1.9.4.2 Operation Phase

Initial mining activities are anticipated to begin in Q3, Year 0 with full production at the 0.75 Mt clean coal annual rate anticipated to begin by the end of Year 1 and continue for the remaining 20 years of the projected mine life. In the early stage of operations, the open pit and material storage piles will be developed. Reclamation materials (surface soils, overburden, and woody debris) suitable for reclamation will be stockpiled in designated areas. Coal processing, and the temporary stockpiling of ROM coal prior to processing, and processed coal prior to shipping, will occur. Aquatic effects monitoring, wildlife studies, and reclamation studies will also be ongoing during the Operation Phase to monitor changes to the environment and develop or improve upon the approved mitigation measures provided during the regulatory process.

The Project anticipates operating 24-hours per day, on a continuous basis, with crews working on 10 to 12 hour rotating shifts. An estimated 16 Mt of processed coal will be mined from the Project's open pit over its operational life of 21 years.

1.9.4.2.1 Open Pit Development

The Project will use open pit development methods currently in practice at other existing surface mining operations in BC. Blasting will occur every two (2) days. In concordance with blasting best practices, blast patterns will be drilled on approximate 8 m hole spacing and loaded with the appropriate bulk explosive suited for the water conditions present in the hole.

At this time, the powder factor, or the quantity of explosive used per unit of rock blasted is approximately 0.50 kg per BCM of rock for both PAG and non-PAG rock. Using the current mine plan and technologies the average amount of explosives used at the Project will be approximately 1.6 Mt per year. As part of this Project, TCL will implement an **Explosives Management Plan (S13.0-C6) (EMP)** with one (1) of its objectives being the reduction of explosive residues present in the rock piles and backfill.

1.9.4.2.2 Run-of-mine (ROM) Coal Extraction

After a blast, the tops of coal seams are cleaned off with dozers and backhoes. If seam dips are sufficiently shallow, a dozer will be used to clean the coal seam, pushing rock off the top of the coal seam toward the mining bench as the backhoe removes the rock. When mining exposes a steeply dipping or thinner recoverable coal seam, a backhoe is used to clean the hanging wall rock from the coal to reduce dilution. Again, if the seam dip is sufficiently shallow, a dozer will be used to clean the coal seam off the footwall into coal piles on the mining bench. When coal seams are steeply dipping or thinner, a backhoe will be used to clean the coal off the footwall. The coal is transferred to haul trucks utilizing a backhoe and/or front-end loader (FEL).

1.9.4.2.3 Rock and Overburden Placement

The proposed practice at TCL will be to haul rock and overburden by truck to designated disposal areas for placement in a controlled and safe manner. Disposal areas are designed to limit haul distances, while not burying mineable coal or blocking present or future access to the open pit where feasible. Disposal at designated locations will be on a schedule consistent with the overall rock and overburden pile areas**.** A significant amount of the rock and overburden excavated will be used to backfill the completed portion of the open pit with the goal of covering exposed wall areas as quickly as practical while the reminder of the material placed within the management and control pond's dams and buttresses. As summarized in the equipment schedule, the required number of trucks is static at around eight (8) units, with around six (6) of these units being designated for rock and overburden haulage requirements.

1.9.4.2.4 Run-of-mine (ROM) Coal, Processed Rock, and Processed Coal Transportation

ROM coal mined from the Project will be transported in haul trucks to the ROM stockpiles located adjacent to the CPP. From these stockpiles ROM coal will be reclaimed using a FEL and will feed into a conventional jaw crusher and from there will feed onto a conveyor going into the CPP. The number of coal trucks required ranges from one (1) to two (2) units depending on where mining is occurring in the open pit.

Three (3) types of material are produced from the CPP; processed coal, coarse processed rock, and fine processed rock. The coarse and fine processed rock are combined at the CPP into one (1) material type, making it "processed rock" and then placed into a temporary stockpile using a radial stacking conveyor. FELs then reclaim this material from the stockpile which can be disposed of using haul trucks to haul this material to the management ponds where this material will be co-disposed of with PAG rock from the open pit. As TCL is dewatering the fine and coarse process rock streams sufficiently to allow them to be hauled, there is no “wet” tailings stream planned for the Project.

Processed coal is also placed in a temporary stockpile using a radial stacker adjacent to the CPP. A hydraulic excavator and/or a FEL reclaim the processed coal and place it in on-highway super B-train tractor trailers for haulage to the Rail Infrastructure.

1.9.4.2.5 Mining

1.9.4.2.5.1 Mining Methods

The Project will be a conventional excavator and truck operation like other rock quarry and surface mine operations in the region. The surface mining method will be completed bench-by-bench (4 to 12 m in height), which will include the salvage of reclamation materials (surface soils, overburden, and woody debris) , excavation of overburden, drilling and blasting of rock, ripping, and dozing of coal, loading these materials with either a hydraulic excavator and/or a FEL, and moving ROM coal to the CPP and moving non-coal materials to the management pond embankments and/or buttresses and/or backfills with 90-tonne capacity rigid frame haul trucks depending on the geochemical properties of the material.

1.9.4.2.5.1.1 Bottom-up Mining Method

At the Project, a bottom-up mining method has been considered for the Start Phase of the open pit. Other phases, with steeper seam geometry or limited width (Mining Phases North and Central South) or excessive depth in tight areas (Mining Phase Central North), use a more conventional top-down bench mining approach. The cut configurations for the bottom-up method are shown in **Figures 1.9-4** and **1.9-5** below.

