **Environmental Management System (S13.0-C1) (EMS)**, an overarching management plan strategy comprising a set of processes and practices which enable TCL to manage its environmental and safety performance in a holistic way, within an integrated framework. While the management plans are part of the **EMS**, the **EMS** is not just a collection of management plans.

In addition to the overall guidance of the **EMS**, this SMP has a relationship with other management plans that also present mitigation measures. Those management plans and their relationship to this SMP are listed in **Table 5-1**.

Table 5-1: Management Plans with Relationship to the Soil Management Plan (SMP)

Management Plans	Nature of Relationship
Environmental Management System (S13.0-C1) (EMS)	All management plans are part of the EMS, including this RCP.
Air Quality Management Plan (S13.0-C2) (AQMP)	Dust management associated with surface soil salvage, stockpiling and placement.
Construction Environmental Management Plan (S13.0-C4) (CEMP)	Surface soil salvage operations and erosion and sediment control during construction.
Metal Leaching (ML)/Acid Rock Drainage (ARD) Management Plan (S13.0-C12) (ML/ARDMP)	Surface soils for reclamation cover will be characterized for metal leaching and acid rock drainage or high metal content and only used if not potentially acid generating.
Reclamation and Closure Plan (S13.0-C15) (RCP)	Cover designs for reclamation inform reclamation-material volume requirements as required by the RCP. This Soil Management Plan (SMP) is an appendix to the **RCP**.
Socio-Economic Management Plan (S13.0-C16) (SEMP)	Sharing of annual reports and community engagement programs will be conducted as per this plan.
Surface Erosion Prevention and Sediment Control Plan (S13.0-C17) (SEPSCP)	Surface erosion prevention and sediment control plan during surface soil salvage, stockpiling and placement.
Vegetation Management Plan (S13.0-18) (VMP)	Revegetation, including management of invasive plants on surface soil stockpiles and reclaimed areas.
Visual Resources Management Plan (S13.0-C19) (VRMP)	Reclamation with salvaged surface soil will help to reduce visual effects.

6. Details of the Soil Management Plan (SMP)

6.1 Terminology

Reclamation materials referred to throughout the SMP are defined as follows:

- **Reclamation materials** – surface soils and OVB and woody debris that will be salvaged and used in reclamation;
- **OVB** – OVB is defined as unconsolidated soil that underlies surface soils (greater than [>] 0.5 metres [m] below the interface between organic and mineral surface soil horizons). These materials have not undergone pedogenesis, except the uppermost OVB (e.g., 0.5 to 1.0 m below the interface between organic and mineral surface soil horizons), which has undergone less pedogenesis than surface soil and has lower organic-matter (OM) content. Overburden within the Project Area consists primarily of morainal deposits. OVB, in the context of reclamation materials and this SMP, does not include any mine materials (e.g., mine rock, coal);
- **Surface soil** – surface soils include organic horizons, if present, and the upper 0.5 m of mineral horizons underlying the organic horizons. Surface soils have undergone pedogenesis, which includes accumulation of OM. For mineral soils, the organic horizons are thin (less than [<] 0.1 m), while the organic horizons of organic soils are approximately 1 m deep in the Project Area[1];
- **Woody Debris** – involves larger deadwood such as logs, branches, stumps, roots, and other stems and branches that are not large enough to be merchantable but are too large just to incorporate with surface soil salvage operation. Woody debris is used to encourage revegetation through the creation of microsites.

The following are subcomponents of surface soil that are used as part of the RCP, and SMP:

- **Organic soil** – surface soils classified to the Organic soil order. The Organic order comprises soils with greater than 40-centimetre (cm)-deep litter (L), fermentation (F) and/or humic (H) horizons, greater than 40-cm-deep Of horizons, or greater than 60-cm-deep Om or Oh horizons;
- **Mineral soil** – surface soils classified to non-organic soil orders (e.g., from colluvial, morainal, and glaciofluvial parent materials). Mineral soil orders may have L, F, and/or H horizons, but these organic horizons will be mixed with the underlying mineral soil during salvage and are grouped under mineral surface soils in this SMP; and
- **Organic-mineral mix** – over-salvaged organic surface soils that are planned to be salvaged. The organic-mineral mix will encompass the organic horizons of organic surface soils in addition to underlying mineral soil, which is enriched in fine surface soil particles due to the landscape position and enriched in organic nutrients due to the overlying organic layers. This mix is estimated to be 50 percent [%] mineral soil (by volume).

[1] Terrain polygons with organic soils either had a surface expression code of veneer (Ov) or blanket (Ob), indicating that the organic horizons of organic soils were either less than 1 m deep or between 1 to 2 m deep, respectively.

6.2 Baseline Information

6.2.1 Terrain

During the last glaciation (28,000 to 10,000 years ago), the Project Area was completely covered by the Cordilleran Ice Sheet. The surficial materials are glacial deposits: basal till and ablation till; localized subglacial and supraglacial ice contact gravel and sand deposits; proglacial gravel and sand deposits transported by glacial meltwater streams; and clay and silt deposited in late-glacial lakes. During the final decay of the Cordilleran Ice Sheet, downcutting by glacial meltwater streams shaped the 80 to 120-m deep valleys of the lower Telkwa River, Goathorn Creek, Tenas Creek and Four Creek. The rapid erosion over-steepened the valley walls and exposed underlying stratigraphic units: fine-textured and coal-bearing Cretaceous sedimentary rock; and advance-phase glacial sediments such as clayey silt and gravelly sand that were deposited in pre-glacial valleys. Since the end of the last glaciation, fluvial and colluvial processes have shaped the modern floodplains and fans of the rivers and major creeks in the Project Area and have formed small toe slope deposits at the base of steep slopes. Details of terrain are provided in the Tenas Project Terrain and Soil Baseline Report (TCL 2021).

6.2.2 Surface Soils

Baseline surface soil mapping provided an inventory of the surface soil resources within the Project Area. Soil management units (SMUs) reflect groupings of surface soil with related properties to provide surface soil information efficiently for assessment and reclamation purposes. The SMUs provide a model of the most common surface soils within the Project Area, taking into consideration how surface soils have developed based on local parent materials, climate, topography and drainage, slope position, vegetation, and existing disturbance history. Each SMU describes surface soils with related properties such as parent material, surface soil texture, coarse-fragment content, and degree of organic enrichment. A summary of SMUs delineated for the Project is presented in **Table 6.2-1**: and shown in **Figures 6.2-1** and **6.2-2**. Details of baseline surface soil mapping are provided in the Tenas Project Terrain and Soil Baseline Report (TCL 2021).

Fine- to medium-textured, well- to moderately-drained surface soil, derived from basal till (SMU 1.1) is the most common surface soil type within the Project Area. Fine-to medium-textured, imperfectly- to poorly-drained surface soil (SMU 1.2) occurs to a much more limited extent in lower, moisture-receiving slope positions, and is characterised by organic-enriched humus and Ah layers and gleying. More coarsely textured, well-drained surface soil derived from ablation till (SMU 1.3) occurs on parts of the Tenas plateau and is characterised by nutrient-poor, freely-drained sandy loams.

Coarse-textured, well- to rapidly-drained surface soil derived from glaciofluvial parent material (SMU 2) occurs on the plateau in the vicinity of Four Creek and to lesser extent at the west end of the Bypass Road and the north end of the Goathorn Creek area. Surface soil textures include sand and loamy sand, and nutrient levels are low.

Fine-textured, moderately-drained surface soil with zero coarse fragments (SMU 3.1) is associated with a localized glaciolacustrine deposit at the east end of the Bypass Road. Fine-textured, imperfectly- to poorly-drained surface soil (SMU 3.2) characterised by rich humus and Ah-horizon development and gleying, occurs to a limited extent throughout the Project Area on depressional sites.

Coarse-textured, well- to rapidly-drained surface soil derived from active fluvial deposits (SMU 4.1) are like SMU 2, but seasonal flood events provide a source of nutrients and moisture. This SMU occurs on active floodplain benches of Goathorn Creek, Tenas Creek, the Telkwa River, and the Bulkley River. Surface soil textures are sandy, and the surface soil is classed as Regosolic. Fine silty-textured, imperfectly- to poorly-drained surface soil (SMU 4.2) occurs to a limited extent in back-channel depressions. This surface soil typically has a deep Ah layer and is classed as Humic Regosol. Coarse-textured, well- to rapidly-drained surface soil derived from inactive, high-bench floodplain deposits (SMU 4.3) is classed as Brunisolic and is nutrient poor.

Shallow surface soil over bedrock (SMU 5) and bedrock outcrops (SMU 6) occur to a limited extent at the south end of the Project, along parts of Tenas Creek, Goathorn Creek, and the Bypass Road. Surface soils on the steep and potentially unstable valley wall slopes of Goathorn and Tenas Creeks are placed in their own categories. SMU 8.1 describes fine- to medium-textured surface soils with moderate drainage that occur along the valley sides. SMU 8.2 captures the surface soils with rich humus and Ah horizons and imperfect drainage that have developed on localized colluvial and fluvial deposits at the base of these slopes. Organic soil (SMU 7) occurs in depressions left by meltwater channels and small kettle-hole lakes. Organic soil is limited in extent in the Project Area.

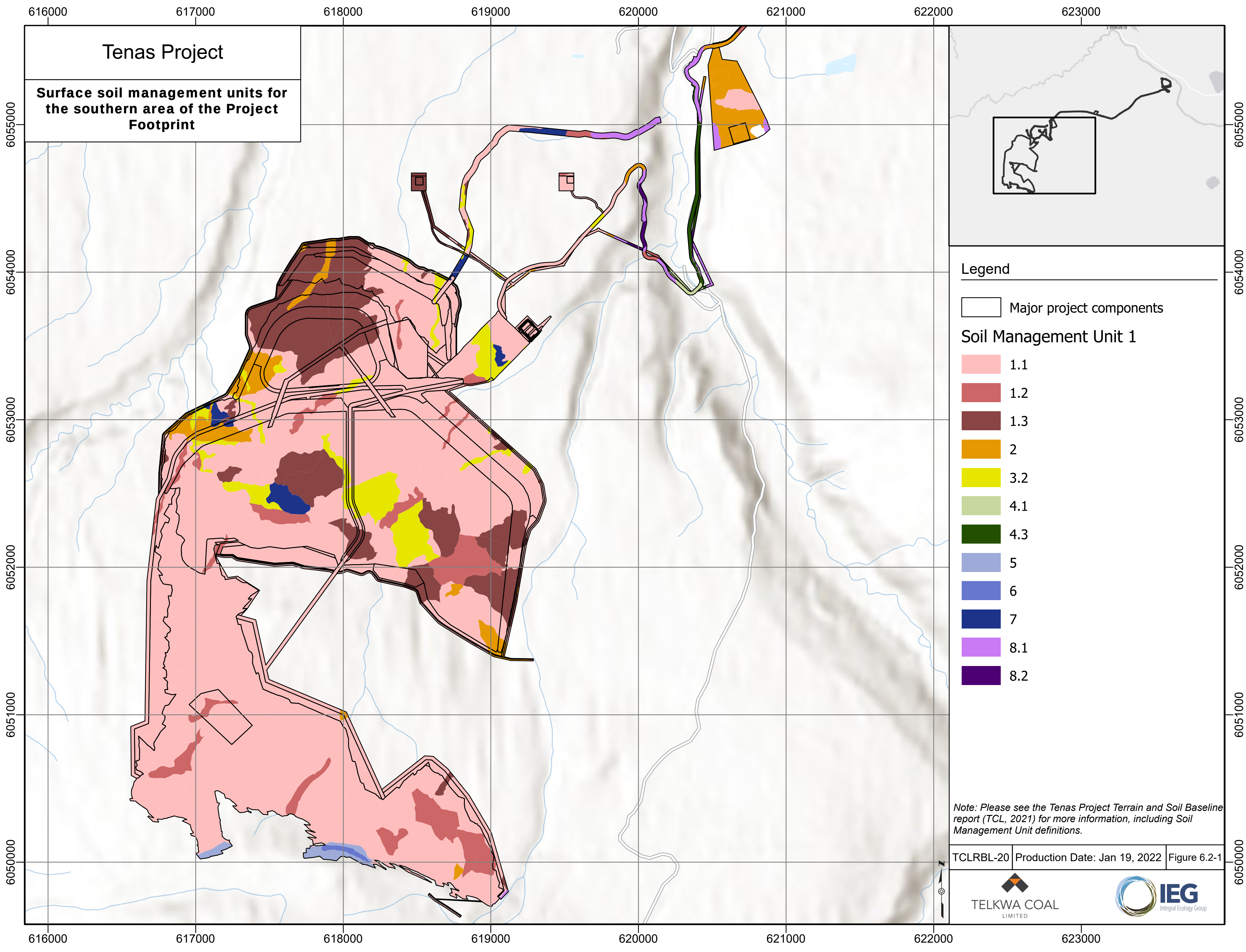
Lands along portions of the Tenas Access Corridor (TAC), Goathorn Creek, and Rail Infrastructure areas are designated as Agricultural Land Reserve (ALR). No ALR lands are found within the Minesite portion of the Project (i.e., open pit, management ponds, Mine Infrastructure Complex [MIC]). Agricultural capability ratings were assigned to polygons that intersect with the TAC, Goathorn Creek, and Rail Infrastructure areas. Within the Rail Infrastructure area, agricultural capability is class 5AP, limited by aridity, stoniness, and lack of fertility. Low-lying depressions are rated 5DI, limited by dense surface soil structure and a seasonal high water-table. Land at the east end of the TAC is Class 4D, limited by dense surface soil structure. Cultivated fields and pasture above 600 m, towards the west end of the TAC, are Class 5, limited by the short growing season at this elevation and stoniness. Sloping terrain and wet draws are Class 6WP. Occasional steep slopes are Class 7T. Organic soil occurs to an extremely limited extent in small kettle-hole depressions. Lands within the Goathorn Creek area are mostly Class 5 and Class 6. Above 600 m, crop potential is limited by a short growing season. The bottom end of the Telkwa Coalmine Road has sandy-gravelly surface soils that are limited due to stoniness, aridity, and lack of fertility. Seasonal inundation occurs along the Goathorn and Telkwa floodplains, most of which is Class 6. The goal of the **RCP** will be to return lands within the ALR to their pre-development agricultural capability; please see **Appendix 13.15-A Reclamation and Closure Plan for Lands within the Agricultural Land Reserve (ALR)** in the **RCP** for further information.

Table 6.2-1: Soil Management Units (SMUs)