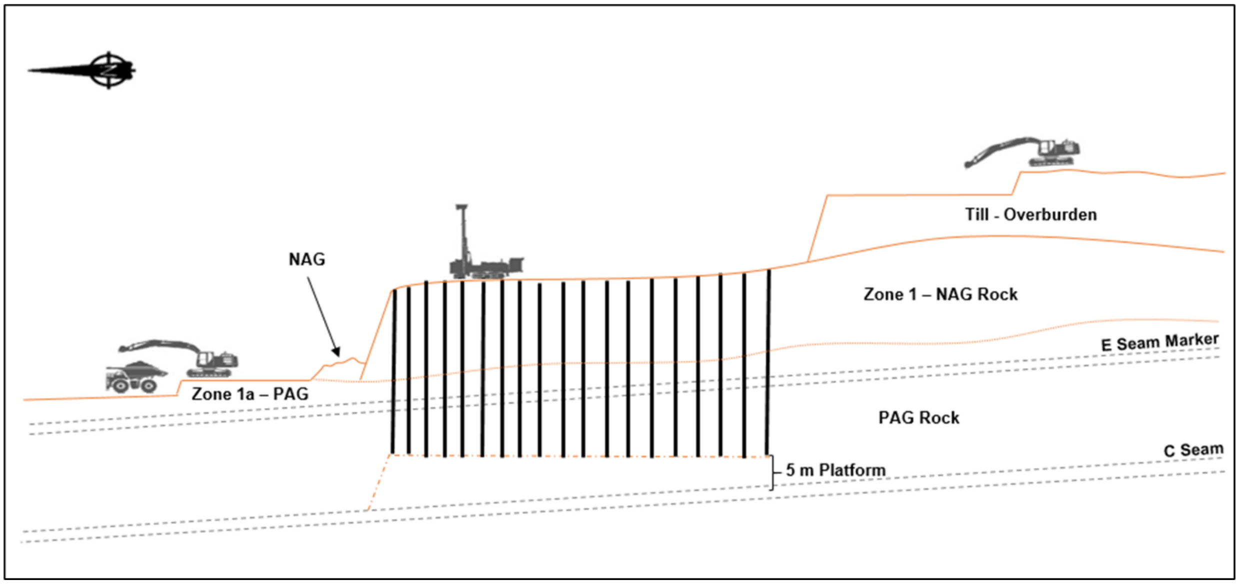


Figure 1.9-4: Mining to 4-metre (m) platform above c seam

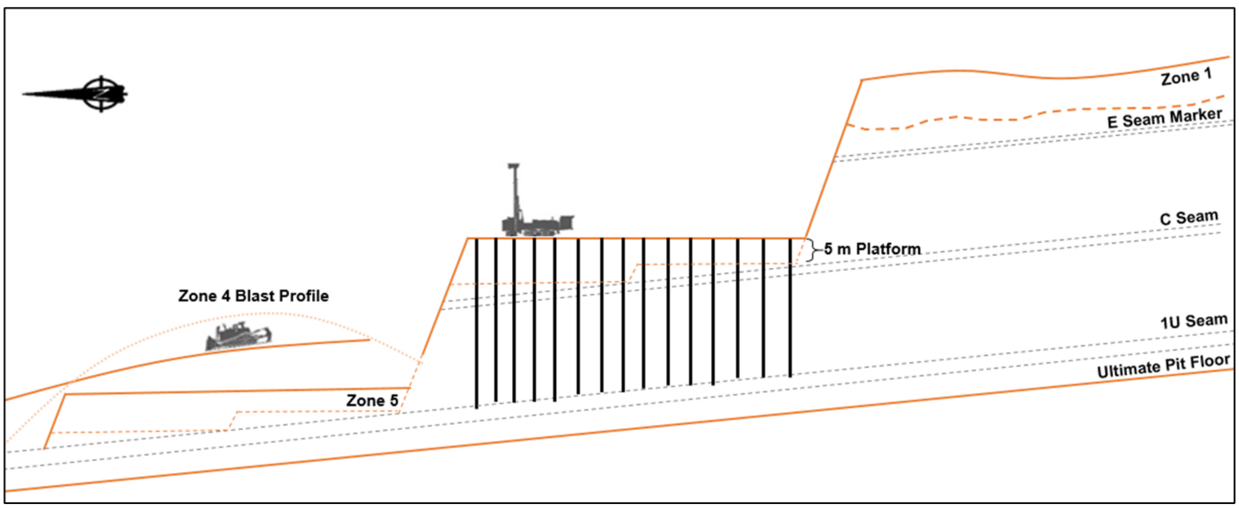


Figure 1.9-5: Mining to the top of 1U Seam or 1 Seam

Figure 1.9-4 below shows the drilling and blasting down to a bench elevation offset approximately 4 m above Seam c, as well as preceding and succeeding activities. Prior to drilling and blasting, overburden is removed in the next cut by truck-excavator. After drilling and blasting the material to the offset bench (Zone 1 and portion of Zone 2 and 3), the non-PAG Zone 1 material is mined. To the extent possible, Zone 1a, a PAG zone atop Seam c marker, should be avoided and mined with the similar PAG rock of Zones 2 and 3. Mining above Seam c is detached from mining down to Seam 1, but generally is scheduled no more than a cut in advance.

Figure 1.9-5 below shows the mining sequence down to Seam 1. Once the bench 4 m above Seam c is excavated, it serves as a drilling platform to drill down to Seam 1 (or Seam 1U if present). Once blasted, the Seam c overburden is mined to the Seam c roof. Where the cut is wide enough (coal dips less than 13 degrees) an additional 4-m bench is mined over the downslope material wedge, leaving two (2) material wedges within the cut. Where the seam dips(slope) are greater than 13 degrees (up to 22 degrees), only a single 4-m bench is mined to expose a single material wedge. In the latter circumstance, the material wedge would be 12 m thick over Seam c on the downslope edge.

Concurrent with mining the material wedges over Seam c, the excavator will mine the Seam c coal. With the single wedge configuration, with its 12-m thickness to Seam c, the excavator will be required to undercut the bench to reach the coal.

Once Seam c is removed, Zone 4 material can be mined. At the Project, Zone 4 is typically non-PAG. This allows it to be dozer pushed on to the final Seam 1 footwall. Zone 5 is then bench-mined to leave material wedges over Seam 1 (or Seam 1U where it occurs). Where Zone 4 is PAG, both Zone 4 and Zone 5 will be bench mined. The mining of the wedges and coal is like for Seam c.

To facilitate mining of the final parting (Zone 55) and Seam 1, an access road will be established in the adjacent backfill material. The excavator, positioned atop the Zone 55 parting, will need to use its reach to dig parting and material up-dip and load a truck on the backfill road.