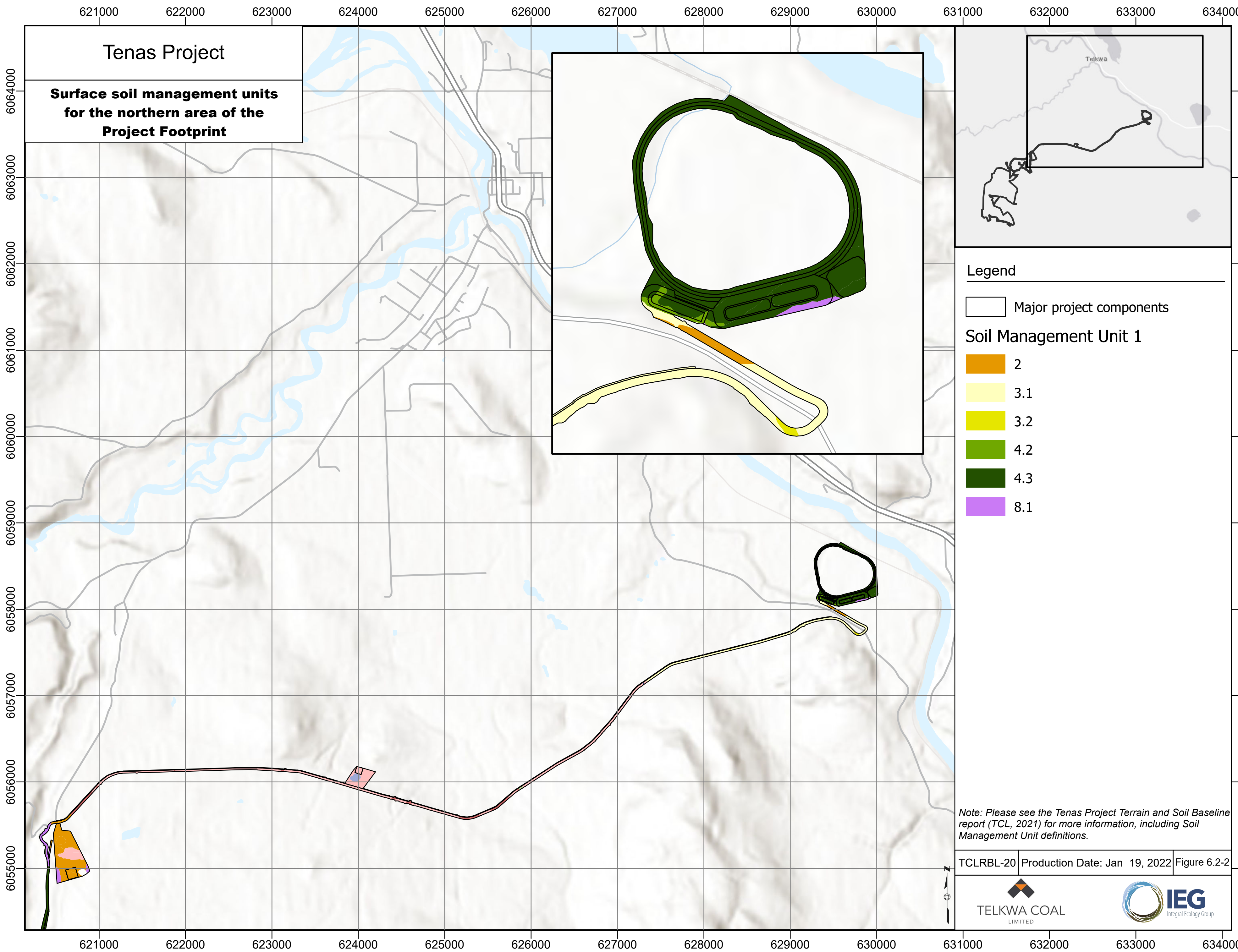
SMU	Parent Material	General Description	Topography	Soil Texture	Average Rooting Depth (cm)	Coarse Fragment Content (%)[1]
1.1	M	Medium textured, well- to moderately-drained Orthic and Brunisolic Grey Luvisols, Eutric and Dystric Brunisols derived from tills. Coarse-fragment content from 10 to 40%. May have compacted Bt horizon. Limited organic enrichment.	Level to moderately steep	▪ SiL, L, ▪ SiCL, (SL)	30	10–35
1.2	M (Fv)	Medium-textured, imperfectly- to poorly-drained Humic Gleysols, Gleyed Grey Luvisols, Gleyed Melanic Brunisols derived from tills on receiving slope positions. Organic-enriched A layer is typical.	Lower receiving slope positions	▪ SiL, SiCL, ▪ SiC, (SL, ▪ LS)	30	10–40
1.3	M	Coarse-textured, silty-sandy, well- to rapidly-drained, nutrient-poor Dystric Brunisols derived from ablation tills. Cold-air ponding.	Undulating, convex	▪ SL, LS	25	30–50
2	FG	Coarse-textured, sandy, coarse-loamy to gravelly, well- to rapidly-drained Dystric Brunisols derived from glaciofluvial parent materials.	Level to gently sloping	▪ S, LS, (SL)	30	20–60
3.1	LG, (FG)	Fine-textured, moderately-drained Orthic and Brunisolic Gray Luvisols derived from glaciolacustrine parent materials. Zero coarse fragments and high clay content.	Level to gently sloping	▪ SiCL, SiL, ▪ Si	25	0
3.2	Fv [LG], LGp, Mp	Fine-textured, imperfectly- to poorly-drained Gleyed Dark Grey Luvisols, Gleyed Brunisolic Grey Luvisols, and Humic Luvic Gleysols. Organic-enriched A layer > 10 cm. Often signs of prolonged water saturation.	Level to gently sloping and depressions	▪ Si, SiCL, ▪ SiL	25	0–10
4.1	F^Ap, Fp	Coarse-textured, sandy-silty, well- to moderately-drained Orthic and Cumulic Regosols on active floodplain deposits. Subsurface flooding or over-bank flooding. Organic enrichment variable.	Level to gently sloping	▪ LS, S, SL, ▪ SiL	30	0–60
4.2	F^Ap, Fp	Fine-textured, silty, imperfectly- to poorly-drained Humic Regosols associated with floodplain deposits, often with organic enrichment (like SMU 3.2).	Level	▪ SiL, SiCL, ▪ Si	25	0

SMU	Parent Material	General Description	Topography	Soil Texture	Average Rooting Depth (cm)	Coarse Fragment Content (%)[1]
4.3	Ft	Coarse-textured, sandy-silty, well- to rapidly-drained Brunisols derived from inactive fluvial deposits (like SMU 2).	Level to gently sloping	▪ SL, LS	25	0–40
5	Mv [R or D]	Shallow, well- to rapidly-drained Dystric Brunisols over bedrock. Medium textured with high coarse-fragment content.	Gentle upperslopes and crests	▪ SiL, FSL, ▪ SL	20	30–75
6	R, D	Skeletal. Rapidly-drained bedrock outcrops.	Upper slopes, crests	▪ Skeletal	<5	Skeletal
7	O	Organic soil, poor- to very-poorly-drained. Veneers and blankets.	Level to depression	▪ Fibric, ▪ mesic ▪ organics	30	N/A
8.1	Cbv, FGks	Well- to moderately-well drained Regosols, Brunisols, and Luvisols on steep to moderately steep escarpment slopes. Some active failures and slumps.	Moderately steep, steep slopes	▪ SiL, L, SiCL	30	25–80
8.2	Cfb	Humic Regosols with organic Ah horizons > 10 cm. Situated in toe-slope receiving positions at base of escarpment slopes.	Gentle to moderate receiving slopes	▪ SiL, L, SiCL	40	0–50

Source: *TCL 2021 (Table 3-7)*
Notes: *>=greater than; %=percent; cm=centimetre; SMU=soil management units*
Parent Material: *Cbv=colluvium thick blanket/veneer; Cfb = colluvium fan(s)/veneer; D=weathered bedrock; FAp=active fluvial plain; FG=glaciofluvial; FGks=glaciofluvial moderately steep/steep slope; Fp=fluvial plain; Ft=fluvial terrace; Fv=fluvial veneer; LG=glaciolacustrine; LGp=glaciolacustrine plain; M=morainal (till); Mp=morainal plain; Mv=morainal veneer; n/a=not applicable; O=organic; R=bedrock*
Soil Texture: *L=Loam; LS=Loamy Sand; S=Sand; SL/FSL=Sandy Loam/Fine Sandy Loam; Si=Silt; SiL=Silt Loam; SiC=Silt Clay; SiCL=Silty Clay Loam*
[1] *Coarse-fragment content in rooting zone*



Tenas Project
Surface soil management units for the southern area of the Project Footprint
616000
617000
618000
619000
620000
621000
622000
623000
6050000
6051000
6052000
6053000
6054000
6055000
Legend
Major project components
Soil Management Unit 1
1.1
1.2
1.3
2
3.2
4.1
4.3
5
6
7
8.1
8.2
Note: Please see the Tenas Project Terrain and Soil Baseline report (TCL, 2021) for more information, including Soil Management Unit definitions.
TCLRBL-20
Production Date: Jan 19, 2022
Figure 6.2-1
TELKWA COAL LIMITED
IEG
Integral Ecology Group


Tenas Project
Surface soil management units for the northern area of the Project Footprint
Telkwa
Legend
Major project components
Soil Management Unit 1
2
3.1
3.2
4.2
4.3
8.1
Note: Please see the Tenas Project Terrain and Soil Baseline report (TCL, 2021) for more information, including Soil Management Unit definitions.
TCLRBL-20
Production Date: Jan 19, 2022
Figure 6.2-2
TELKWA COAL LIMITED
IEG Integral Ecology Group
621000
622000
623000
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6064000

6.3 Suitability of Reclamation Materials (Surface Soils and Overburden)

Suitability of available reclamation materials (surface soil and OVB) was assessed to enable incorporation of suitability considerations into calculations of reclamation-material supply. Suitability was evaluated using the SMUs defined in the Tenas Project Terrain and Soil Baseline Report (TCL 2021), and as detailed in the **RCP** and **Table 6.3-1** below. Available water-storage capacity (AWSC) was used as the primary suitability criterion because surface soil water supply is a dominant control on the characteristics of an ecosystem, including its nutrient regime (Pojar et al. 1987; Baker et al. 2020). The SMUs were grouped into suitability classes based on AWSC (calculated from particle-size distribution [PSD] and OM content) and operational salvage constraints (steep slopes and shallow surface soil thicknesses) as shown in Error! Reference source not found.**1**. Detailed results of AWSC by SMU and relative abundance of each SMU are presented in **Appendix 13.15-B-A**. SMUs are mapped in **Figures 6.2-1** and **6.2-2** and suitability classes are presented on the salvage maps in **6.4**.

Surface soil that is sufficiently deep and operationally accessible is categorised as suitable for salvage, as surface soil types can support ecosystems on the pre-Project landscape. Suitable surface soils are, however, divided into three classes based on AWSC: low-AWSC mineral, high-AWSC mineral, and organic. Segregation of these classes will enable targeted creation of specific soil moisture regimes (and corresponding ecosystems), as per the ecohydrological modelling in the **RCP**, to promote heterogeneity on the post-closure landscape. The suitability classes (**Table 6.3-1**) correspond to parent-material types, with high-AWSC mineral surface soils formed from finer-textured parent materials (primarily morainal), and low-AWSC mineral surface soil formed from coarser-textured parent materials (primarily fluvial and glaciofluvial).

The AWSCs of the low-AWSC, high-AWSC and organic surface soils are shown in **Figure 6.3-1** and compared with the AWSC of OVB and Project materials (mine rock and the material used to represent roads and Coal Processing Plant (CPP) and Maintenance Facility areas). Reclamation materials (surface soils, overburden) have AWSC values far exceeding mine rock and the projected substrate of roads and plant areas, which have negligible water-holding capacity and would be expected to have a limited ability to support vegetation if left uncovered. High-AWSC mineral surface soil has a greater AWSC than OVB, while low-AWSC mineral surface soil has a lower AWSC than OVB.

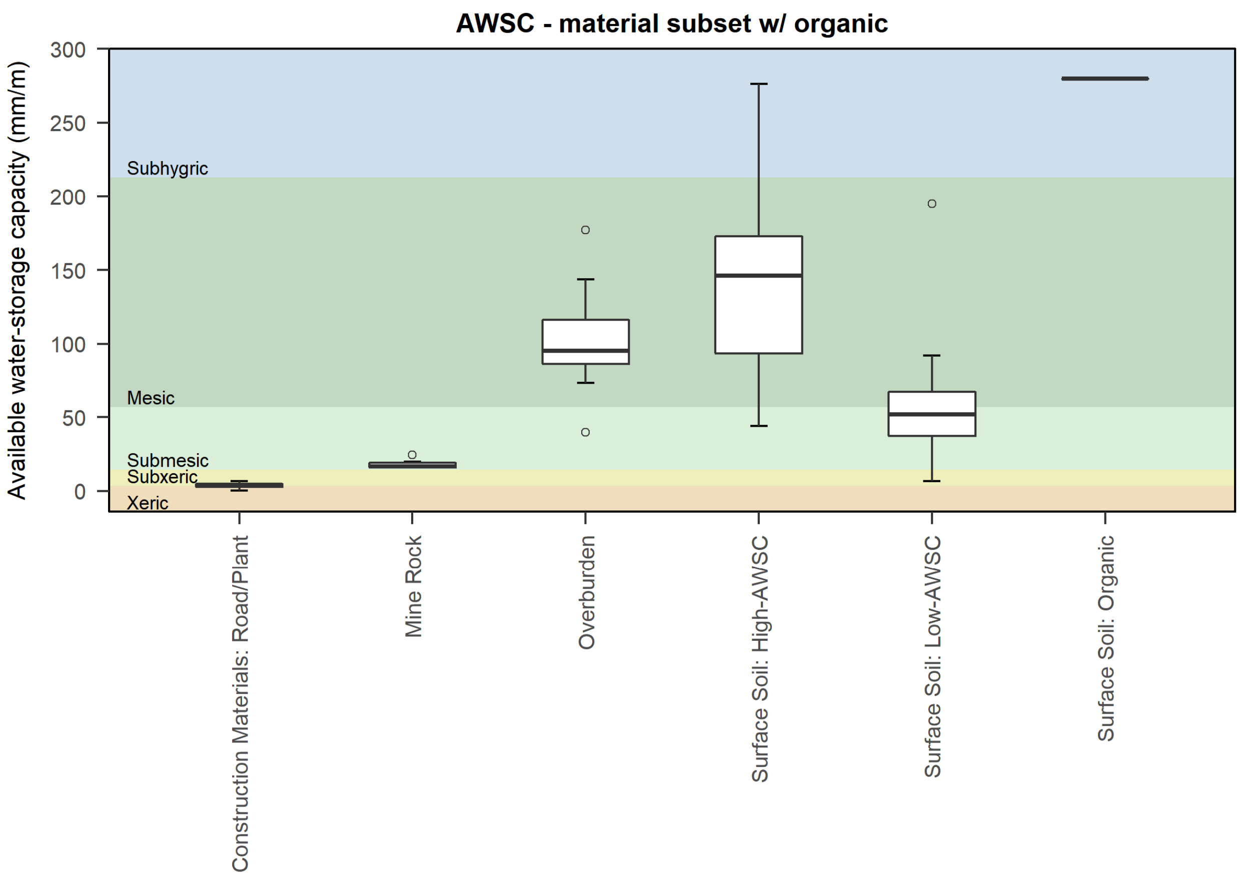
Details on AWSC calculations and input data are presented in **Appendix 13.15-B-A**. Criteria to be applied during salvage operations to support delineation of reclamation-material types are provided in **6.7.1**.

Table 6.3-1: Surface Soil Suitability Classification

Suitability Class	Soil Management Units (SMUs)	Description
Unsuitable	5, 6, 8.1, 8.2	SMUs were deemed unsuitable due to surface soil is that is too shallow to operationally salvage (SMUs 5 and 6), and terrain that is too steep for salvage (SMUs 8.1 and 8.2).
Low-AWSC mineral	1.3, 2, 4.1, 4.3	Coarse-textured, low-AWSC and low-nutrient surface mineral soils derived from fluvial, glaciofluvial, and ablation-till parent materials. Suitable for reclamation of submesic or drier ecosystems.
High-AWSC mineral	1.1, 1.2, 3.1, 3.2, 4.2	Finer-textured and high-AWSC surface mineral soils with a nutrient-rich Ah (humic) horizon present. Surface soils are derived from morainal, glaciolacustrine and silty-fluvial parent materials. Suitable for reclamation of mesic ecosystems.

Suitability Class	Soil Management Units (SMUs)	Description
Organic	7	Organic surface soils with high organic-matter content and nutrient availability. Useful as an organic amendment or for reclamation of wetlands and low-lying ecosystems.

Notes: *AWSC=available water-storage capacity; SMU = soil management unit*



Note: *The coloured bands represent relative surface soil moisture regime classes for flat sites without root restriction in the upper metre. The middles of the boxplots represent the 50th percentile, the hinges represent the 25th and 75th percentiles, and the whiskers represent 1.5 times (x) the interquartile range of the hinges.*

Figure 6.3-1: Available-water storage capacity (AWSC) of materials and overburden (OVB) compared to surface soil suitability classes

6.4 Available Volumes of Reclamation Materials (Surface Soils and Overburden)

Reclamation materials (surface soils, overburden) supply was evaluated to support development of a reclamation-materials balance and confirm that sufficient reclamation materials (surface soils, overburden) are available to meet demands for implementing the designed reclamation covers.

6.4.1 Surface soil

Areas with surface soil suitable for salvage were assigned by applying the surface soil suitability class groupings to polygons of SMUs delineated in bioterrain mapping in the Tenas Project Terrain and Soil Baseline Report (TCL 2021). Polygons had up to two (2) SMUs assigned, so SMU deciles were used to calculate the proportion of a polygon to assign to each SMU. The following areas were excluded from salvage estimates:

- areas of existing disturbance;
- Project components for which salvage of surface soil is not required, including the powerline right-of-way (ROW) and the footprints of surface soil stockpiles; and
- Project components that will be maintained after the Decommissioning and Reclamation Phase and beyond the Post-closure phase (i.e., not reclaimed) and are not proximal to the Project (i.e., primary mining area), including the water effluent channel and the portion of the TAC between the Mine Infrastructure Complex (MIC) and the Gravel Quarry, as it may be used by local companies in the future.
- Surface soil volumes were calculated from salvage areas using salvage depths of 0.3 m for high-AWSC mineral surface and 0.15 m for low-AWSC mineral surface soil. The exception to this is greater salvage depths are recommended at satellite areas away from the Minesite portion of the Project where no OVB is available to supplement surface soil with. For the TAC, quarries, Explosive Facility and Explosive Magazine, the recommended salvage depth is 0.4 m for mineral surface soils (low- and high-AWSC). For the Rail Infrastructure area, the recommended salvage depths are 0.4 m for high-AWSC mineral surface soil and 0.35 m for low-AWSC surface soil.

Organic soils within the Project Area are, on average, 1.0 m deep (TCL 2021).[2] Therefore, an average salvage depth of 2.0 m is recommended to capture the organic materials plus an additional 1.0 m to include the underlying mineral soil, which is likely enriched in fine soil particles due to the landscape position and enriched in organic nutrients due to the overlying organic layers.[3] These “over-salvaged” organic soils are more useful and feasible to use in reclamation than pure organics.

These salvage depths are in accordance with recommended surface soil salvage depths in the mine-reclamation literature, which range from 0.15 to 0.80 m (MacKenzie 2011; Paquin and Brinker 2011). The upper 0.5 m of mineral soils plus the overlying organic layers is typically the portion of the surface soil profile where most biotic activity occurs, and concentrations of OM and nutrients are highest. Subsurface soil (0.5–1.0+ m) is minimally influenced by biotic activity and surface soil processes and are expected to have material properties more like reclamation-suitable OVB.

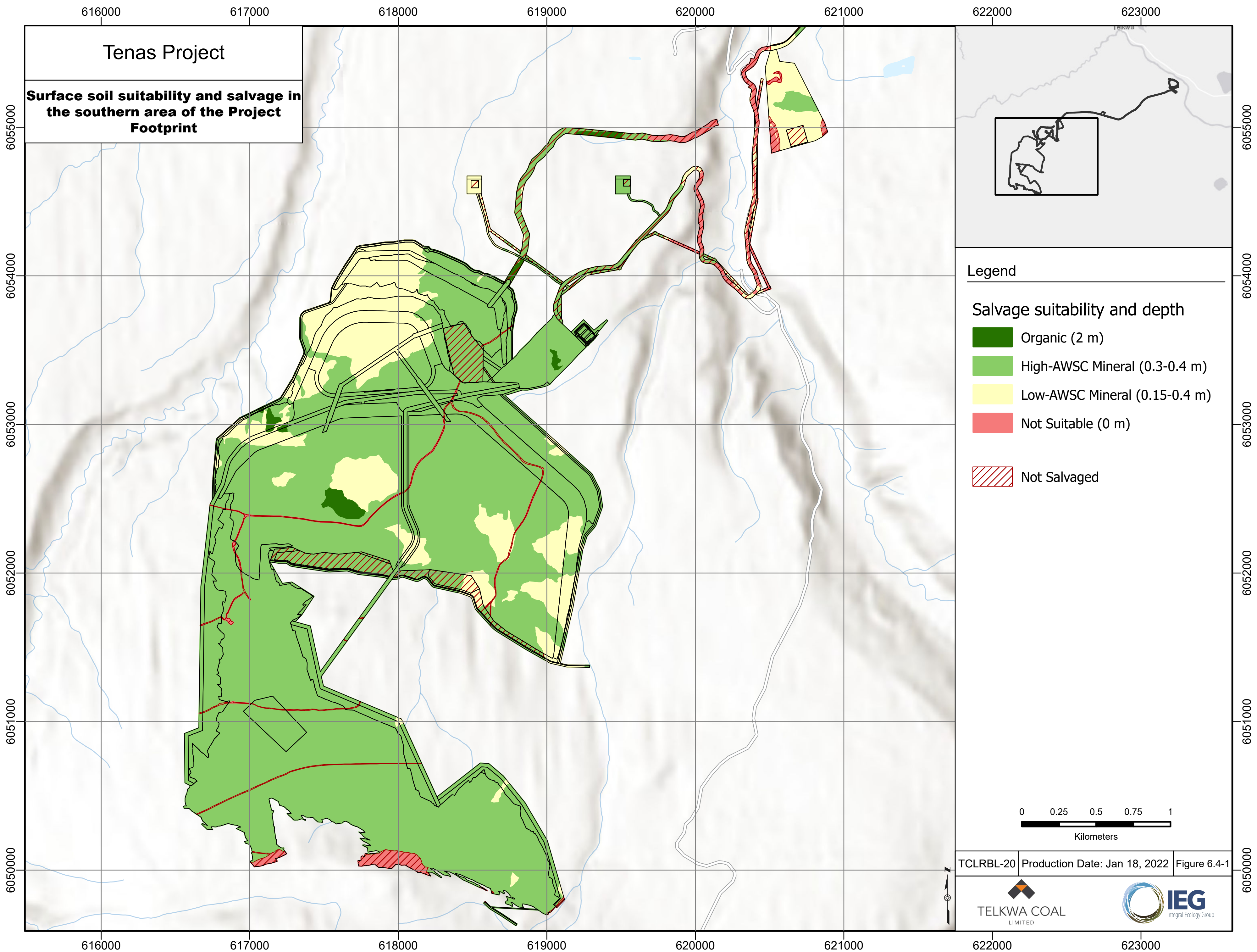
[2] Terrain polygons with organic soils either had a surface expression code of veneer (Ov) or blanket (Ob), indicating that the organic horizons of organic soils were either less than 1 m deep or between 1 to 2 m deep, respectively.

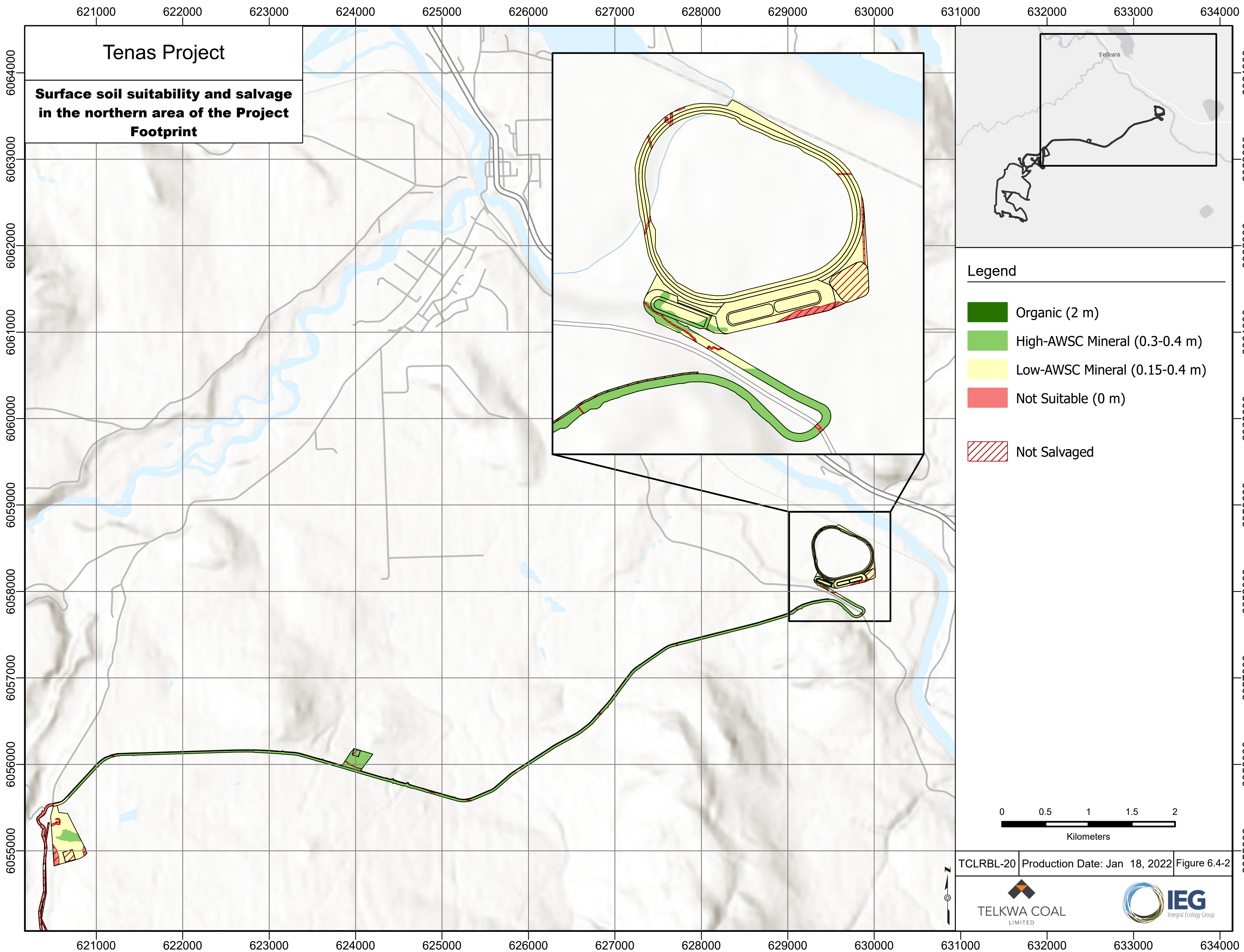
[3] Salvage depths should be confirmed and adjusted during salvage operations, as overseen by a Qualified Professional with appropriate training.

Figures 6.4-1 and **6.4-2** show the reclamation suitability of surface soils in the Project Area and planned areas of surface soil salvage. A total of 1.87 million cubic metres (Mm^3) of high-AWSC mineral surface soil, 0.27 Mm^3 of low-AWSC mineral surface soil, and 0.12 Mm^3 of suitable over-salvaged organic soil mixes (50% of which is estimated to be underlying suitable mineral soil) are projected to be available for salvage, totaling 2.26 Mm^3 of salvaged surface soil. The LFH (forest floor) portion of mineral surface soils was conservatively not included in these volumes, as these organic horizons commonly compress with handling and mixing. A more detailed breakdown of projected surface soil salvage volumes by Project Area is presented in the reclamation-materials balance in **Table 6.6-2** of **6.6 Reclamation-Materials Balance**.

6.4.2 Overburden (OVB)

A total of 25.69 loose (swelled at 20%) Mm^3 of OVB is available from open pit excavation. Of this total amount available, 14.50 Mm^3 will be used in dams and buttresses, leaving 11.19 Mm^3 available for reclamation (See **S1.0 Overview of Project Proponent Description** of the **Environmental Assessment Certificate [EAC] Application**).


Tenas Project
Surface soil suitability and salvage in the southern area of the Project Footprint
Legend
Salvage suitability and depth
Organic (2 m)
High-AWSC Mineral (0.3-0.4 m)
Low-AWSC Mineral (0.15-0.4 m)
Not Suitable (0 m)
Not Salvaged
0 0.25 0.5 0.75 1
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.4-1
TELKWA COAL LIMITED
IEG Integral Ecology Group
616000 617000 618000 619000 620000 621000 622000 623000
6050000 6051000 6052000 6053000 6054000 6055000


Tenas Project
Surface soil suitability and salvage in the northern area of the Project Footprint
Telkwa
Legend
Organic (2 m)
High-AWSC Mineral (0.3-0.4 m)
Low-AWSC Mineral (0.15-0.4 m)
Not Suitable (0 m)
Not Salvaged
0 0.5 1 1.5 2
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.4-2
TELKWA COAL LIMITED
IEG Integral Ecology Group
621000 622000 623000 624000 625000 626000 627000 628000 629000 630000 631000 632000 633000 634000
6064000 6063000 6062000 6061000 6060000 6059000 6058000 6057000 6056000 6055000

6.5 Required Volumes of Reclamation Materials (Surface Soils and Overburden)

The volume demands for surface soils and OVB were calculated by spatially applying the cover designs developed with the ecohydrological model, as described in the **RCP**, to the post-Decommissioning and Reclamation Phase landscape and converting these surface soils and OVB depths to volumes based on the areas of Project components. It is estimated that 2.14 Mm^3 of surface soil will be required for reclamation:

- 1.80 Mm^3 of high-AWSC mineral surface soil;
- 0.27 Mm^3 of low-AWSC mineral surface soil; and
- 0.07 Mm^3 of organic-mineral mix surface soil.

A total of 4.35 Mm^3 of OVB is projected to be required for reclamation covers. This OVB value excludes the OVB that is projected to already be present on the upper lifts of the buttresses and dams of the water management ponds and Tenas Control Pond (TCP), as this 0.95 Mm^3 (calculated at an assumed depth of 1 m) is already accounted for separately in the mine plan.

Planned reclamation-material cover depths developed in the **RCP** and the corresponding volume requirements by Project component are shown in **Table 6.5-1.** Planned reclamation covers are shown in **Figure 6.5-1** and **Figure 6.5-2**. Reclamation covers were not prescribed for:

- areas projected to have a water cover in closure;
- facilities and infrastructure that will be maintained during a portion of the Post-closure Phase, including water infrastructure (e.g., channels, spillways, water effluent channel), roads required for maintenance and monitoring, and retained buildings at the Rail Infrastructure area; and
- Project components for which stripping of surface soil is not required and the existing surface soils will remain in place, including the powerline ROW and surface soil stockpile footprints.

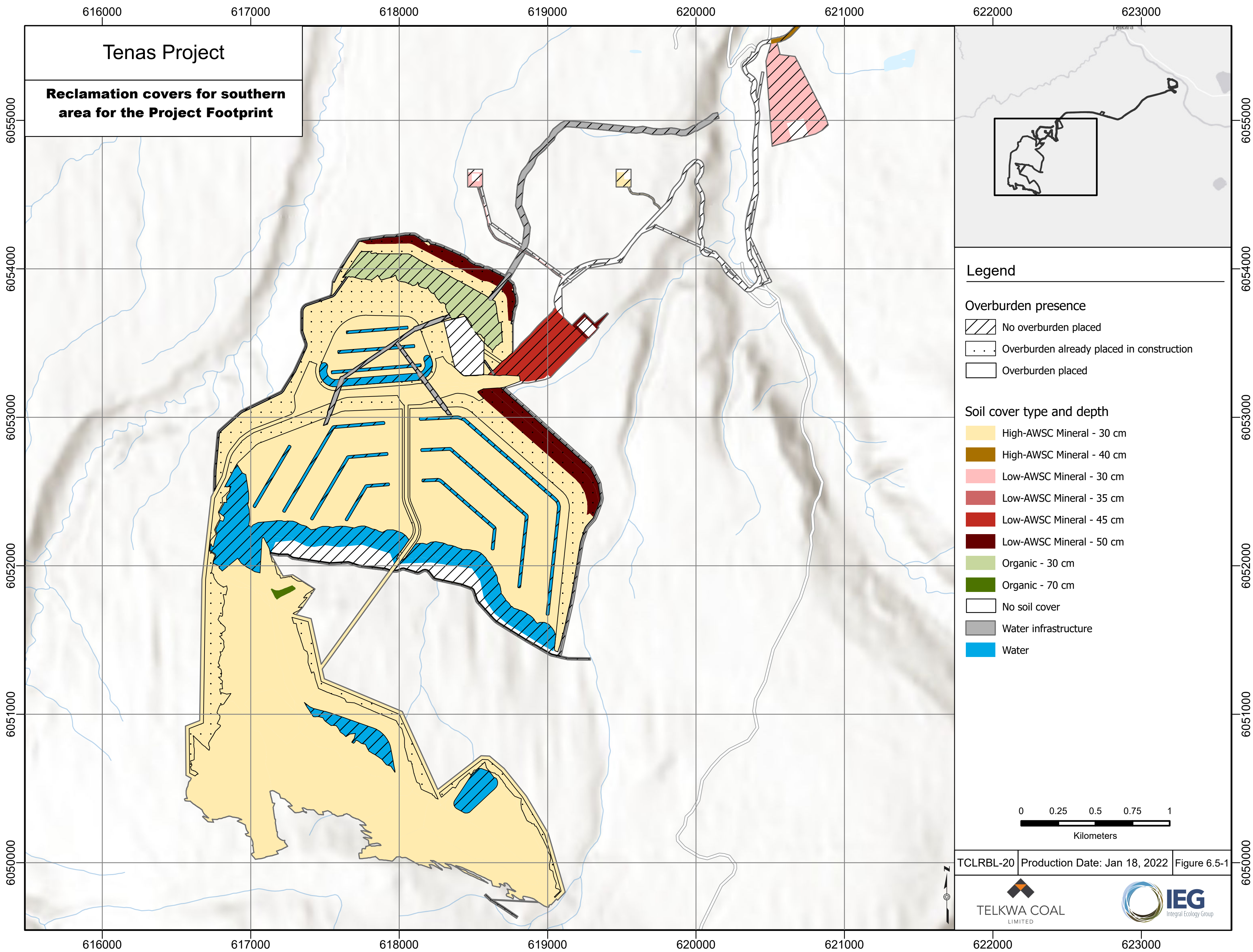
Table 6.5-1: Cover Designs and Reclamation Material Requirements by Project Component

Project Component	Area (ha)	OVB Depth (m)	OVB Volume Required (m^3)	Surface Soil Suitability Class	Surface Soil Depth (m)	Surface Soil Volume Required (m^3)
Backfill Area	213.2	1	2,131,761	High-AWSC mineral	0.30	639,528
Backfill Area	0.7	1	6,956	Organic-mineral mix	0.70	4,869
Buttress – East MP	13.6	1[1]	136,172	Low-AWSC mineral	0.50	68,086
Buttress – North MP, West MP	20.2	1[1]	201,819	High-AWSC mineral	0.30	60,546
Buttress – TCP	7.4	1[1]	73,513	Low-AWSC mineral	0.50	36,757
Cleared Areas for Access	44.6	0	0	High-AWSC mineral	0.30	133,818
Cleared Areas for Access	0.9	1	9,027	High-AWSC mineral	0.30	2,708