1.9.4.2.5.1.2 *<u>Top-down Mining Method</u>*

Mining will commence in a phased approach and will be a conventional top-down approach to mining for most of the deposit except for the phases noted above where the bottom-up approach will be used. Mining will start in the lower ratios of the open pit for coal release while also developing in the thick overburden portion of the open pit to produced material for the management ponds. The phases, while still utilizing truck and excavator, combined with the site geology and corresponding topography allow for lower cost mining. The phasing of the overall open pit allows for shorter material hauls for the backfill of material and placing material into the management ponds. Blasting is the use of explosives to break rock as one (1) step in the mining process. The phasing of the open pit provides the ability to backfill most of the excess rock and overburden material back within the open pit. The strip ratio will vary by year with an expected average 3.5 BCM per processed coal tonne produced over the life of the Project. The entire open pit mine is located within the Measured/Indicated resource portion of the Tenas Deposit.

Auxiliary equipment will be used at the mine, including bulldozers, graders, FELs, service trucks, forklifts, smaller excavators, and general equipment to support mining operations and conduct maintenance. Based on the level of production and the strip ratio, the primary mining fleet planned for the operation consists of two (2) hydraulic shovel/excavators, eight (8) haul trucks, two (2) diesel rotary drills, four (4) FELs, two (2) graders, and four (4) bulldozers.

At the end of the Operation Phase the area of the proposed open pit will be approximately 285 ha and extend about 3,000 m from north to south, 1,500 m from west to east, and 100 to 150 m below the current topographic surface. However, most of the open pit will be completely covered with overburden and rock to limit wall exposure areas to mitigate potential ARD from the open pit walls.

1.9.4.2.5.2 Drill and Blast Activities

The following subsections provide an overview of the drill and blasting operations associated with developing the open pit for the Project.

1.9.4.2.5.2.1 Production Drilling for Rock

The primary production drilling is to be conducted by a rotary drill capable of drilling up to a 9-7/8 inch (") (250.8 millimetre [mm]) hole, with back-up and pre-shear wall drilling being provided by a smaller down-the-hole hammer or top-hammer drill capable of drilling up to a 5-1/2" (139.7 mm) hole. Drill patterns were designed to achieve a powder factor of approximately 0.50 kilograms per bank cubic metre (kg/BCM) of rock, resulting in the pattern dimensions summarized in **Table 1.9-2** for the main two blasting agents used by the Project: Heavy Ammonium Nitrate and Fuel Oil (Heavy ANFO) and Emulsion**.** Both blasting agents are a blend of ANFO and pure emulsion with emulsion having a higher water residence than Heavy ANFO.

The 0.50 kilograms per cubic metre (kg/m^3) powder factor was based on a fragmentation analysis conducted by Orica Canada Inc. (Orica) using a rock strength of 30 to 60 megapascals (MPa) and comparing its fragmentation to the desired fragmentation achieved in a stronger rock mass which is provided in **Appendix 1.0-D Tenas Project Orica Canada's Fragmentation Study.** Blasting will be carried out by TCL utilizing BC ticketed blasters with Orica providing explosive delivery and storage services under contract to TCL. TCL is expecting to use electronic detonators and all holes will have two (2) detonators to minimize the likelihood of a misfire. Additional information on explosives can be found in the **EMP**.

Table 1.9-2: Drill Pattern Design Specifications

Typical Holes (~13 m)		
Blasting Agent	**Heavy ANFO**	**Emulsion**
Bit diameter of 9-7/8" and 12 m bench		
Spacing (m)	9.30	9.30
Burden (m)	8.05	8.05
Stemming (m)	4.25	4.25
Sub-drill (m)	1	1
Explosive Column (m)	8.75	8.75
Pattern Type	Equilateral	Equilateral
Bit diameter 5-1/2" and 12 m bench		
Spacing (m)	5.64	5.64
Burden (m)	4.88	4.88
Stemming (m)	2.5	2.5
Sub-drill (m)	0.5	0.5
Explosive Column (m)	10	10

Typical Holes (~13 m)		
Pattern Type	Equilateral	Equilateral

***Notes**: ~=approximately; "=inch; ANFO=ammonium nitrate fuel oil; m=metre; %=percent*

1.9.4.2.5.2.2 Wall Stabilization Drilling

Two (2) scenarios of wall stabilization drilling will be utilized in the development of the Project. The first is footwall stabilization drilling and the second is highwall stabilization drilling. The footwall method will require a modification of the production patterns to drill the wedge between the last full-length production hole that does not intersect the footwall coal seam or encroach upon the 2 m coal seam stand-off limit and the remaining holes up-dip.

These holes will have some or all the following modified to ensure that the footwall and coal seam are not damaged by blasting:

- drill length;
- burden;
- spacing; and
- use of smaller diameter drillholes.

Figure 1.9-6 below provides the footwall blast drill hole design used for the open pit.

The highwall stabilization drilling will include the use of pre-shear, stub, buffer, and production drilling. The pre-shear holes will be drilled one (1) pattern ahead of the trim blast.

To achieve the recommended bench face angles of 70 degrees and inter-ramp angles in mine rock up to approximately 50 degrees within the double bench sections, and to develop a stable face in weaker rock mass units, it will be essential that the pre-split holes are drilled and shot in sufficient time to be included in the mining schedule to implement these programs.

The trim blast pattern will include the stub, buffer and production holes and will be drilled by the 9-7/8" drill. The trim blast will be shot to an open face to maximize movement and minimize energy reflected into the highwall.

Operating costs have been included to cover the additional cost of use of the small diameter (5-1/2") drill. Drill utilization for both drills has been factored to capture the increased number of moves, increased difficulty of lining up on holes and the congestion encountered on the pattern.

A typical highwall blast pattern stabilization design is shown by **Figure 1.9-7**.