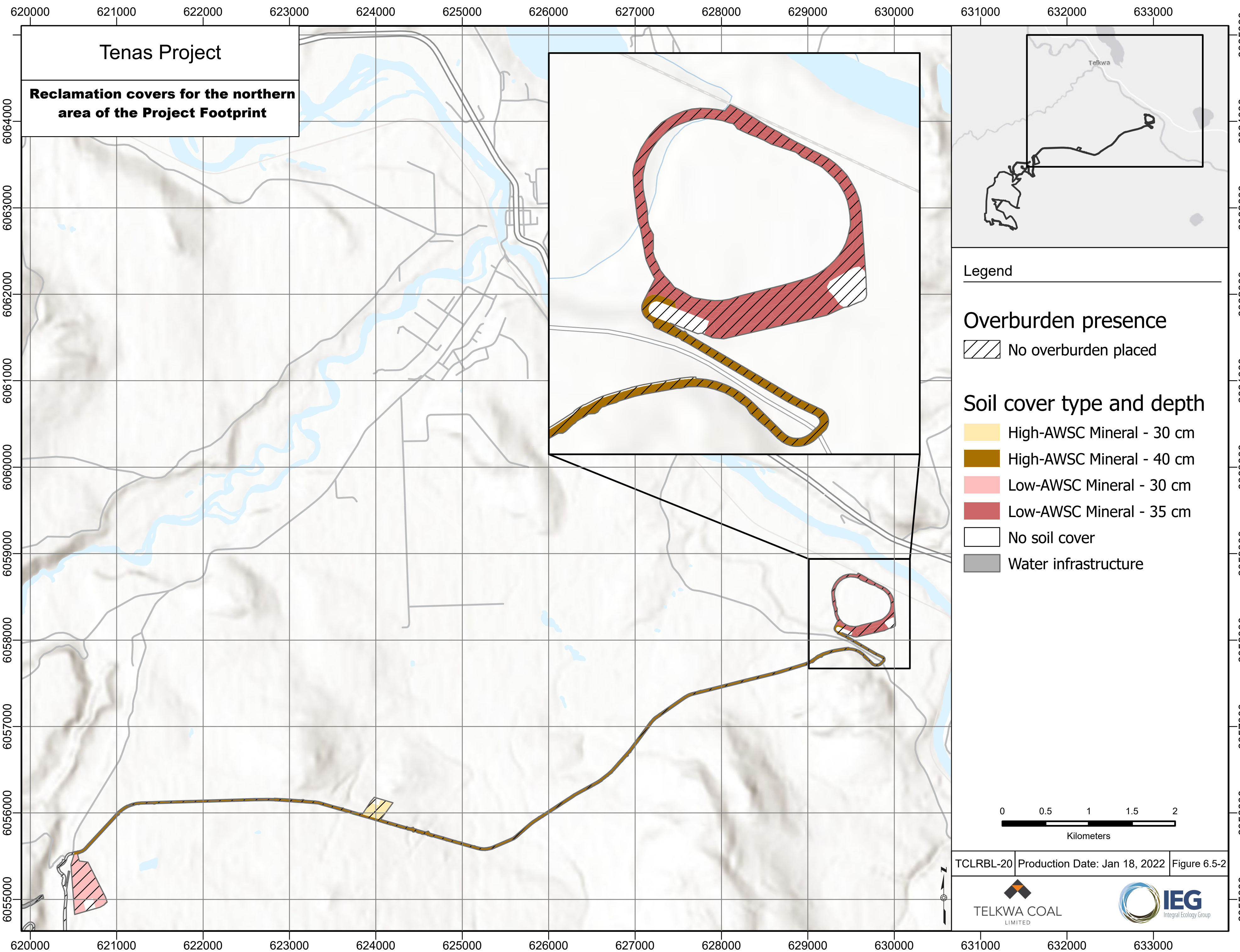
Project Component	Area (ha)	OVB Depth (m)	OVB Volume Required (m^3)	Surface Soil Suitability Class	Surface Soil Depth (m)	Surface Soil Volume Required (m^3)
CPP Pond	1.0	0	0	Low-AWSC mineral	0.50	5,163
Embankments for Management Ponds	53.9	1[1]	538,501	High-AWSC mineral	0.30	161,550
Explosives Facility	1.6	0	0	Low-AWSC mineral	0.30	4,897
Explosives Magazine	1.1	0	0	High-AWSC mineral	0.30	3,253
Gravel Quarry	16.4	0	0	Low-AWSC mineral	0.30	49,075
Haul Roads	24.8	1	248,455	High-AWSC mineral	0.30	74,537
Management Ponds	192.9	1	1,929,304	High-AWSC mineral	0.30	578,791
Mine Infrastructure Complex	15.2	0	0	Low-AWSC mineral	0.45	68,237
Rail Infrastructure	11.8	0	0	Low-AWSC mineral	0.35	41,144
Rock Quarry	4.6	0	0	High-AWSC mineral	0.30	13,863
Service Roads	2.6	1	26,309	High-AWSC mineral	0.30	7,893
TCP – Embankment	3.9	0	0	High-AWSC mineral	0.30	11,563
TCP – Pond	21.1	0	0	Organic-mineral mix	0.30	63,402
Tenas Access Corridor	27.9	0	0	High-AWSC mineral	0.40	111,437
Total High AWSC Areas	**590.5**	**0 to 1**	**5,085,176**	High-AWSC mineral	**0.30 to 0.40**	**1,799,487**
Total Low AWSC Areas	**66.9**	**0 to 1**	**209,685**	Low-AWSC mineral	**0.30 to 0.50**	**273,357**
Total Organic Soil Areas	**21.8**	**0 to 1**	**6,956**	Organic-mineral mix	**0.30 to 0.70**	**68,271**
Project Component Footprint Area not requiring cover designs	**150.8**	**-**	**-**	**N/A**	**-**	**-**
Total	**830.1**	**-**	**5,301,817**	**-**	**-**	**2,141,116**

Notes: *AWSC=available water-storage capacity; ha=hectare; m=metre; m^3=cubic metre; OVB=overburden; TAC=Tenas Access Corridor; TCP=Tenas Control Pond; MP=management pond*

[1] Assumed to be already present on surface of dam and buttress (final lift of construction)



Tenas Project
Reclamation covers for southern area for the Project Footprint
616000
617000
618000
619000
620000
621000
622000
623000
6055000
6054000
6053000
6052000
6051000
6050000
Legend
Overburden presence
No overburden placed
Overburden already placed in construction
Overburden placed
Soil cover type and depth
High-AWSC Mineral - 30 cm
High-AWSC Mineral - 40 cm
Low-AWSC Mineral - 30 cm
Low-AWSC Mineral - 35 cm
Low-AWSC Mineral - 45 cm
Low-AWSC Mineral - 50 cm
Organic - 30 cm
Organic - 70 cm
No soil cover
Water infrastructure
Water
0 0.25 0.5 0.75 1
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.5-1
TELKWA COAL LIMITED
IEG Integral Ecology Group



Tenas Project
Reclamation covers for the northern area of the Project Footprint
Telkwa
Legend
Overburden presence
No overburden placed
Soil cover type and depth
High-AWSC Mineral - 30 cm
High-AWSC Mineral - 40 cm
Low-AWSC Mineral - 30 cm
Low-AWSC Mineral - 35 cm
No soil cover
Water infrastructure
0 0.5 1 1.5 2
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.5-2
TELKWA COAL LIMITED
IEG Integral Ecology Group
620000 621000 622000 623000 624000 625000 626000 627000 628000 629000 630000 631000 632000 633000
6055000 6056000 6057000 6058000 6059000 6060000 6061000 6062000 6063000 6064000 6065000

6.6 Reclamation Materials (Surface Soils and Overburden) Material Balance

To generate a reclamation-materials balance, **Table 6.6-1** summarizes the available and required volumes of reclamation materials (surface soils, overburden) from **6.4** and **6.5**, respectively. Sufficient volumes of surface soil and OVB are anticipated to be salvaged to meet reclamation needs with a surplus of reclamation-material types projected to be available as a contingency.

While the organic-mineral mix surface soil is only currently scheduled to be applied at two (2) locations, the surplus will be used opportunistically to reclaim low-lying areas and potential wetlands, or as an organic soil amendment.

Since the Project includes several satellite areas, including the Rock Quarry, Gravel Quarry, Explosive Facility, Explosive Magazine, TAC and the Rail Infrastructure area, a more detailed materials balance for surface soil is presented in **Table 6.6-2**, showing required and available surface soil volumes broken down by surface soil stockpile and Project Area. Surface soils salvaged at satellite areas will be stockpiled at each location and replaced following mining. This approach is efficient for minimizing hauling of surface soil and allows for the surface soil types present within the Project footprint pre-Project to be replaced.

Table 6.6-1: Reclamation Materials (surface soil, overburden) Material Balance

Reclamation Material	Available (Mm^3)	Required (Mm^3)	Surplus (+Mm^3) or Deficit (-Mm^3)	Surplus (+%) or Deficit (-%)
High-AWSC mineral surface soil	1.87	1.80	+0.07	+4
Low-AWSC mineral surface soil	0.27	0.27	+<0.01	+<1
Organic-mineral mix surface soil	0.12	0.07	+0.05	+71
Total surface soils	**2.26**	**2.14**	**+0.12**	**+6**
Overburden	11.19	5.30	+5.89	+111

Notes: *<=less than; %=percent; AWSC=available water storage capacity; Mm^3=million cubic metres*

Table 6.6-2: Surface Soil Material Balance by Identified Surface Soil Stockpile and Suitability Class

Identified Surface Soil Stockpile	Surface Soil Suitability Class	Availability by Suitability Class (m^3)	Total Available Surface Soils (m^3)	Required Surface Soils for Reclamation (m^3)	Surplus (+m^3) or Deficit (-m^3) of Surface Soils	Surplus (+%) or Deficit (-%) of Surface Soils	Notes
Pit #1, #2, #3 and #4	High-AWSC mineral	1,729,457	2,022,062	1,917,448	+104,614	+5.5	Will be separated into four stockpiles with sub material portions or stockpiles.
	Low-AWSC mineral	175,077					
	Organic-mineral mix	117,528					
Explosive Magazine	High-AWSC mineral	3,790	3,790	2,392	+1,397	+58.4	Only one (1) stockpile required.
Explosive Facility	High-AWSC mineral	156	5,345	3,784	+1,561	+41.3	97% low-AWSC surface soil. Reclamation material will be like pre-mine surface soils. Ecohydrological modeling assumed use of low-AWSC mineral surface soil in reclamation.
	Low-AWSC mineral	5,189					
Rock Quarry	High-AWSC mineral	17,994	17,994	13,863	+4,132	+29.8	Only one (1) stockpile required.
Gravel Quarry	High-AWSC mineral	11,720	58,541	49,075	+9,466	+19.3	80% low-AWSC surface soil. Reclamation material will be like pre-mine surface soils. Ecohydrological modeling assumed use of low-AWSC mineral surface soil in reclamation.
	Low-AWSC mineral	46,821					
Tenas Access Corridor #1 and #2	High-AWSC mineral	106,734	113,416	113,411	+6	+<1	5% low-AWSC surface soil. Reclamation material will be like pre-mine surface soils. Ecohydrological modeling assumed use of high-AWSC mineral surface soil in reclamation. Projected stockpile
	Low-AWSC mineral	5,868					
	Organic-mineral mix	814					

Identified Surface Soil Stockpile	Surface Soil Suitability Class	Availability by Suitability Class (m^3)	Total Available Surface Soils (m^3)	Required Surface Soils for Reclamation (m^3)	Surplus ($+m^3$) or Deficit ($-m^3$) of Surface Soils	Surplus (+%) or Deficit (-%) of Surface Soils	Notes
							volume still provides sufficient soil for a 40-cm (39.6-cm) cover.
Rail Infrastructure	High-AWSC mineral	1,763	42,725	41,144	1,581	3.8	96% low-AWSC surface soil. Reclamation material will be like pre-mine surface soils. Ecohydrological modeling assumed use of low-AWSC mineral surface soil in reclamation.
	Low-AWSC mineral	40,962					
Total	**High-AWSC mineral**	**1,871,614**	**2,263,873**	**2,141,116**	**+122,757**	**+5.7**	
	Low-AWSC mineral	**273,916**					
	Organic-mineral mix	**118,342**					

Notes: *%=percent; AWSC=available water-storage capacity; cm=centimetres; m^3=cubic metre*

6.7 Salvage Plan Surface Soils

6.7.1 Suitability Criteria and Monitoring

For surface soil salvage, Qualified Professional(s) (QP) will delineate suitable surface soils based on the SMU descriptions in the Tenas Project Terrain and Soil Baseline Report (TCL 2021), as summarized in **Table 6.7-1** and as shown in previously-presented **Figures 6.2-1** and **6.2-2** (SMUs) and **Figures 6.4-1** and **6.4-2** (suitability classes). The British Columbia Field Manual for Describing Terrestrial Ecosystems (British Columbia Ministry of Forests and Range [BC MOFR] and British Columbia Ministry of Forests [BC MOF] 2010) and the Key 9.13 therein, will be used in the field to support delineation of parent material types.

Data available for 55 samples from baseline surveys indicated occasional elevated concentrations of arsenic and frequent elevated concentrations of boron in comparison to the Canadian Council of Ministers of the Environment (CCME) agricultural guidelines (TCL 2021)[4]. Elevated boron was identified in the Rail Infrastructure and Bypass road areas, while elevated arsenic was identified in the open pit, Rail Infrastructure, and Bypass Road areas. Other CCME agricultural guidelines were met (TCL 2021). Given that existing disturbance levels are low in baseline conditions in the Project Area, these elevated concentrations should be interpreted as reflecting natural mineralization of surficial materials rather than contamination, and do not affect suitability ratings for reclamation. Samples of surface soil will be taken during salvage to further verify and augment baseline element concentrations, to identify any materials with consistently elevated levels, and to build on the existing dataset. Surface soil pH and electrical conductivity criteria have not been proposed for salvaged surface soils because the surface soils on site are currently supporting healthy forests that are like those being proposed for revegetation in the Decommissioning and Reclamation Phase of the Project.

QPs will supervise salvage and stockpiling of surface soils and direct the sampling program to capture the range of variability in surface soil properties. A minimum sampling intensity of one sample for every 20,000 m^3 of salvaged surface soil is recommended, on average, over the life-of-mine (LOM), with higher-intensity sampling occurring during early salvage operations to address any uncertainties regarding surface soil properties, followed by a decrease in sample intensity over time as confidence in surface soil properties increases.[5] Surface soil properties to be tested during salvage are presented in **Table 6.7-2** and it is recommended that one (1) in five (5) samples be analyzed for the more comprehensive subset of tests. The properties to be evaluated include PSD, OM and total Kjeldahl nitrogen, which are the required inputs for AWSC calculations.

[4] Agricultural guidelines apply to the ALR portion of the Project and were used for the remaining Project areas to be conservative.
[5]This sampling intensity corresponds to a minimum of thirteen low-AWSC mineral surface soil samples, ninety-four high-AWSC surface mineral soil samples, and 6 organic-mineral mix surface soil samples.

Table 6.7-1: Surface Soil Salvage Suitability Criteria

SMU	Suitability Class	Parent Material	General Description	Topography	Surface soil Texture	Average Rooting Depth (cm)	Coarse Fragment Content (%)[1]
1.1	High-AWSC mineral	M	Medium textured, well- to moderately-drained Orthic and Brunisolic Grey Luvisols, Eutric and Dystric Brunisols derived from tills. Coarse-fragment content from 10 to 40%. May have compacted Bt horizon. Limited organic enrichment.	Level to Moderately steep	▪ SiL, L, ▪ SiCL, (SL)	30	10–35
1.2	High-AWSC mineral	M (Fv)	Medium-textured, imperfectly- to poorly-drained Humic Gleysols, Gleyed Grey Luvisols, Gleyed Melanic Brunisols derived from tills on receiving slope positions. Organic-enriched A layer is typical.	Lower receiving slope positions	▪ SiL, SiCL, ▪ SiC, (SL, ▪ LS)	30	10–40
1.3	Low-AWSC mineral	M	Coarse-textured, silty-sandy, well- to rapidly-drained, nutrient-poor Dystric Brunisols derived from ablation tills. Cold-air ponding.	Undulating, convex	▪ SL, LS	25	30–50
2	Low-AWSC mineral	FG	Coarse-textured, sandy, coarse-loamy to gravelly, well- to rapidly-drained Dystric Brunisols derived from glaciofluvial parent materials.	Level to gently sloping	▪ S, LS, (SL)	30	20–60
3.1	High-AWSC mineral	LG, (FG)	Fine-textured, moderately-drained Orthic and Brunisolic Gray Luvisols derived from glaciolacustrine parent materials. Zero coarse fragments and high clay content.	Level to gently sloping	▪ SiCL, SiL, ▪ Si	25	0
3.2	High-AWSC mineral	Fv [LG], LGp, Mp	Fine-textured, imperfectly- to poorly-drained Gleyed Dark Grey Luvisols, Gleyed Brunisolic Grey Luvisols, and Humic Luvic Gleysols. Organic-enriched A layer > 10 cm. Often signs of prolonged water saturation.	Level to gently sloping and depressions	▪ Si, SiCL, ▪ SiL	25	0–10
4.1	Low-AWSC mineral	F^Ap, Fp	Coarse-textured, sandy-silty, well- to moderately-drained Orthic and Cumulic Regosols on active floodplain deposits. Subsurface flooding or over-bank flooding. Organic enrichment variable.	Level to gently sloping	▪ LS, S, SL, ▪ SiL	30	0–60
4.2	High-AWSC mineral	F^Ap, Fp	Fine-textured, silty, imperfectly- to poorly-drained Humic Regosols associated with floodplain deposits, often with organic enrichment (like SMU 3.2).	Level	▪ SiL, SiCL, ▪ Si	25	0
4.3	Low-AWSC mineral	Ft	Coarse-textured, sandy-silty, well- to rapidly-drained Brunisols derived from inactive fluvial deposits (like SMU 2).	Level to gently sloping	▪ SL, LS	25	0–40
5	Unsuitable	Mv [R or D]	Shallow, well- to rapidly-drained Dystric Brunisols over bedrock. Medium textured with high coarse-fragment content.	Gentle upper slopes and crests	▪ SiL, FSL, ▪ SL	20	30–75

SMU	Suitability Class	Parent Material	General Description	Topography	Surface soil Texture	Average Rooting Depth (cm)	Coarse Fragment Content (%)[1]
6	Unsuitable	R, D	Skeletal. Rapidly-drained bedrock outcrops.	Upper slopes, crests	▪ Skeletal	<5	Skeletal
7	Suitable organic	O	Organic soil, poor- to very-poorly-drained. Veneers and blankets.	Level to depression	▪ Fibric, ▪ mesic ▪ organics	30	n/a
8.1	Unsuitable	Cbv, FGks	Well- to moderately-well drained Regosols, Brunisols, and Luvisols on steep to moderately steep escarpment slopes. Some active failures and slumps.	Moderately steep, steep slopes	▪ SiL, L, SiCL	30	25–80
8.2	Unsuitable	Cfb	Humic Regosols with organic Ah horizons > 10 cm. Situated in toe-slope receiving positions at base of escarpment slopes.	Gentle to moderate receiving slopes	▪ SiL, L, SiCL	40	0–50

Source: *TCL 2021 (Table 3-7)*
Notes: *<=less than; >=greater than; n/a=not applicable; %=percent; cm=centimetres*
Parent Material: *Cbv=colluvium thick blanket/veneer; Cfb = colluvium fan(s)/veneer; D=weathered bedrock; F^Ap=active fluvial plain; FG=glaciofluvial; FGks=glaciofluvial moderately steep/steep slope; Fp=fluvial plain; Ft=fluvial terrace; Fv=fluvial veneer; LG=glaciolacustrine; LGp=glaciolacustrine plain; M=morainal (till); Mp=morainal plain; Mv=morainal veneer; n/a=not applicable; O=organic; R=bedrock*
Surface soil Texture: *L=Loam; LS=Loamy Sand; S=Sand; SL/FSL=Sandy Loam/Fine Sandy Loam; Si=Silt; SiL=Silt Loam; SiC=Silt Clay; SiCL=Silty Clay Loam*
[1] Coarse-fragment content in the rooting zone.

Table 6.7-2: Surface soil Properties to be Tested During Surface soil and Overburden (OVB) Salvage and Corresponding Suitability Criteria

Surface soil Property	Tests to Perform		Thresholds	Notes
	Samples	Subset		
Particle-Size Distribution	100, 5, 2, 1, 0.5, 0.25, 0.1, 0.05, 0.002 mm	N/A	Surface soils: no specific threshold; in-field evaluations will be made based on parent material type, which relates to particle-size distribution. OVB: coarse fragments >100 mm will be less than 10% with silty clay loam, silt loam, loam, sandy loam, or clay loam fine-fraction (<2 mm) textures.	Coarse fragment thresholds should be re-evaluated as data from salvage and mine wastes become available.
Organic-Matter Content	Loss on ignition	N/A	No threshold required, data should be collected for baseline information and to build datasets for ecohydrological modelling.	If inorganic carbon is suspected due to mineralogy, testing should be done by Walkley-Black method.
Nutrients	Total Kjeldahl nitrogen	Olson available phosphorus	No threshold required, data should be collected for baseline information and to build datasets for ecohydrological modelling.	Fertilization can supplement low surface soil nutrients during early establishment.
Surface soil Chemistry		pH (in water), electrical conductivity	OVB pH: 4.5-8 OVB electrical conductivity: <1 dS/m	Thresholds apply to OVB only and should be re-evaluated as operational data become available. Surface soils will have formerly supported local ecosystems and are assumed to be appropriate for reclamation.
Element Concentrations[1]	Standard metals[2] (Al, B, Ca, Cu, Fe, K, Mg, Mn, Mo, S, Zn) + trace metals[3] (Ag, As, Ba, Be, Cd, Co, Cr, Hg, Ni, Pb, Se, Sn, Sr, U, V)[1]	Refer to Note 4	OVB: Element concentrations below CCME thresholds for agricultural soils (or Project-specific thresholds, where applicable)[2]	Element concentration thresholds should be re-evaluated as operational data become available.

Notes: *<=less than; >=greater than; %=percent; dS/m= decisiemens per metre; CCME=Canadian Council of Ministers of the Environment; OVB=overburden; mm=millimetres; QP=Qualified Professional*

1 Element concentration thresholds should be evaluated relative to ranges of natural variation in surface soils within the Project Area as surface soil samples are collected during salvage. In cases where baseline conditions exceed CCME guidelines, use of Project-specific criteria may be appropriate, as designated by a QP.

2. Standard metals: Al=Aluminum, B=boron, Ca=calcium, Cu=copper, Fe=iron, K=potassium, Mg=magnesium, Mn=manganese, Mo=molybdenum, S=sulphur, Zn=zinc)

3. Trace metals: Ag=silver, As=arsenic, Ba=barium, Be=beryllium, Cd=cadmium, Co=cobalt, Cr=chromium, Hg=mercury, Ni=nickel, Pb=palladium, Se=selenium, Sn=tin, Sr=strontium, U=uranium, V=vanadium

4 Initially samples should be evaluated for the full suite of metals to determine whether any specific metals are frequently elevated in reclamation materials (surface soils). As reclamation material types (OVB, surface soil suitability classes) are characterized more thoroughly, the metals analysis can be reduced to standard metals, as well as any trace metals that are frequently elevated, as guided by QPs.

6.7.2 Salvage Operations

Dozers will be used to push surface soil into piles, from which it will be picked up by loaders and excavators along these piles and transported to designated stockpiles. Salvage will occur in a systematic method to avoid trafficking un-salvaged areas. Other equipment may be used to economize on travel time and distance for efficient salvage and schedule. The overall objective in surface soil salvage is to maximize salvage in operationally feasible conditions. Operational salvage by dozers is not possible on slopes steeper than 26 degrees (or as designated unsafe by qualified Project personnel) and is not recommended in areas where the surface soil is consistently less than 50 cm deep to bedrock. Field assessments by a QP (**6.7.5**) will be required to verify areas where surface soil depths are sufficient for salvage.

Large volumes of woody debris will be encountered during site clearing and pre-stripping, some representing large pieces (logs, root wads). These materials can represent valuable biotic material for reclamation and surface micro-habitat creation. Under the direction of a QP, opportunities for salvage will be identified and woody debris will be salvaged and stored, considering fire or beetle risks, for future use in stockpiles that are co-located with surface soil stockpiles. Woody debris is planned to be stored within the surface soil stockpile footprints depending on diameter and nature of these debris' materials. Large woody debris will be stored adjacent to the surface soil stockpile footprints as mixing it in with the surface soil stockpiles may become operationally challenging for managing the size of the surface soil stockpiles.

6.7.3 Erosion Potential of Surface Soil

Erosion potential of surface soils by SMU and suitability class, as evaluated in the Tenas Project Terrain and Soil Baseline Report (TCL 2021), is presented in **Table 6.7-3**. Best practices that will be implemented to manage erosion are presented in the following section.

Table 6.7-3: Surface Soil Erosion Potential Ratings

SMU	Suitability Class	Erosion Rating	Surface Soil Textures	Comments
1.1	High-AWSC mineral	Low to moderate	SiL, L, SiCL, (SL)	Cohesive tills
1.2	High-AWSC mineral	Moderate to high	SiL, SiCL, SiC, (SL, LS)	Silty, clayey, low permeability
1.3	Low-AWSC mineral	Low to moderate	SL, LS	Ablation tills, sandy
2	Low-AWSC mineral	Moderate to high	S, LS, (SL)	Sandy glaciofluvial
3.1	High-AWSC mineral	Moderate to high	SiCL, SiL, Si	Silty, clayey, zero coarse fragments
3.2	High-AWSC mineral	Moderate to high	Si, SiCL, SiL	Silty, clayey, zero coarse fragments, low permeability
4.1	Low-AWSC mineral	Moderate to high	LS, S, SL, SiL	Sandy gravelly fluvial
4.2	High-AWSC mineral	High	SiL, SiCL, Si	Silty, clayey, zero coarse fragments, low permeability
4.3	Low-AWSC mineral	Moderate to high	SL, LS	Sandy gravelly fluvial
5	Unsuitable	Low to moderate	SiL, FSL, SL	Can have high coarse fragments
6	Unsuitable	Low	Skeletal	Bedrock outcrops
7	Organic	Low	Fibric, mesic organics	Organic

SMU	Suitability Class	Erosion Rating	Surface Soil Textures	Comments
8.1	Unsuitable	Very high	SiL, L, SiCL	Steep slopes
8.2	Unsuitable	Very high	SiL, L, SiCL	Landslide deposits

Source: *TCL 2021 (Table 3-11)*
SMU=soil management unit; AWSC=available water-storage capacity
Surface soil Texture: *L=Loam; LS=Loamy Sand; S=Sand; SL/FSL=Sandy Loam/Fine Sandy Loam; Si=Silt; SiL=Silt Loam; SiC=Silt Clay; SiCL=Silty Clay Loam*

6.7.4 Surface Soil Salvage Best Practices

The best practices listed below and the Trigger Action Response Plan (TARP) in **Table 6.7-3** will be followed to maintain the quality of salvaged soils and protect the adjacent environment:

- Avoid or minimize surface soil salvage during extremely dry and windy conditions to prevent loss of fine-textured material and dust deposition on adjacent areas. If it is necessary to conduct surface soil salvage under these conditions, measures will be taken to minimize erosion and dust generation (e.g., water application);
- Avoid salvaging surface soils during excessively wet conditions to prevent loss of fine materials due to erosion and degradation of soil structure;
- Soil salvage may occur under frozen conditions with the benefit of reducing soil compaction, but snow should be removed prior to salvaging surface soils to reduce undesired settling or erosion in stockpiles or reclamation areas. Avoid surface soil salvage when frost penetrates deep into the soil profile, making it challenging to accurately target the desired salvage depth and causing admixing; and
- Where the water table is within 50 cm of the surface (e.g., wetlands), drain salvage areas using trenching[1] prior to salvage of surface soils.

Soil salvage will be scheduled during periods when the above conditions are absent, primarily in summer between June and the end of October when it is not heavily raining or extremely dry and windy. Soil salvage may be conducted outside of this window where conditions allow.

As per the Construction Environmental Management Plan (S13.0-C4) (CEMP) and Surface Erosion Prevention and Sediment Control Plan (S13.0-C14) (SEPSCP), TCL will establish erosion and sediment controls on stripped areas to reduce erosion risk and protect water quality, such as:

- applying seed or other temporary covers on exposed areas that will not promptly have mine facilities constructed on them;
- using berms, water bars and ditches to direct runoff away from rivers and streams;
- creating sediment ponds to allow settling of sediments during higher-runoff events; and
- installing silt fencing, straw wattles and check dams for additional sediment capture.

[1] Trenches are dug along the edges of a salvageable wetland area and allowed to fill with water. Drained surface soil can then be salvaged and stockpiled.

Table 6.7-4: Trigger Action Response Plan (TARP) for Surface Soil Salvage and Stockpiling, and Reclamation Material Placement

Activity	Issue	Normal		Caution		Stop Work	
		Trigger	Action	Trigger	Action	Trigger	Action
Surface soil Salvage	Rain	No precipitation	Salvage as per SMP	Ongoing or recent light to moderate rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify supervisor; monitor precipitation gauges and surface soil conditions	Ongoing or recent heavy rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify EC; stop salvage; implement **SEPSCP** measures
	Wind	No or light wind	Salvage as per SMP	Moderate (some surface soil lifted, typically <30 km/h)	Notify supervisor; monitor wind levels	Heavy wind erosion (e.g., location hazardous to personnel, substantial surface soil is being lifted)	Notify EC; stop salvage; implement **SEPSCP** and **AQMP** measures
	Snow/frozen surface soil	No snow present; surface soil not frozen	Salvage as per SMP	Snow may or may not be present; surface soil not frozen at salvage depth	Remove any snow present	Surface soil frozen at salvage depth	Notify EC; stop salvage until no longer frozen to salvage depth
	Steep slope	Located on flat surface	Salvage as per SMP	Located on slope (<26°)	Ensure machinery is stable and operator is trained for task	Location hazardous to personnel (slope ≥ 26°)	Notify EC; plan for mitigation or avoidance
Surface soil Stockpiling	Wind erosion	No visible wind erosion	Stockpile as per SMP	Moderate (some surface soil lifted, typically <30 km/h)	Notify supervisor; monitor wind levels	Heavy wind erosion (e.g., location hazardous to personnel, substantial surface soil is being lifted)	Notify EC; stop stockpiling; implement **SEPSCP** and **AQMP** measures
	Water erosion	No visible water erosion	Stockpile as per SMP	Visible water erosion (e.g., rills)	Notify supervisor; assess existing water catchment features and vegetation on stockpile	Heavy water erosion (e.g., structural damage to surface)	Notify EC; stop stockpiling; implement **SEPSCP** measures
	Rain	No precipitation	Stockpile as per SMP	Ongoing or recent light to moderate rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify supervisor; monitor precipitation gauges and surface soil conditions	Ongoing or recent heavy rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify EC; stop stockpiling
	Snow	No snow present	Stockpile as per SMP	Starting to snow or snow in forecast	Monitor snowfall	Snow present	Stop stockpiling; remove snow prior to further placement
Reclamation Material Placement	Wind erosion	No visible wind erosion	Place surface soil as per SMP	Moderate (some surface soil lifted, typically < 30 km/h)	Notify supervisor; monitor wind levels	Heavy wind erosion (e.g., location hazardous to personnel, substantial surface soil is being lifted)	Notify EC; stop placement; implement **CEMP** or **SEPSCP** and **AQMP** measures
	Water erosion	No visible water erosion	Place surface soil as per SMP	Visible water erosion (e.g., rills)	Notify supervisor; assess existing water catchment features and vegetation on slope	Heavy water erosion (e.g., structural damage to surface)	Notify EC; stop placement; implement **CEMP** or **SEPSCP** measures
	Rain	No precipitation	Place surface soil as per SMP	Ongoing or recent light to moderate rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify supervisor; monitor precipitation gauges and surface soil conditions	Ongoing or recent heavy rain; surface soil not sticking to equipment (e.g., excavator bucket)	Notify EC; stop placement
	Snow	No snow present	Place surface soil as per SMP	Starting to snow or snow in forecast	Monitor snowfall	Snow present	Stop placement; remove snow prior to further placement

Notes: *°=degree; <=less than; <=greater than ; ≥=greater than or equal to; AQMP=Air Quality Management Plan (**S13.0-C2**); EC=Environmental Coordinator; CEMP=Construction Environmental Management Plan (S13.0-C4); km/h=kilometre per hour; SEPSCP=Surface Erosion and Sediment Control Plan (S13.0-C14); SMP=Soil Management Plan*

6.7.5 Salvage Training and Supervision

A QP who has appropriate training and experience for delineating operationally salvageable areas and surface soil suitability classes will be present to supervise salvage operations. They will be required to clearly mark and/or communicate to operators the salvageable areas and the areas that should be avoided during salvage (e.g., steep areas or areas with exposed bedrock that are expected to have shallow surface soils). Supervising QPs will be responsible for designating the surface soil suitability class (i.e., low-AWSC mineral, high-AWSC mineral, organic) and designating the appropriate salvage depths (**6.4.1**) and material segregation (**6.3**). They will check operations regularly to verify compliance with the SMP and collect samples of recently stockpiled surface soil during salvage operations to collect baseline information as described in **6.7.1**.

6.8 Salvage Plan for Overburden

6.8.1 Suitability Criteria and Monitoring

For OVB used as rooting-zone material (i.e., in the uppermost 1.0 m) in reclamation covers to meet the specifications used in ecohydrological modelling, it must be as fine or finer than the samples used in the modelled dataset. For operational purposes, these thresholds have been set using coarse-fragment sizes that can be visually identified in the field. Namely, the volume of coarse fragments larger than 100 millimetres (mm) in diameter must be less 10% of the total bulk material volume. Furthermore, the OVB should appear to be morainal in origin, as identified by the predominance of sub-rounded and sub-angular coarse fragments (typically silty clay loam, silt loam, loam, sandy loam, or clay loam fine-fraction [<2-mm] textures in the Project Area).