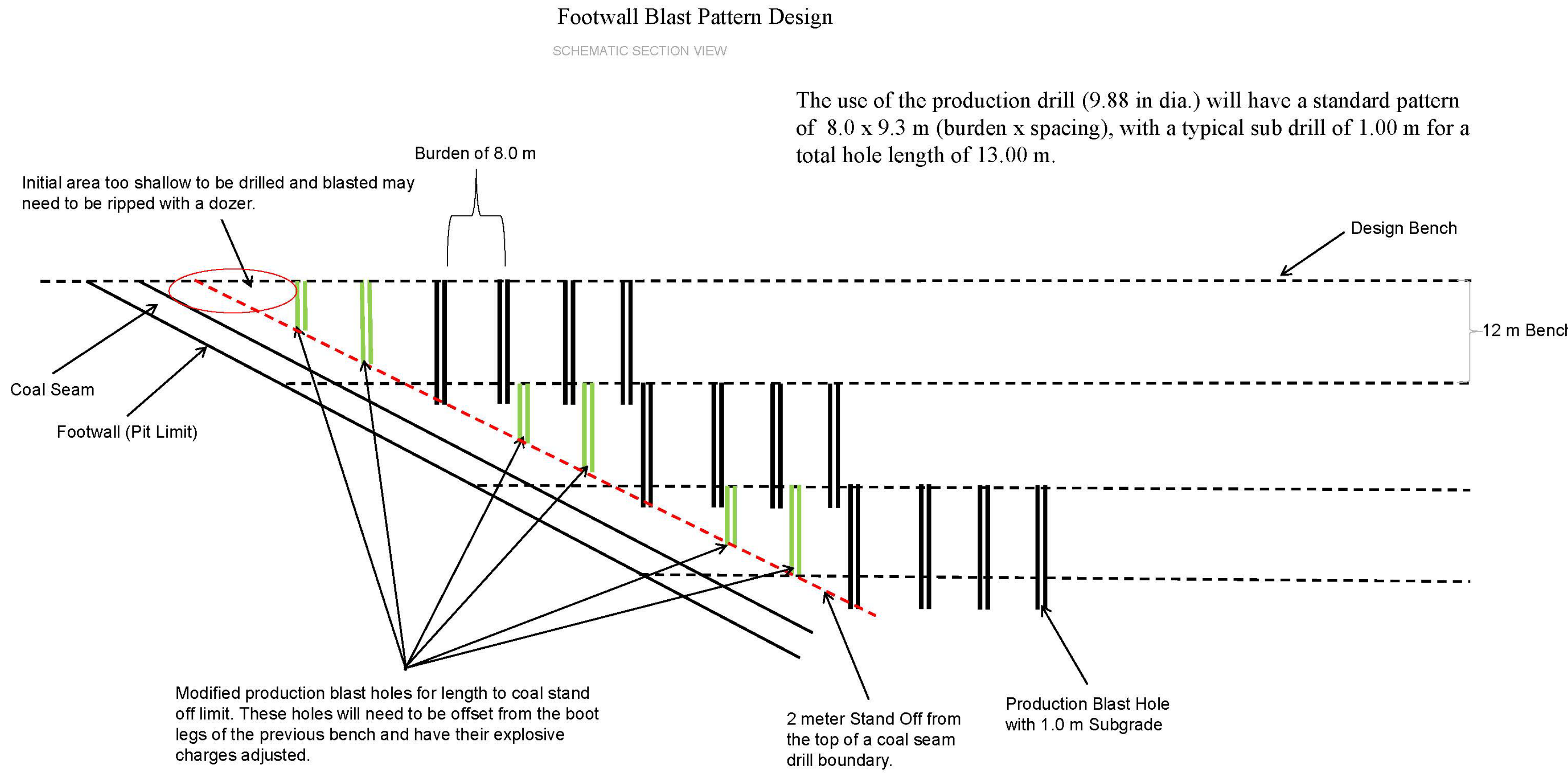
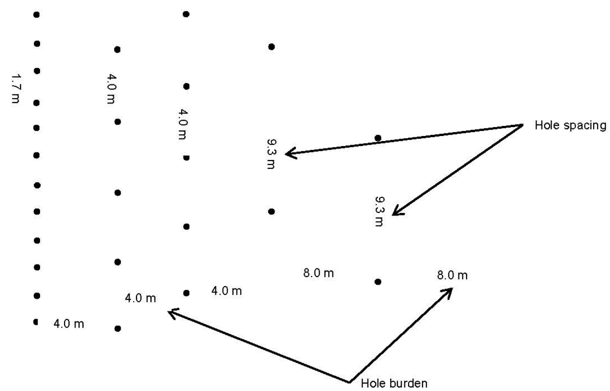


Figure 1.9-6: Footwall stabilization blast pattern design

Blast Pattern Design

SCHEMATIC PLAN VIEW



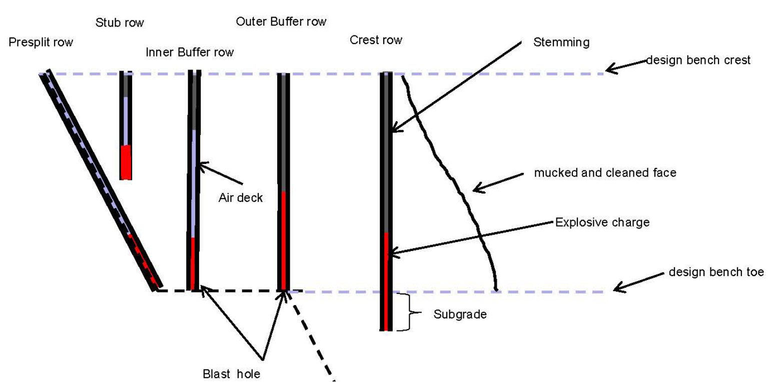
Blast Pattern Design Criteria

	Unit	Presplit Row	Stub Row	Inner Buffer Row	Outer Buffer Row	Crest Row
Hole diameter	inches	5.5	9.88	9.88	9.88	9.88
Hole length	m	12.77	6	12	12	13
Hole Angle	°	70	0	0	0	0
Decoupled		Y	Y	Y	N	N
Burden	m	4.0	4.0	4.0	8.0	8.0
Spacing	m	1.7	4.0	4.0	9.3	9.3
Air Deck	m	Y	Y	Y	N	N
Subgrade	m	0	0	0	0	1.00
Stemming column	m	0.00	1.00	1.80	4.30	4.30
Charge weight	kg	11	29	58	446	446
Powder factor	kg/bcm	0.12	0.30	0.30	0.50	0.50
Energy factor	kcal/tonne	37	92	92	153	153

Note: Typical modified production blast shot to a free face and loaded with Heavy ANFO - Emulsion.