Preliminary suitability criteria for selection of OVB that is appropriate for use as a reclamation medium are:

- volume of coarse fragments larger than 100 mm constitute less than 10% of the total bulk material volume (i.e., surface soil plus voids);
- morainal in origin, as identified by the predominance of sub-rounded and sub-angular coarse fragments and silty clay loam, silt loam, loam, sandy loam, or clay loam fine-fraction (<2-mm) textures;
- element concentrations below CCME thresholds for agricultural soils (or alternate Project-specific criteria);[6]
- pH between 4.5 and 8; and
- electrical conductivity below 1 dS/m.[7]

Suitability of OVB placed within the management and Tenas Control ponds and/or backfills within the open pit will be assessed by personnel trained by a QP as it is excavated (i.e., prior to application at reclamation sites). OVB ‘units,’ or spatially distinct areas of OVB that have comparable properties, will be sampled as they are exposed and evaluated for PSD and chemical characteristics to verify that suitability criteria are met. The recommended sampling intensity for OVB destined for reclamation areas is one sample per 50,000 m^3, on average, with higher-intensity sampling occurring during early salvage operations to address any uncertainties regarding OVB properties, followed by a decrease in sample intensity over time as

[6] Element concentration thresholds should be evaluated relative to ranges of natural variation in surface soils within the Project Area as surface soil samples are collected during salvage. In cases where baseline conditions exceed CCME guidelines, use of Project-specific criteria may be appropriate, as designated by a QP.
[7] The proposed thresholds for pH and electrical conductivity in OVB should be evaluated relative to the baseline range of natural variation to be assessed as samples of salvaged soil and OVB samples are sent for laboratory testing.

confidence in OVB properties increases. Sample properties to be evaluated during OVB salvage are presented in previously-presented **Table 6.7-2**. Monitoring programs will provide data to support ongoing refinement of OVB suitability criteria, including the proposed coarse-fragment thresholds and ranges of natural variation for pH, electrical conductivity, and elemental concentrations.

6.8.2 Salvage Operations

OVB will be excavated using a shovel or excavator during excavation of the open pit and directly placed on reclamation areas within the backfill, management and control pond embankments and buttresses by haul trucks. The sediment and erosion control measures listed in **6.7.3** and the **CEMP** and **SEPSCP** will be applied to salvage of OVB.

6.9 Reclamation Materials (Surface Soil) Storage

6.9.1 Storage Sequence

Throughout the Operation Phase, opportunities will be pursued for direct placement of salvaged surface soils on newly completed areas for reclamation research and progressive reclamation. During the Operation, and Construction phases, a total of 0.85 Mm^3 of surface soil is directly placed from surface soil salvage activities while an additional 0.47 Mm^3 will be reclaimed from surface soil stockpiles (**Table 6.9-1**) for a total of 1.32 Mm^3 being placed during the Operation Phase (approximately 62% progressive reclamation), leaving only 0.82 Mm^3 to be placed during the Decommissioning and Reclamation Phase. (**Table 6.9-1**).

Surface soil stockpiles will be in place for up to 25 years (except Pit #4, which will be in place for 15 years), but majority of the surface soil will be directly placed or stockpiled for shorter periods. This represents a significant reduction in reclamation liability and will reduce degradation of surface soil quality due to long-term storage in surface soil stockpiles.

Salvaged OVB will be used directly to build dams and buttresses as well as for progressive reclamation; therefore, dedicated OVB stockpiles are not currently planned. If OVB stockpiles may become required during the Construction, and Operation phases due to capacity issues and/or sequencing requirements, they will be added in as needed in field-fit locations and configurations that are appropriate for the current stage of mining and will be within previously and/or future disturbed areas for the Project Area.

Table 6.9-1: Surface Soil Stockpiling and Direct Placement Sequencing for the Mine Area

Year	Project Component Footprint Surface Soil Salvage Volume (m^3)	Cumulative Proportion of Surface Soil Placed (%)	Volume of Direct Placed Surface Soil (m^3)	Volume of Surface Soil from Surface Soil Stockpiles (m^3)	Total Volume of surface soils placed (m^3)	Volume of Surface Soil in Stockpiles (m^3)
-0.5	797,257	-	-	-	-	797,257
0	83,283	-	-	-	-	880,540
1	140,186	4	96,062	-	96,062	924,665
2	365,868	8	76,503	-	76,503	1,214,030
3	139,931	11	69,052	-	69,052	1,284,909
4	28,295	14	28,295	39,319	67,614	1,245,590
5	24,096	19	24,096	64,115	88,211	1,181,475

Year	Project Component Footprint Surface Soil Salvage Volume (m^3)	Cumulative Proportion of Surface Soil Placed (%)	Volume of Direct Placed Surface Soil (m^3)	Volume of Surface Soil from Surface Soil Stockpiles (m^3)	Total Volume of surface soils placed (m^3)	Volume of Surface Soil in Stockpiles (m^3)
6-10	194,239	45	194,239	363,341	557,579	818,134
11-15	292,059	53	189,622	-	189,622	920,571
16-20	198,658	62	175,897	-	175,897	943,333
21-25	-	100	-	820,575	820,575	122,757
Totals	**2,263,873**	**100**	**853,766**	**1,287,350**	**2,141,116**	**122,757***

Notes:*%=percent; m^3=cubic metres; * there is forecast to be some material left in stockpile at the end of the Decommissioning and Reclamation phase, which will be used for additional topographic diversity*

6.9.2 Surface Soil Storage Locations and Surface Soil Stockpile Design

Table 6.9-2 presents surface soil stockpile sources, volumes, and dimensions. Surface soil stockpiles will be less than or equal to ≤ 12 m in height and (greater than or equal to [≤] 6 m (for surface soil stockpiles except one (1) surface soil stockpile), built on stable and level ground, and located greater than 15 m from watercourses. Stockpile slopes will not be steeper than 3H:1V, which is in accordance with best management practice guidelines (Mackenzie 2011).

Stockpile locations for surface soil are shown in **Figures 6.9-1**and **6.9-2** and include four (4) stockpiles within the Minesite area of the Project, along with satellite stockpiles for more remote areas (Rail Infrastructure, quarries, Explosive Magazine and Explosive Facility). Windrows will be used to store surface soil salvaged along the TAC. Note that while stockpile locations are shown in place in **Figures 6.9-1** and **6.9-2**, the creation and depletion of surface soil stockpiles will be temporally staggered throughout the LOM as mine development and progressive reclamation are carried out, as described in **6.9.1**.

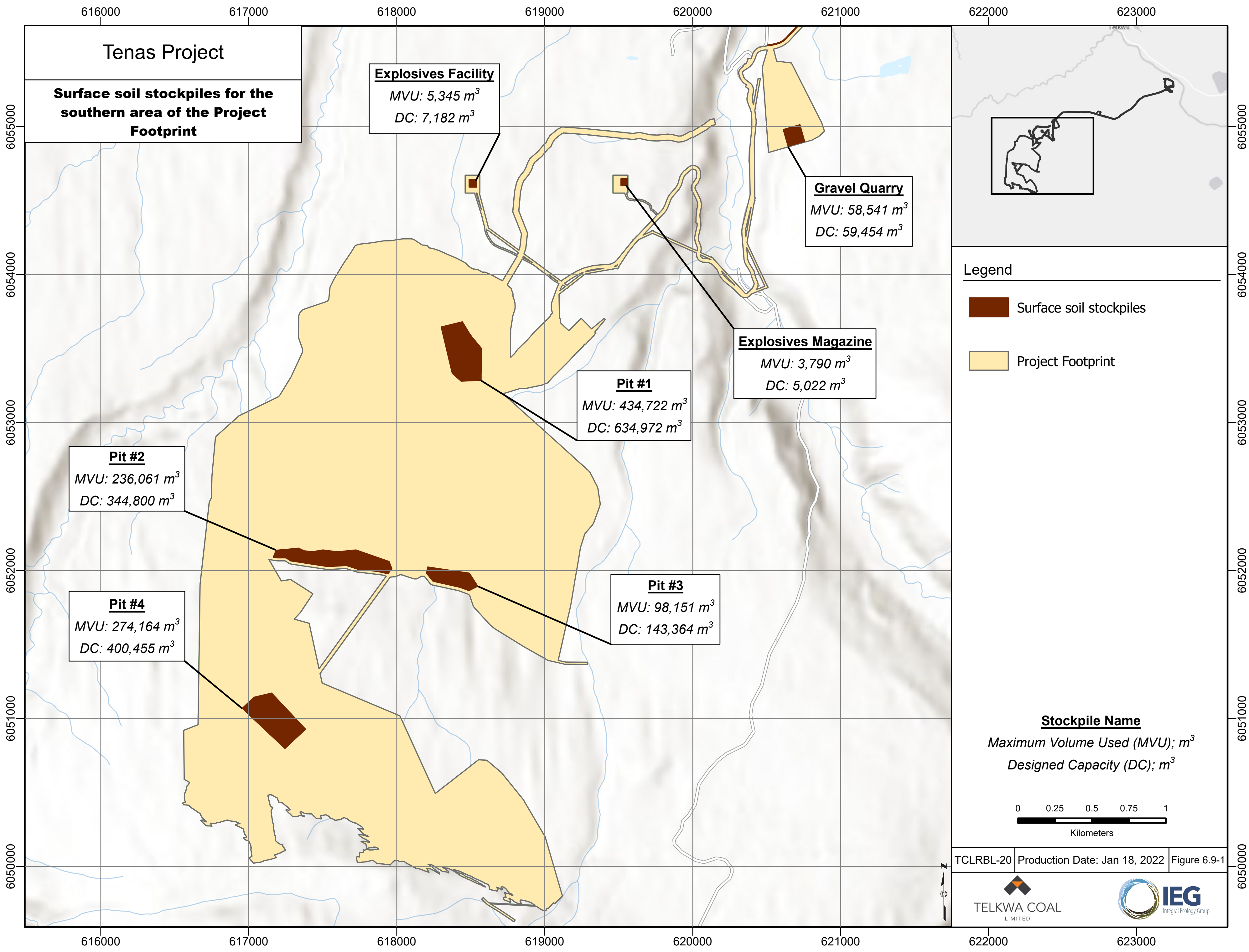
For stockpiles at the Explosive Facility, Explosive Magazine, Gravel Quarry, Rock Quarry and Rail Infrastructure area, surface soil of different suitability classes will be stockpiled within one (1) stockpile area, but at different ends of the surface soil stockpiles to limit mixing and dilution of specific properties. This is anticipated to be feasible given the small size of these stockpiles. The TAC surface soil stockpile is constructed as a windrow located on the north side of the TAC, and surface soil will be windrowed adjacent to where it is salvaged, such that surface soil that is replaced in reclamation from the windows will maintain the pre-development heterogeneity and distribution of surface soil suitability classes. For larger stockpiles within the Minesite area of the Project, different surface soil suitabilities will be stockpiled separately as much as possible.

Table 6.9-2: Surface Soil Stockpiles Sources, Reclamation Material Types, and Dimensions

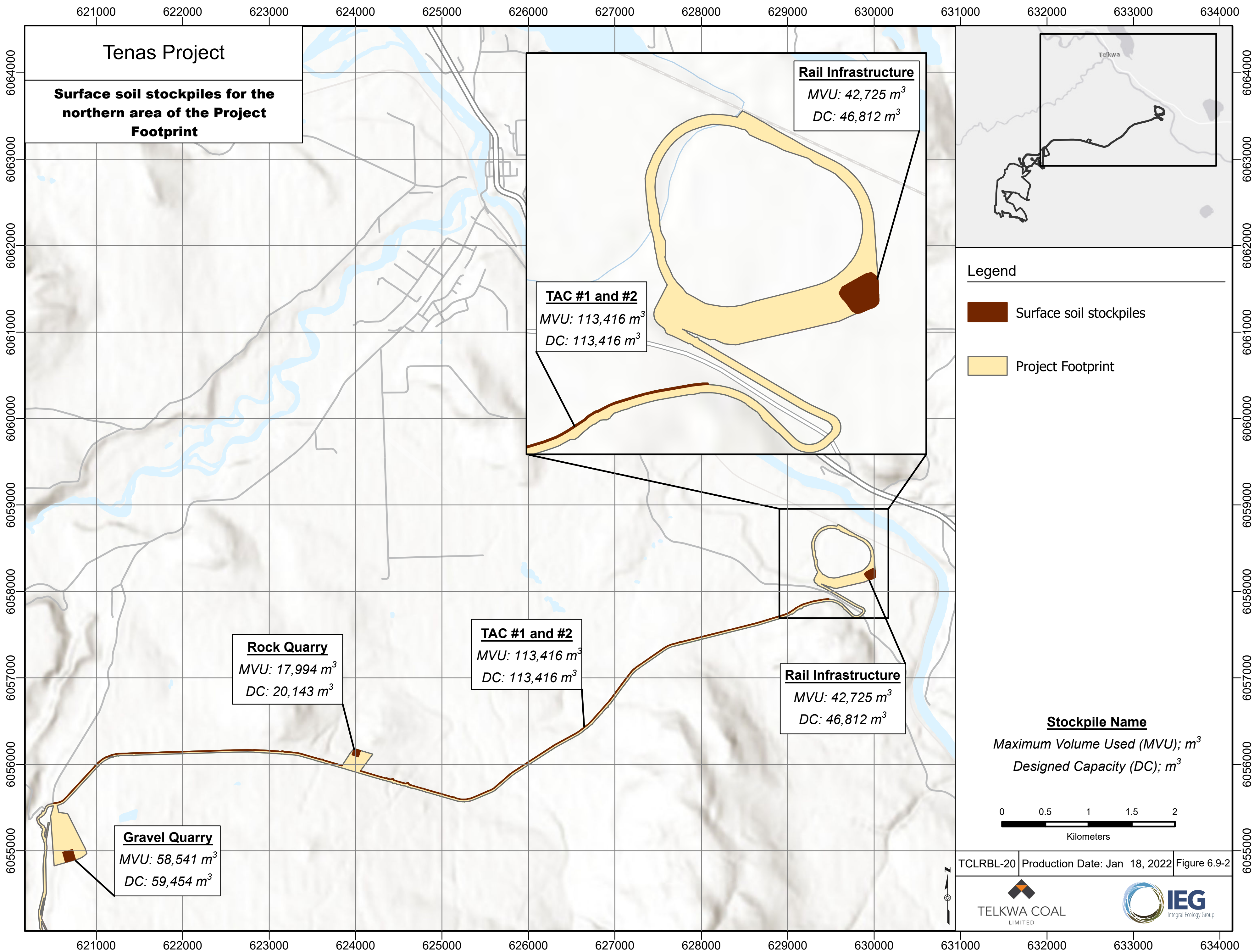
Surface Soil Stockpile Identification	Surface Soil Sources for Stockpiles	Maximum Volume Placed into Stockpiles (m^3)[1]	Designed Capacity of the Stockpiles (m^3)	Maximum Height of Stockpiles (m)	Area of Stockpiles (m^2)
Pit #1	MIC, Cleared Areas for Access, Water MPs, Pit	434,722	634,972	12	75,870

Surface Soil Stockpile Identification	Surface Soil Sources for Stockpiles	Maximum Volume Placed into Stockpiles (m^3)[1]	Designed Capacity of the Stockpiles (m^3)	Maximum Height of Stockpiles (m)	Area of Stockpiles (m^2)
Pit #2	Cleared Areas for Access, Water MPs, Pit	236,061	344,800	6	72,540
Pit #3	Cleared Areas for Access, Water MPs, Pit	98,151	143,364	6	30,853
Pit #4	Cleared Areas for Access, Water MPs, Pit	274,164	400,455	6	76,713
Explosive Magazine	Explosive Magazine	3,790	5,022	6	2,025
Explosive Facility	Explosive Facility	5,345	7,182	6	2,601
Rock Quarry	Rock Quarry	17,994	20,143	6	5,625
Gravel Quarry	Gravel Quarry	58,541	59,454	6	13,689
TAC #1 and #2	TAC	113,416	110,411	6	56,316
Rail Infrastructure	Rail Infrastructure	42,725	46,812	6	11,008
Totals	**Multiple**	**1,284,909**	**1,772,615**	**6 to 12**	**340,024**

Notes: *m^2=square metre; MIC=Mine Infrastructure Complex, MP=management pond; TAC=Tenas Access Corridor*
*[1] Maximum volumes used for open pit surface soil stockpiles are less than the total salvage designed volumes in **Table 6.6-2** due to sequencing (i.e., some surface soil is used for progressive reclamation).*



Tenas Project
Surface soil stockpiles for the southern area of the Project Footprint
Explosives Facility
MVU: 5,345 m3
DC: 7,182 m3
Gravel Quarry
MVU: 58,541 m3
DC: 59,454 m3
Explosives Magazine
MVU: 3,790 m3
DC: 5,022 m3
Pit #1
MVU: 434,722 m3
DC: 634,972 m3
Pit #2
MVU: 236,061 m3
DC: 344,800 m3
Pit #3
MVU: 98,151 m3
DC: 143,364 m3
Pit #4
MVU: 274,164 m3
DC: 400,455 m3
Legend
Surface soil stockpiles
Project Footprint
Stockpile Name
Maximum Volume Used (MVU); m3
Designed Capacity (DC); m3
0
0.25
0.5
0.75
1
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.9-1
TELKWA COAL LIMITED
IEG Integral Ecology Group
616000
617000
618000
619000
620000
621000
622000
623000
6050000
6051000
6052000
6053000
6054000
6055000



Tenas Project
Surface soil stockpiles for the northern area of the Project Footprint
Rail Infrastructure
MVU: 42,725 m3
DC: 46,812 m3
TAC #1 and #2
MVU: 113,416 m3
DC: 113,416 m3
Rock Quarry
MVU: 17,994 m3
DC: 20,143 m3
TAC #1 and #2
MVU: 113,416 m3
DC: 113,416 m3
Rail Infrastructure
MVU: 42,725 m3
DC: 46,812 m3
Gravel Quarry
MVU: 58,541 m3
DC: 59,454 m3
Telkwa
Legend
Surface soil stockpiles
Project Footprint
Stockpile Name
Maximum Volume Used (MVU); m3
Designed Capacity (DC); m3
0 0.5 1 1.5 2
Kilometers
TCLRBL-20
Production Date: Jan 18, 2022
Figure 6.9-2
TELKWA COAL LIMITED
IEG Integral Ecology Group

6.9.3 Surface Soil Storage Best Management Practices (BMPs)

Over time, erosion can reduce the quality and quantity of stockpiled surface soil. Invasive or unwanted plant species can also become established and may create a source of these species for adjacent and future reclamation areas. The following best practices will be followed to maintain and protect stockpiled materials.

- Select stable stockpile locations that are not at risk of rehandling or intrusion by machinery over the stockpile life prior to use;
- Ensure that stockpiles are located at least 10 m from any materials that could negatively impact the quality of the materials, such as mined rock, processed coal, or processed rock that may have elevated element concentrations or unfavourable surface soil properties for reclamation;
- Segregate different classes of reclamation materials (OVB, low-AWSC mineral soil, high-AWSC mineral soil, wood debris, and over-salvaged organic soil mixes) into separate stockpiles or separate portions of stockpiles;
- Construct stockpiles to minimize wind and water erosion, as prescribed by the **CEMP** and to meet the geotechnical stability standards required by engineering designs. Water erosion can be reduced by limiting the steepness of stockpile slopes, creating surface microtopography and ensuring that salvaged materials are placed on well-drained areas. Avoid locating stockpiles closer than 15 m to a watercourse or other sensitive environmental feature, or in proximity to runoff pathways to channels or watercourses to reduce the risk of sediment transport to downstream environments;
- Reduce erosion and establishment of invasive species by seeding stockpiles with non-propagating grass species (e.g., oats [*Avena sativa*] , annual [*Lolium multiflorum*] and/or fall [*Secale cereale*] rye), native grasses (e.g., ticklegrass [*Agrostis scabra*], slender wheatgrass [*Elymus trachycaulus*], northern fescue [*Festuca saximontana*]), and forbs (e.g., lupine, if available), and planting with tree and shrub species such as Sitka alder and trembling aspen (unless sufficient natural regeneration is occurring). The **Vegetation Management Plan (S13.0-C18) (VMP**) will be followed regarding invasive species management on stockpiles;
- Aggressive agronomic species should be avoided, as they will be transferred with the reclamation materials (surface soils) during placement and may not meet end land use objectives. Seeding or planting reclamation stockpiles with species intended for the closure landscape can help build a seedbank in the reclamation material;
- Clearly mark stockpile locations and material types and ensure that Project personnel are aware of their presence to prevent inadvertent contamination, burial, or removal;
- Conduct semi-annual inspections of stockpiles in the spring and fall to assess revegetation status, presence of invasive or non-desirable species and evidence of erosion. Presence of identification signage will also be confirmed. As detailed in the **CEMP** and **SEPSCP,** during inclement weather conditions, erosion and sediment control structures and stockpile stability will be inspected at least daily where practical and required maintenance will be conducted immediately, provided it is safe to do so. Erosion and sediment control materials and pumps will be stored where they are readily accessible;
- Maintain a reclamation-materials balance that will account for current stockpiles and will detail:
  - when a new stockpile is established, along with its initial volume;
  - material type of each stockpile; and
  - volumes of material added to or removed from existing stockpiles, with the resulting volume recorded.

A TARP was provided in **Table 6.7-3** to guide implementation of best practices.

6.10 Reclamation Material Application for Reclamation

Reclamation materials (surface soils, woody debris) will be placed as facilities acquire their final topography through deposition and landform grading. Placement within +/- 20 cm of target depths is acceptable; achievement of target ecosystems is not expected to be compromised if overall average depths for each hectare meet specifications. Surface soil placement activities will avoid excessively dry and windy conditions to reduce dust generation and excessively wet conditions to reduce the risk of erosion and compaction.

Placement of reclamation materials (surface soils, overburden, woody debris) will be accomplished using mine-type equipment, primarily bulldozers, in a manner that generates microtopography to improve microsites for plants and reduce erosion. Woody debris will be incorporated to create microhabitats, improve water, and snow retention. Equipment operators should not seek to create planar surfaces with exact material depths, it is preferable to have surface roughness and undulations. Dozer and/or excavator ripping, surface loosening and/or mounding with an excavator bucket, or other means of site preparation may be applied if additional decompaction is necessary or further creation of microtopography is desired. The following considerations will inform selection of appropriate decompaction and site preparation techniques:

- Excess water is removed from a site through infiltration or surface flow. Surface flow may cause erosion; however, infiltration into underlying rock is not desirable. Surface soil properties, such as texture, influence water storage and infiltration;
- Large mounds may reduce the accessibility for wildlife and/or land users in some situations;
- The possible risk of larger-scale cover system failures caused by pooling water (e.g., cascading failures from larger depressions on slopes and
- In select areas, including roads and quarries, ripping will be required prior to replacement of reclamation materials (surface soils, overburden, woody debris) to reduce compaction of the underlying waste materials/traffic surfaces.

Placement operations will be overseen by a QP. Placement areas will be monitored to confirm acceptable densities for reclamation (e.g., a fine-fraction post-placement density ≤1600 kilogram per cubic metre [kg/m^3]) at a sample intensity of one (1) measurement per hectare (ha). It is recommended that density monitoring be conducted using a nuclear densometer, which is the most efficient and reliable method for taking numerous density measurements in materials with high coarse-fragment contents. Placed reclamation materials (surface soils, woody debris)will also be checked for placement depths and erosion risks. Reclamation materials (surface soils, overburden) will be sampled following placement as per the reclamation monitoring program in the **RCP**.

6.10.1 Placement Best Practices

The following practices will be followed to maintain the quality of reclamation materials (surface soils) and maximize achievement of reclamation objectives:

- Clean equipment will be used in placement and spreading/contouring to prevent establishment of invasive species;
- Avoid placing reclamation materials (surface soils) in excessively wet conditions to reduce material compaction, material loss to erosion and instability of placed materials;

- If reclamation materials (surface soils) are placed in excessively dry and/or windy conditions, avoid placing materials or apply water to materials to reduce the risk of dust generation and loss of fine material;
- Remove snow prior to placement if feasible, to prevent mixing, uneven placement, and material instability;
- Place reclamation materials (surface soils) so that the surface is uneven—microtopography provides shelter for seeds and plants, reduces erosion, and retains more snow and water than a flat surface (Polster 2009);
- Incorporate coarse woody debris to create microhabitats, improve water, and snow retention;
- Once reclamation materials (surface soils) are placed, seed and/or plant vegetation to reduce erosion and the establishment of invasive species which require seedlings to be grown ahead of time in nurseries to allow for planting;
- If fertilization of planted stems is required, use spot-treatment methods, such as in-hole slow-release fertilizer bags, as opposed to broadcast fertilization. Local native plant species targeted in revegetation planning are not nitrophilic, and thus broadcast fertilization tends to favour the establishment of weedy or non-target species over target species;
- Follow erosion and sediment controls described in the **SEPSCP** to reduce erosion risk in reclaimed areas and protect waterways, such as:
  - using slope contouring and landform grading to direct runoff;
  - creating microtopography on the surface to shorten flow-path lengths on reclaimed slopes;
  - revegetation;
  - armouring channels in reclaimed areas as needed;
  - using mulch, rolled erosion control product or polyethylene covers on areas with elevated erosion risk;
  - using berms, water bars and ditches to direct runoff away from erosion-susceptible areas;
  - creating sediment ponds to allow settling of sediments during higher-runoff events; and
  - installing silt fencing, straw wattles, bioengineering installations or check dams for additional sediment capture.

A TARP was provided in **Table 6.7-3** to guide implementation of best practices.

7. MONITORING

Monitoring of surface soil salvage, stockpiling and application, as described throughout this SMP, is summarized in this section. Regular monitoring will be conducted and at a minimum will include the following activities:

- **Salvage –** During salvage operations, if suitability and salvageability of surface soil varies from that indicated by mapped units, the reclamation-materials balance will need to be reviewed to confirm that adequate volumes of each surface soil material type are still available to meet reclamation material needs; salvage plans (e.g., areas, depths, suitability criteria) may need to be adjusted accordingly. Daily visual inspections will be conducted during salvage operations to confirm that:
  - weather and surface soil moisture conditions are appropriate for salvage;
  - target reclamation material is being salvaged, as practical;
  - suitability criteria defined in **6.7.1** and **6.8.1** are being applied;
  - target salvage depths are being achieved (**6.4.1**);
  - surface soils of different suitability classes are being appropriately segregated (**6.3**).
- **Sampling –** Sampling of salvaged reclamation materials (surface soils, overburden) will be conducted during salvage as per **6.7.1** (surface soil) and **6.8.1** (OVB) to confirm material properties and suitability for reclamation;
- **Stockpiling –** Weekly stockpile development inspections (including consideration of foundation, layout, slope, and lift height) and completion inspections of the final structure, as well as inspections required for erosion monitoring will be conducted. Stockpile volume and location tracking will be conducted during salvage and stockpile operations as described in **6.9**. Along with volume tracking, the reclamation-materials balance will need to be reviewed to confirm that material availability and suitability aligns with mapped polygons and verify the accuracy of the projected reclamation-materials balance;
- **Stockpile Inspections** – Semi-annual inspections of stockpiles in spring and fall will be conducted to assess revegetation status, presence of invasive or non-desirable species and evidence of erosion. Presence of identification signage will also be confirmed. As detailed in the **CEMP** and **SEPSCP**, during inclement weather conditions, erosion and sediment control structures and stockpile stability will be inspected at least daily where practical and required maintenance will be conducted immediately, provided it is safe to do so. Erosion and sediment control materials and pumps to assist with directing non-contact water away from surface soil stockpiles will be stored where they are readily accessible;
- **Material Application** – Completion inspections of final grading, application depth, decompaction, surface roughening, and long-term stabilization (erosion and sediment control measures, revegetation) and post-placement sampling will be conducted; and
- **Reclamation Performance** – Research trials, progressive reclamation and operational reclamation areas will be monitored over time per the **RCP** to validate modeled surface soil properties, verify the suitability of the applied reclamation materials (surface soils), and assess the recovery of planned ecosystems.

7.1 Performance Objectives

The performance objectives and targets TCL will use to ensure the proper implementation of this SMP are shown in **Table 7.1-1**.

Table 7.1-1: Performance Objectives

Objectives	Target
Salvage activity BMPs followed	▪ Weather and surface soil moisture conditions are appropriate for salvage. ▪ Target reclamation material is salvaged, as practical. ▪ Surface soil suitability classes are salvaged to the designated depths and appropriately segregated. ▪ Stockpile volume and location tracking are performed. ▪ Erosion and sediment control inspections are completed on salvaged areas.
TARP is followed	Should caution or stop work be triggered by issues in any activity, actions were completed, including notifying the Environmental Coordinator.
Sampling is completed to verify quality	▪ Sampling of salvaged reclamation materials (surface soils, overburden) is conducted during salvage and/or application to confirm material properties and suitability for reclamation. ▪ Suitability criteria are applied.
Stockpile inspections and surveys conducted	▪ Weekly stockpile development inspections are completed (including consideration of foundation, layout, slope, and lift height). ▪ Completion inspections of the final stockpile structures are done. ▪ Semi-annual inspections of stockpiles in spring and fall are conducted to assess revegetation status, presence of invasive or non-desirable plants and evidence of erosion. ▪ Supplemental sediment and erosion control inspections are conducted following major rainfall events. ▪ Identification signage for stockpiles is confirmed. ▪ Stockpiles are identified on weekly site maps. ▪ Surveys of stripped areas are completed.
Material balance surveys and balance reviewed annually	▪ Reclamation-materials balance is reviewed annually to confirm that material availability and suitability aligns with mapped polygons and the projected balance. ▪ Surveys of stockpiles are completed.
Material Placement BMPs followed	▪ Weather and surface soil moisture conditions are appropriate for placement. ▪ Final grading, application depth, decompaction, surface roughening, and long-term stabilization (erosion and sediment control measures, revegetation) are appropriate as per Qualified Professional (QP) inspections and the reclamation monitoring program. ▪ Audits and tracking of loads are completed daily. ▪ Surface soil placement areas are indicted on weekly site maps.
Reclamation research trials completed	▪ Research trials, progressive reclamation and operational reclamation areas are monitored over time to validate modelled surface soil properties, verify the suitability of the applied reclamation materials (surface soils, overburden), and assess the recovery of planned ecosystems. ▪ Inspections are completed for invasive plants on reclaimed surfaces. ▪ Reclaimed areas are indicated on weekly site maps.
Management plan performance objectives considered	▪ Other relevant management plans to the Soil Management Plan (SMP) and its associated performance objectives will be followed during Project phases, including: **Environmental Management System (S13.0-C1) (EMS), Air Quality Management Plan (S13.0-C2) (AQMP), Construction Environmental Management Plan (S13.0-C4) (CEMP), Metal Leaching/Acid Rock Drainage Management Plan (S13.0-C12) (ML/ARDMP), Socio-economic Management Plan (S13.0-C16) (SEMP), Surface Erosion Prevention and Sediment Control Plan (S13.0-C17) (SEPSCP), Vegetation Management Plan (C13.0-18) (VMP), Visual Resources Management Plan (S13.0-C19) (VRMP), and the Wildlife Management Plan (S13.0-21) (WMP)**.

8. REPORTING

8.1 General Reporting

Reporting on monitoring and mitigation programs will be used to confirm consistent implementation of the SMP and inform adaptive management measures. Summary reports of monitoring activities and results will be compiled and reviewed annually.

8.2 Compliance Reporting

Compliance reporting will be subject to the EAC and *MA/EMA* permit conditions. The information gathered during monitoring programs will be summarized with appropriate information from other management plans and monitoring programs, into an Annual Environmental Management Summary Report and upon permitting completion, the Annual Environmental Report and Annual Reclamation Report as required by *MA/EMA* permits. Community engagement activities will be an aspect of the **SEMP**. The **SEMP** will have requirements related to reporting on community engagement programs**.**

8.3 Internal Reporting

The results from implementation of mitigation measures, monitoring programs, and adaptive management in this SMP will be documented in a daily log. Daily logs will be stored in a digital data storage system that will be maintained by the Environmental Coordinator. Details of the monitoring will be reported internally on an annual basis according to the adaptive management framework of the **EMS**. The report will provide monitoring results, assessment of performance objectives in **7.1**, summarize and evaluate the success of surface soil management and mitigation measures for the Project, and identify management reviews and adaptive management strategies that were employed.

TCL staff or contractors will be strongly encouraged to report any inefficiencies to TCL management for evaluation and consideration.

8.4 External Reporting

External reporting requirements for reclamation activities include an Annual Reclamation Report, and every five (5) years TCL's future *Mines Act, RSBC 1996, c 293* (GovBC 1996*)* permit and the Code will require a mine plan and reclamation program update. External reporting will be facilitated by this SMP and will be shared with Indigenous groups prescribed by TCL's *MA*/*EMA* permits. Community engagement activities will be an aspect of the **SEMP**. The **SEMP** will have requirements related to reporting on community engagement programs**.**

8.4.1 Annual Reclamation Report

Surface soils monitoring results and management activities will be reported in the Annual Reclamation Report submitted to BC MEMLI. The Annual Reclamation Report will be submitted to BC MEMLI and provided to Indigenous groups on or before March 31 each year. As required by BC MEMLI (BC MEMLI 2021b), this summary will include:

- map(s) of surface soil stockpiles and OVB placement activities associated with reclamation;
- tabulated volumes of surface soil stockpiles and OVB volumes directly placed for reclamation purposes, records of reclamation material sources (i.e., salvage locations) and identification of areas that could not be salvaged due to safety or other reasons, along with a supporting rationale;

- descriptions of surface soil characteristics and suitability for reclamation, including evaluation of results from the reclamation-material monitoring program and, where applicable, updates to ecohydrological modelling;
- review of the reclamation-materials balance, based on evaluation of updated surface soil stockpile volumes, data from newly collected surface soil samples, and projections of remaining salvageable area;
- descriptions of activities conducted to protect surface soil stockpiles;
- confirmation of monitoring of surface soil and OVB placement areas for condition (e.g., records of instances of slumping or losses due to erosion, descriptions of how issues were managed, stockpile revegetation monitoring results); and
- annual reconciliation of the reclamation-materials inventory (addition and subtractions).

Additionally, the SMP will be reviewed annually, and any updates will be documented in the Annual Reclamation Report, along with a proposed implementation timeline for any changes to the SMP. Any changes proposed outside of this annual update will be reviewed with BC MEMLI and Indigenous groups prior to implementation.

Non-compliance related to the SMP will be reported to BC MEMLI. Incidents and related actions will be recorded and maintained in an incident database.