Blast Pattern Design

SCHEMATIC SECTION VIEW



Blast Initiation Design

SCHEMATIC PLAN VIEW

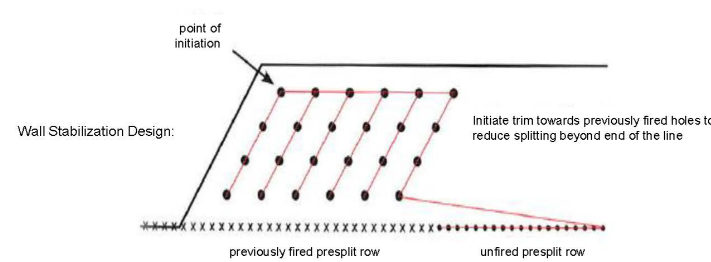


Figure 1.9-7: Highwall stabilization blast pattern design

1.9.4.2.5.2.3 Through-seam Blasting

The mining method for the Project calls for the through-seam blasting of Seam c in some areas where the dip of the coal is above 13 degrees but below an angle of 40 degrees. To minimize the coal loss and/or damage to the coal seam, a 2 m non-blasting zone above the seam and a 1 m non-blasting zone below the coal seam will be established to reduce blast damage to the coal. This portion of the hole will be backfilled with stemming material to ensure the explosive load cannot be in this area. Coal damage will be monitored and if excessive damage still occurs with the above offset parameters, then they will be increased during the Operation Phase of the Project.

1.9.4.2.5.2.4 Through-material Zone Blasting

The mining method for the Project calls for the through-zone blasting of zones that sometimes have different material designations based on their geochemical properties, namely PAG and non-PAG material. At the interface of where two (2) different geochemical zones occur in one (1) blast pattern, a 1.5 to 2.5 m deck of stemming material at the interface between the two (2) zones will be incorporated into the blast design to allow operators in the field to have a better visual guideline to follow for the different geochemical zones.

1.9.4.2.6 Coal Processing

The Project will use a conventional heavy media cyclone with floatation CPP. The CPP will be a closed circuit and all processed coal and processed rock produced will be sufficiently dewatered to allow these materials to be stockpiled and moved with FELs and trucks.

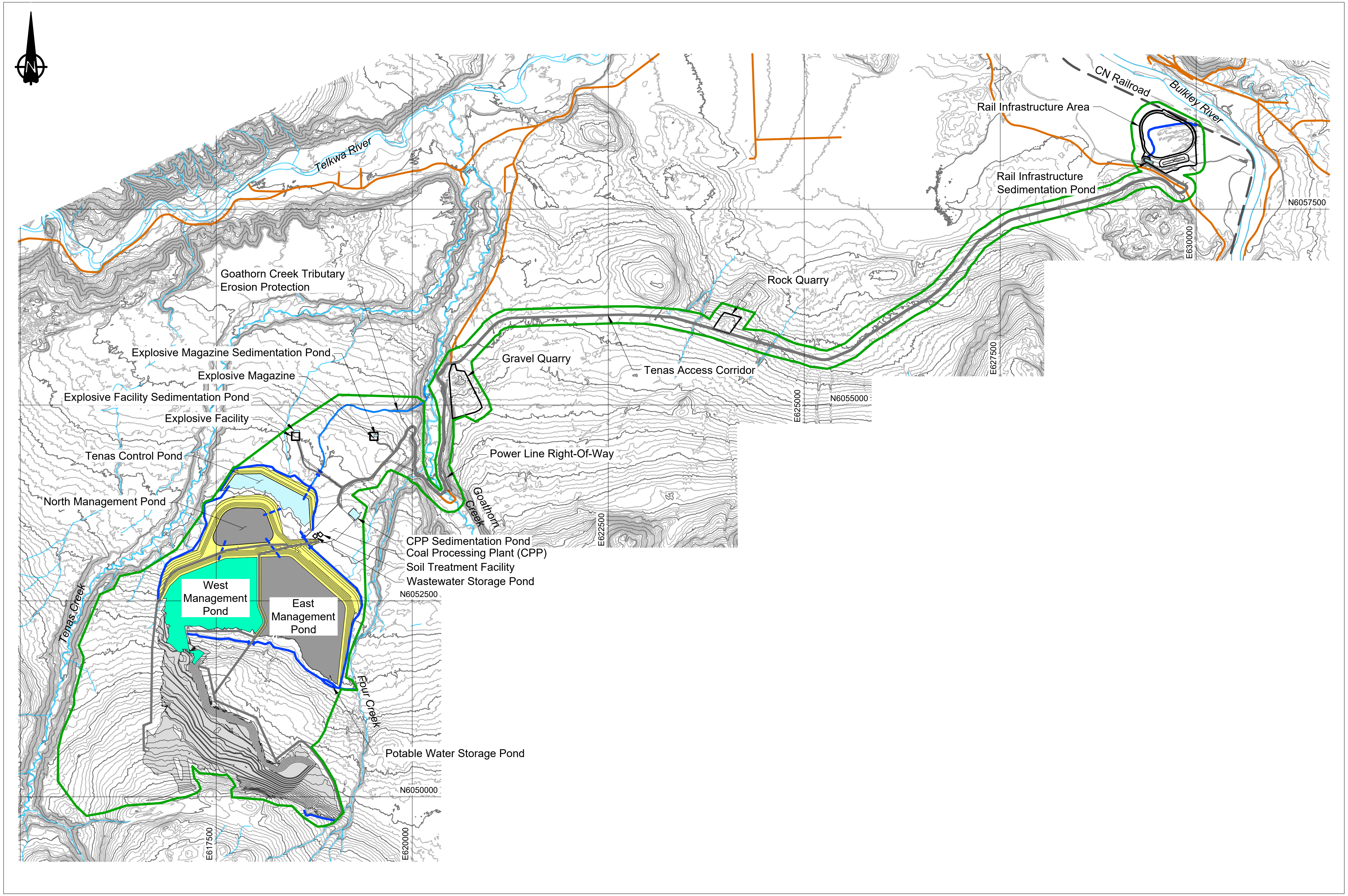
Infrastructure for the Project will be like other western Canadian coal operations and during the Operation Phase will consist of but not be limited to the following:

1.9.4.2.7 Surface Water Management

Water management activities in the Operation Phase include:

- active pumping between sedimentation ponds and management ponds, with excess water discharged to the environment after sufficient settling is achieved;
- collection of water in contact with mining infrastructure or active working areas and routing to downstream sedimentation ponds;
- collection of groundwater and surface runoff in open pit areas and pumping to management ponds;
- water quantity and quality monitoring in adjacent Four, Tenas and Goathorn creeks, as well as in active water storage ponds, including management ponds and sedimentation ponds, as described in the **SRK, Tenas Project Water and Load Balance Modeling Report** attached in **Appendix 1.0-E**; and
- diversion of non-contact water around and away from active working areas.

Figure 1.9-8 presents an overview of the final extents of water management infrastructure at the conclusion of the Operation Phase. Additional details on water management infrastructure are described in **1.17 Water Management,** the **Appendix 1.0-F SRK Tenas Project Water Management Design Technical Report**, and in the **MWMP**.



LEGEND

- Water Management Feature
- Spillway
- Existing Watercourse
- Existing Road
- Proposed Road
- Project Area
- Dam and Buttress
- Sedimentation and Control Pond
- Active Management Pond
- Backfill / NAG Pile
- Covered Inactive Management Pond

NOTES

1. Contours shown at 5.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. Mine Infrastructure designs by Telkwa Coal Limited (TCL).

REFERENCE

NAD83 UTM Zone 9.

0m 500 1000 1500 2000

srk consulting

TELKWA COAL LIMITED

Environmental Assessment

Water Management Infrastructure at the end of the Operation Phase

SRK JOB NO.: 1CT027.003	Telkwa Coal	DATE: 2022/04/05	APPROVED: SAB
FILE NAME: 1CT027.003 Overview.dwg		FIGURE: 1.9-8	

C:\Users\jbokic\SRK Consulting\FS873 Telkwa - Internal\!040_AutoCAD\Environmental Assessment\1CT027.003 Overview.dwg

1.9.4.2.8 Life-of-mine (LOM) Plan including the Construction Phase (Years -0.5 to 0) and Entire Operation Phase (Years 1 to 21) Description

The LOM plan for the Project includes both Construction and Operation phase activities that span from Years -0.5 to 21.

TCL completed a LOM plan that honoured the following constraints:

- Achieve a bench drop-down rate of less than 1 bench per 1.5-month timeframe for every cut and phase;
- Achieve a ROM production rate of 1,050,000 tonnes @5% moisture per annum evenly distributed throughout every month over any given year;
- Achieve equalized production rates of all coal seams in every quarter of any given year;
- Aim for a coal product with a total sulfur of less than 1.05% adb in every quarter of any given year;
- Do not mine overburden material in the months of April, May, and October of any given year;
- Do not construct critical backfill portions of the management pond embankments between December and May of any given year;
- Ensure logging is completed between November 1 and March 31 for the following year's activities if possible;
- Limit reclamation material (surface soil) salvage to between October 31 to June 1 of any given year;
- Only place reclamation materials (surface soils) between June 1 and October 31 of any given year;
- Ensure height of embankments for management pond has sufficient capacity at any time for the following year of production of PAG material;
- Maintain a ROM stockpile of approximately 5,000 tonnes at 5% moisture;
- Maintain a processed coal stockpile of at least 12,500 tonnes at 10% moisture at the Rail Infrastructure;
- Maintain personnel and equipment requirements generally the same between years or have definite trends;
- Have two (2) loading units to allow the operation to produce mine rock, or overburden and ROM coal at the same time; and
- Have multiple mining areas prepared to allow loading equipment to move to prepared areas to maintain optimal production rates.

The mining LOM schedule has mining commencing in the north portion of the open pit in the North Area in the construction phase (Year -0.5). The initial excavation in the North Area is to provide overburden to construct the initial embankment structures for the Tenas Control Pond, the CPP Sedimentation Pond, and the North Management Pond.