8.4.2 Five-year Mine Plan and Reclamation and Closure Plan Update

Part 10, Section 10.4.1 of the Code states:

> *"(1) After commencement of operations, mine plans, including programs for reclamation and closure, shall be updated, at a minimum, every 5 years.*
> *(2) Reclamation plans shall outline progressive reclamation activities for the 5 years following the date on which the plans are updated in accordance with subsection (1)."*

TCL will provide a Five-year Mine Plan and Reclamation and Closure Plan, which will be updated every five (5) years (or more frequently if required to reflect major permitting changes) and submitted to BC MEMLI and to Indigenous groups as required by the *MA* permit and the **SEMP**. This submission will include a reclamation-materials balance, accounting for stockpiled reclamation material and surface soils and OVB projected to be salvaged over the LOM. Updates will present ongoing refinement of reclamation and closure planning, such as updates of the quantitative ecohydrological analysis (QEA) model, cover designs and revegetation prescriptions, based on results from ongoing monitoring and research. Updates will present detailed reclamation and mine plans for the next five (5) years and updated closure cost estimates to reflect the existing and planned development activities, and liabilities on the site. Updates will incorporate new data collected under the sampling program and results of reclamation research.

9. Roles and Responsibilities

Primary responsibilities for the SMP are like those in the **RCP** and have been assigned to the roles or groups described in the following subsections.

9.1 Mine Manager

The Mine Manager bears overall responsibility for phases of the Project, and responsibility for onsite mine reclamation and closure. The Mine Manager is responsible for implementing the regulatory requirements of permits and authorizations and will ensure progressive and closure reclamation prescriptions and reclamation monitoring measures, as outlined in the **RCP** and this SMP are followed. The Mine Manager reports to the executive steering committee for TCL and will coordinate with this group to ensure that Project objectives are being met.

Specifically, the Mine Manager will:

- implement the **RCP** and this SMP;
- provide the necessary budget and resources to allocate sufficient resources to conduct the **RCP** and this SMP, including retention of a QP who is trained in surface soil management, and
- facilitate the annual review of the **RCP** and SMP.

9.2 Mine Superintendent

The Mine Superintendent reports to the Mine Manager and will:

- assist the Mine Manager to implement the **RCP** and this SMP;
- coordinate personnel, equipment, and resources to undertake surface soil salvage, reclamation, and monitoring programs;
- coordinate the integrated reclamation and mine planning process, and make sure reclamation procedures such as the fact sheets, as described in the **RCP** and BMPs in this SMP have been developed and communicated to site staff and contractors, and
- assist the Mine Manager and Environmental Coordinator to complete an annual review of the **RCP** and this SMP.

9.3 Environmental Coordinator

The Environmental Coordinator is responsible for the day-to-day management of Project environmental programs and permits. The Environmental Coordinator reports to the Mine Superintendent.

The Environmental Coordinator will:

- provide guidance relating to permit conditions, commitments, regulations, acts, interpretation of legislation, and company policies;
- consult with the QP in surface soil suitability delineation and salvage supervision, to ensure adherence with mitigation measures and best management practices for management plans related to reclamation such as the **RCP**, this SMP, **SEPSCP**, and **CEMP**;
- be responsible for implementation of the **EMS** and underlying management plans;

- conduct research and reclamation monitoring with the assistance of QPs as required;
- produce the Annual Environmental Management Summary Report; and annual compliance summaries as per EAC and *MA*/*EMA* permit requirements;
- be the liaison for government agencies for permitting, inspections etc.;
- be the liaison for Indigenous groups, through their designated representatives, for reclamation planning involving indigenous traditional values, and
- conduct the annual review of the **RCP** and this SMP.

9.4 Environmental Technician

The Environmental Technician reports to the Environmental Coordinator and will:

- assist the Environmental Coordinator with research and monitoring as required in the **RCP** and this SMP;
- provide vacation coverage for the Environmental Coordinator;
- assist the Environmental Coordinator with the Annual Environmental Management Summary Report and annual compliance summary reports for EAC and *MA/EMA* permits; and
- assist the Environmental Coordinator with the annual review of the **RCP** and SMP.

10. COMMUNICATION

Communication of the **RCP** and this SMP at TCL will be based on internal requirements and will primarily take place through these plans and relevant SPPs. Any substantial change to the SMP or management of surface soil resources will be communicated to the Project's employees and contractors through a site-wide email, announcements over radio channels by Minesite supervisors, bulletins posted around the Project's Minesite, or other methods appropriate for the scale and type of change. When effective to do so, maps will be marked to show the changes. See **12** for details about change management.

10.1 Training and Awareness

Surface soil management will be a component of mine planning, with regular communication between the Mine Planning, Mine Operations, and Environment Departments, such that suitably trained personnel and QPs are onsite, as required, during surface soil salvage and replacement operations, and salvage, storage, and placement of reclamation materials (surface soils, overburden, woody debris) are done in accordance with this SMP.

10.2 Employee and Contractor Training

The training of personnel involved in Construction, Operation, and Decommissioning and Reclamation phase activities on the Project is a critical factor in achieving the objectives outlined in this SMP. Those employees and contractors responsible for the management, implementation, and operation of any aspect of this SMP will:

- attend an induction session that will review the objectives and practices outlined by this SMP;
- receive additional training appropriate to their role in surface soil management activities; and
- review at least annually the requirements of the SMP.

10.3 Visitor Training

Visitors will not be required to be knowledgeable of this SMP as they will be under the direction of TCL employees and will not be allowed to be in a situation involving surface soil management.

11. Evaluation and Adaptive Management

11.1 Evaluation

The SMP will be reviewed by the Environmental Coordinator on an annual basis to comply with regulatory and permit requirements, assess the implementation of the SMP for effectiveness and the appropriateness of mitigation measures, and incorporate updates, as appropriate.

The Environmental Coordinator will compare data and trends from monitoring programs and inspections and evaluate the effectiveness of the mitigation measures implemented as directed in this SMP, to determine if adjustments or corrections are required, through the adaptive management program. This process will include a review of the work plan deliverables and input received from Indigenous groups through the **SEMP**.

11.2 Adaptive Management

A philosophy of adaptive management will be adopted to verify that the **EMS** and associated mitigation measures are consistently meeting or exceeding performance targets. Adaptive management is a structured decision-making approach to reduce uncertainty over time via targeted system monitoring. This will be achieved through periodic reviews of the SMP and the results of monitoring programs. Adaptive management techniques will be employed where measures in the SMP are found to be not performing as designed or expected

11.3 Continual Improvement

TCL will work towards continual improvement at the Project. The SMP is a living document that will be reviewed and improved as site conditions change and following the evaluation of monitoring and sampling data collected through the life of the Project. TCL will amend the SMP as required based on input from consultations, monitoring results, QPs, regulatory or legislative changes. Any updated, improved, or revised best management practices and scientific methods will be considered.

If issues involving surface soil salvage or reclamation are noted during the life of the Project (e.g., revegetation deficiencies), Project design, operational procedures, and/or mitigation measures will be reviewed and adapted, and if appropriate, to minimize effects. The Environmental Coordinator will investigate opportunities for adaptive management based on observing trends in the monitoring data and will report to the Mine Manager any adapted practices that resulted in improved outcomes and that should be applied to other areas of the Project.

Incidents will be assessed for root causes and the Environmental Coordinator, or their delegate will design and implement a suitable corrective action. Examples of corrective actions could include:

- additional training of employees and contractors on surface soil salvage or reclamation procedures;
- enhancement of or alterations to mitigation measures or monitoring programs;
- development and implementation of additional mitigation measures or monitoring programs; and/or
- additional capacity to deliver mitigation or monitoring measures.

TCL will amend the SMP as required based on annual evaluations and feedback from stakeholders and Indigenous groups. Any proposed changes will be sent out for review by Indigenous groups and communities before being finalized and implemented into the SMP.

12. Change Management

Changing any part of the SMP requires a formalized process to be used and will also be part of the five (5)-year mine permit review for the mine plan and RCP. If significant changes are being planned to objectives, management plan structure, operational milestones, communication and/or information management, it is required that the Management of Change (MOC) procedure in the **EMS** be followed. Minor edits and/or updates to this SMP will be controlled through version control and content approval functions described in the preceding sections.

13. Conclusion

Management of surface soil resources at the Project is important for achieving terrestrial reclamation objectives. Through implementation of the SMP and relevant SPPs, TCL will salvage, store, and replace surface soil resources in accordance with applicable regulation and BMPs.

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Appendix 13.15-B-A Estimating Available Water Storage Capacity of Mine and Surface Soil Materials

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Estimating Available Water Storage Capacity of Mine and Surface Soil Materials

A standardized method of estimating available water-storage capacity (AWSC) from surface soil sample data using adaptations of peer-reviewed models has been employed (following from Straker et al. 2015a; Straker et al. 2015b; Baker et al. 2020). The primary inputs to this model are surface soil particle-size distribution (PSD), organic-matter (OM) content, surface soil depth and topographical data, as well as layering arrangements within the surface soil profile. Two (2) AWSC models are central to this approach: Arya and Paris (A&P) (1981; Arya et al. 1999) and Saxton and Rawls (S&R) (2006; Saxton 2005).

The A&P approach is a physical model based on the capillary equation and uses only PSD and bulk density as inputs. The PSD-centric approach ignores the benefit of OM and surface soil structure on AWSC, and thus appears better suited to poorly developed low-OM surface soils. To adjust for this omission, we adjust the A&P value by the percent increase in AWSC attributable to OM according to the S&R model. The S&R approach is an empirical model built on regressions of surface soil survey data (PSD, OM content, and bulk density) against pressure-plate AWSC results to determine a best-fit prediction of AWSC. Since it is based on agricultural surface soil samples, we believe this model better-suited to higher-OM, better-aggregated surface soils.

Fine-fraction (<2 mm) bulk density data was estimated based on texture classes (Saxton 2005). Whole-surface soil bulk density was calculated inclusive of coarse fragments (> 2 mm) using an assumed particle density value of 2700 kg/m^3 for mineral materials, with packing voids around coarse fragments estimated as per Zhang et al. (2011).

Both the S&R and A&P models, when combined with bulk density estimates, allow the estimation of water-retention curves (WRCs); volumetric water content versus tension) for each sample, from which the volumetric water content between field capacity and wilting point is taken, and then reduced according to volumetric coarse-fragment contents. In the A&P model, which does not specify the field capacity tension (Tfc) for calculating AWSC from the WRC, Tfc is estimated between 5 and 33 kilopascals (kPa) for each sample based on fine-fraction sand content, with coarser samples receiving a lower Tfc. This Tfc value is used in the profile layering corrections described below.

In recognition of the different applicability of the two models (A&P for unstructured versus S&R for structured, natural surface soils), the final AWSC value for each layer is calculated as a weighted mean between the A&P and S&R results, with weighting derived from total-surface soil (as opposed to fine-fraction) OM and clay contents, which are used as proxies for aggregation.

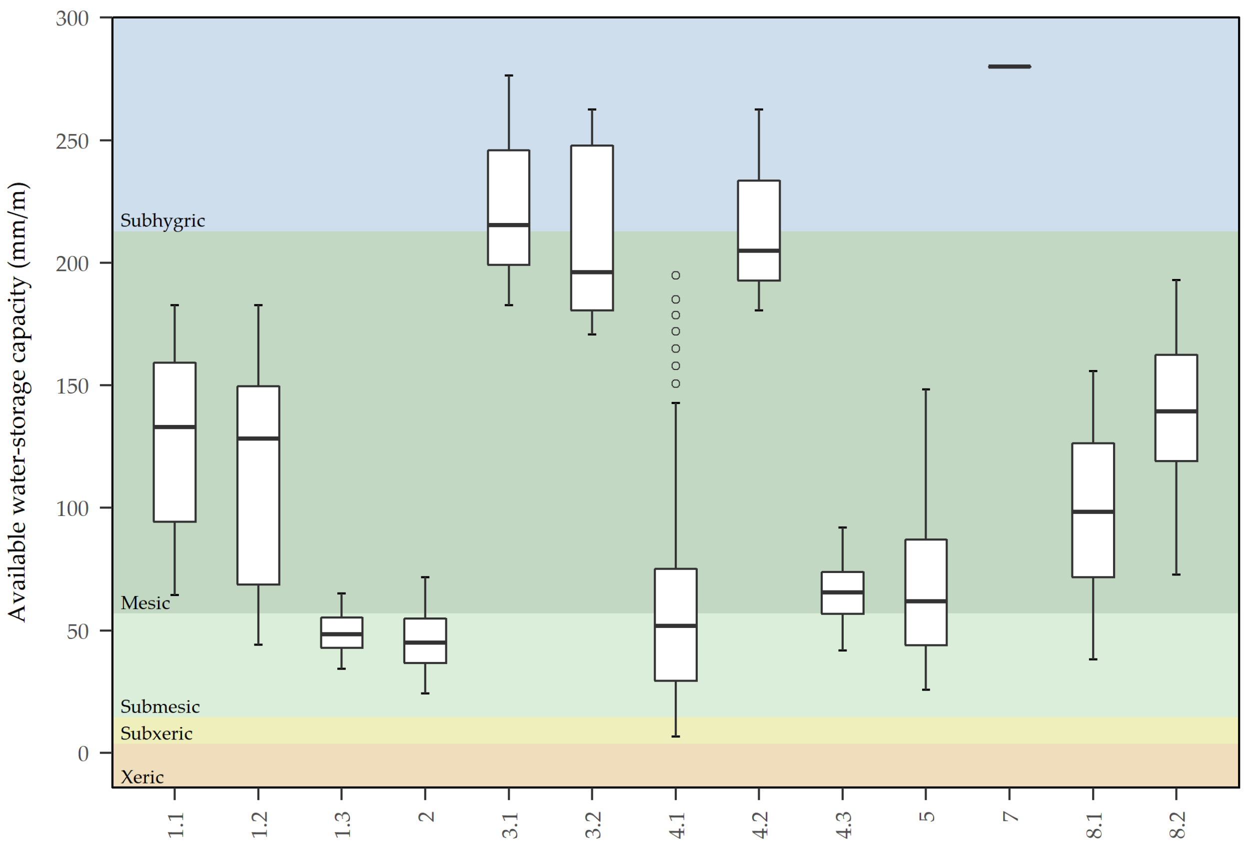
Available Water Storage Capacity of Project Mine and Surface Soil Materials

Cover soil – AWSC ranges for each soil management unit (SMU) were calculated based on PSD and OM content. The rooting-zone coarse fragment ranges and textural classes assigned to each SMU were used as PSD inputs (TCL 2021; Table 3-7), and the OM content assigned to each SMU was the average for the parent material type based on samples collected during baseline Terrestrial Ecosystem Mapping (TCL 2021).

Overburden – PSD data were available for 23 overburden (OVB) samples from two test pits from SRK (2018) and (SRK 2019). Oversize materials (>38 mm) were not represented in samples (SRK, personal communication), so oversize estimates were made based in visual evaluation of test pit-log photos. Photos were available for 13 of the samples and the mean oversize estimate was applied to the remaining samples. OM content data were not available for samples, so OM was estimated to be 1% by weight (fine-fraction basis) based on OM content of surface soil at the site and IEG's experience with OVB at other mine sites.

Mine rock – PSD and OM data for mine rock from another coal mine (located in the Elk Valley) were used calculate an estimated AWSC for mine rock at the site, for use in comparisons between AWSCs of mine rock and reclamation materials (surface soils, overburden).

In comparisons of surface soil and reclamation-material type AWSC, AWSC values are depth-weighted over 1 m and the relative surface soil moisture regime classes for flat sites without root restriction in the upper metre were evaluated. The AWSC ranges of each SMU are presented in Figure A-1, and Table A-1 provides the AWSC ranges along with the relative abundance of each SMU within the Project Area.



Notes: ***SMU 6 is not presented, as it represents skeletal surface soils. The coloured bands represent relative surface soil moisture regime classes for flat sites without root restriction in the upper metre. The middles of the boxplots represent the 50th percentile, the hinges represent the 25th and 75th percentiles, and the whiskers represent 1.5 x the interquartile range of the hinges.***

Figure A-1: Available water storage capacity of surface soil management units (SMUs)

Table A-1: Available Water Storage Capacity (AWSC) and Availability of Surface soil Management Units (SMUs)

Surface soil Management Unit (SMU)	Range of AWSC (mm/m)	Median AWSC (mm/m)	Proportion of Project Footprint (%)
1.1	65-183	133	58.5
1.2	44-183	128	11.6
1.3	34-65	48	12.5
2	24-72	45	5.0
3.1	183-276	216	0.8
3.2	171-263	196	4.8
4.1	7-195	52	0.1
4.2	181-263	205	0.3
4.3	42-92	65	1.9
5	26-148	62	0.7
6	n/a (skeletal surface soils)	n/a (skeletal surface soils)	0.1
7	280-280	280	2.0
8.1	38-156	98	0.6
8.2	73-193	139	0.2
Unassigned	NA	NA	0.9
Total or Range	**7 to 280**	**45 to 280**	**100.0**

Notes: *%=percent; AWSC=available water-storage capacity; ha=hectare; mm/m=millimetre per metre; n/a=not applicable*
[1] Includes areas of the Project footprint that have already undergone existing disturbance and can't be salvaged.

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