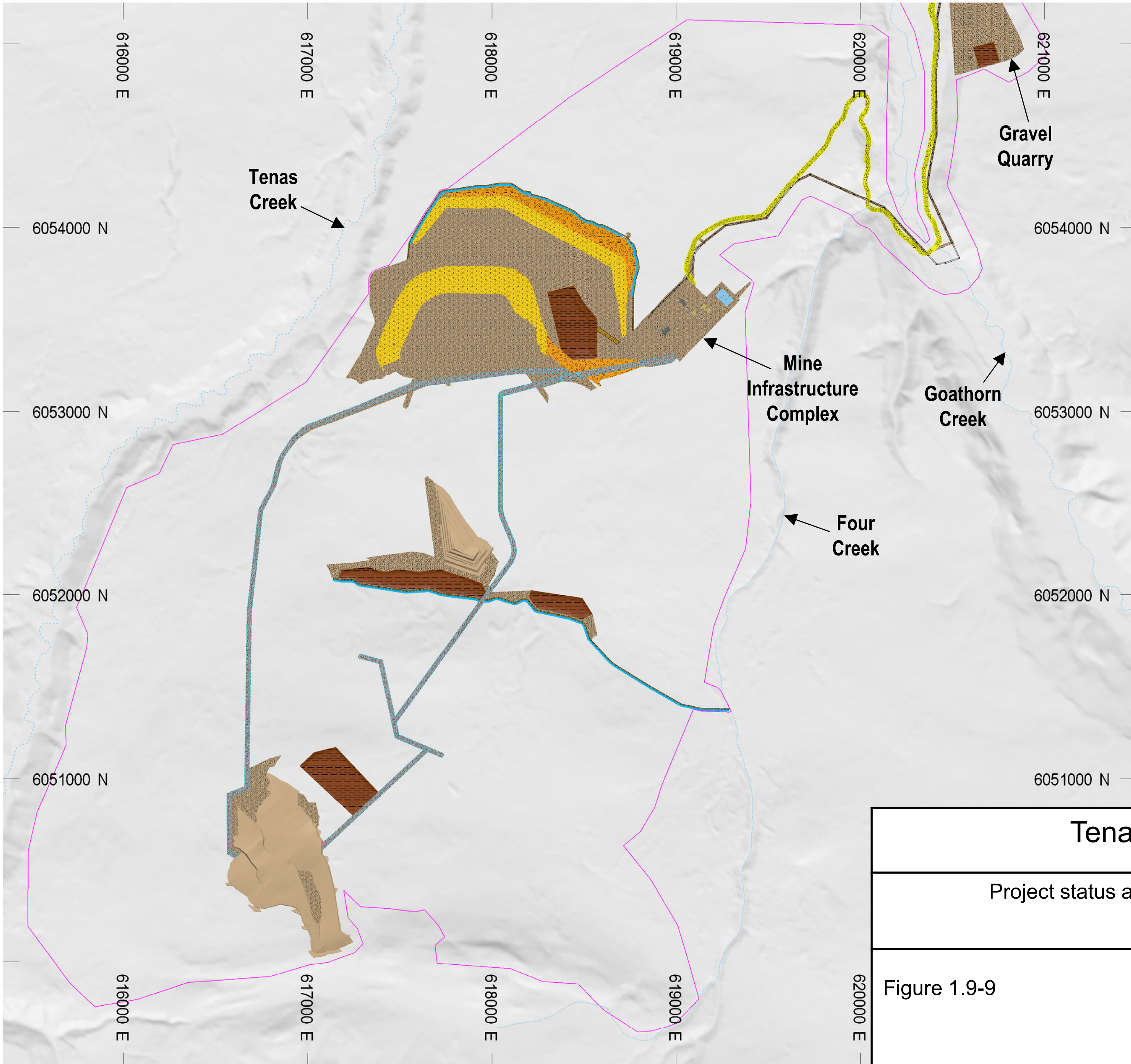
The water control structures that will be built first are the Tenas Control Pond and the CPP Sedimentation Pond. These two (2) structures form the water management backbone for the future development activities of the Project. Once these structures are completed, development of the North Management Pond and Mine Infrastructure Complex, and ultimately the remaining mining areas will follow. The management ponds will be built (and filled) in the following order: North, East, and West. The management ponds are to manage the exposure time of the PAG rock which overlays the coal in this deposit. Once the North Management Pond reaches approximately 50% of its planned capacity, mining of PAG rock will commence for the purpose of exposing the coal in the Start Area.

As construction finishes, coal extraction will be in the Start Area. Towards the end of Year 2, coal extraction will be in the North Area. Between Years 6 and 21, coal extraction will be in the South, Centre South, and Centre North in sequence.

Between Years 0 and 5 mining will continue west in the North Area to produce overburden and non-PAG rock for the management ponds and other structures. Between Years 5 and 21 mining will continue north in the South, Central South and Central North Areas to produce overburden and non-PAG rock for progressive reclamation (backfill and capping requirements). The backfill can be then reshaped and sloped to allow final reclamation activities.

Once mining is complete in Year 21, Decommissioning and Reclamation Phase activities will commence with the removal of all buildings and structures. Any pile or open pit walls that have not been sloped as part of progressive reclamation will now be sloped and have topsoil/growth media placed on them. Revegetation activities will then complete the reclamation. Once water encountering the Minesite and flowing through the Tenas Control Pond meets acceptable turbidity values for several years, the Tenas Control Pond structure will be modified and allowed to drain, establishing a wetland in the former bottom of this pond.

Figure 1.9-9 through **1.9-23** illustrate the Project development from onsite construction starting in Year -0.5 (Construction Phase) through to the end of the Decommissioning and Reclamation Phase in Year 25. Progressive reclamation is shown on these maps as well. Little progressive reclamation is planned in the first five (5) years except for the embankments of the Tenas Control Pond and the North Management Pond, due to the need to use the overburden for building the management structures. All haul roads and service roads within the Project are also shown. The operation will utilize diesel powered equipment, so no powerlines are required in the mine area beyond what is constructed at the beginning of the Project to distribute power to the Mine Infrastructure Complex (MIC) and Explosive Infrastructure.



Legend

- Backfill
- Buttress
- Cleared/Surface Soil removed
- Embankment
- Haul Road
- Open Pit
- Service Road
- Surface Soil Stockpile
- Surface Soil replaced + revegetated area
- Surface Topography
- Tenas Access Cooridor
- Water Cover
- Water effluent channel
- Wetland
- Project Area Outline

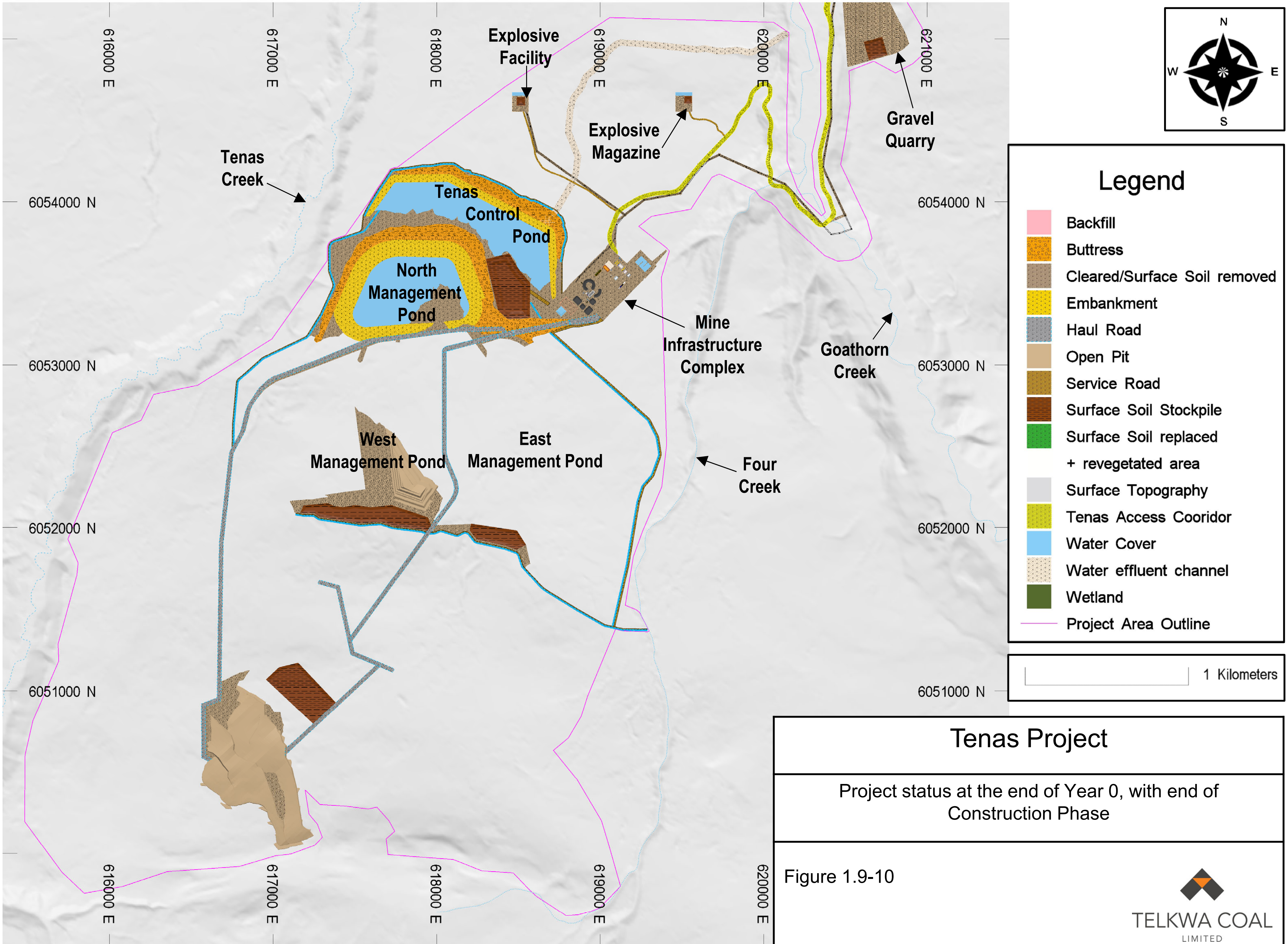
1 Kilometers

Tenas Project

Project status at the end of Year -0.5

Figure 1.9-9

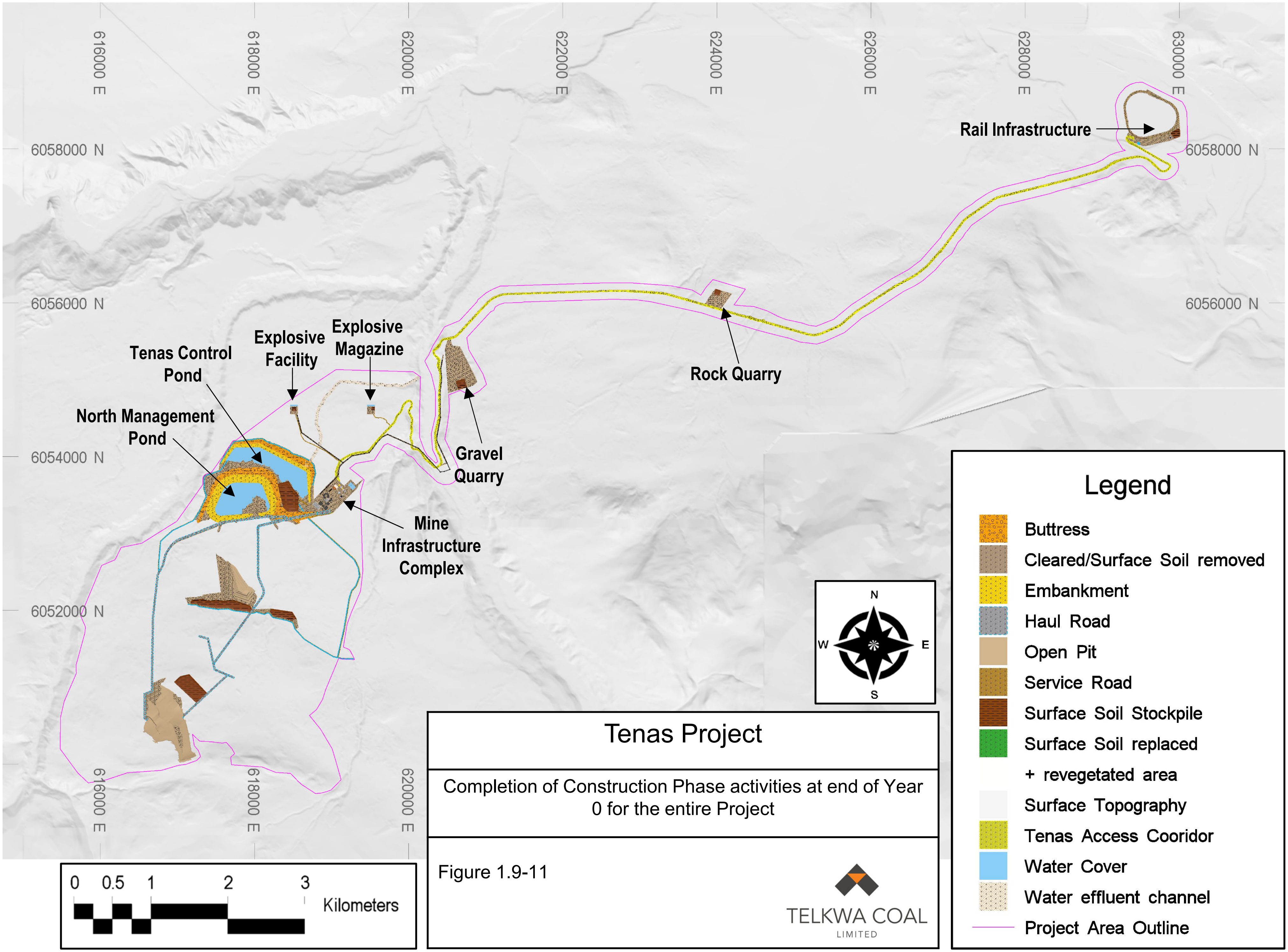
TELKWA COAL LIMITED



Tenas Project

Project status at the end of Year 0, with end of Construction Phase

Figure 1.9-10

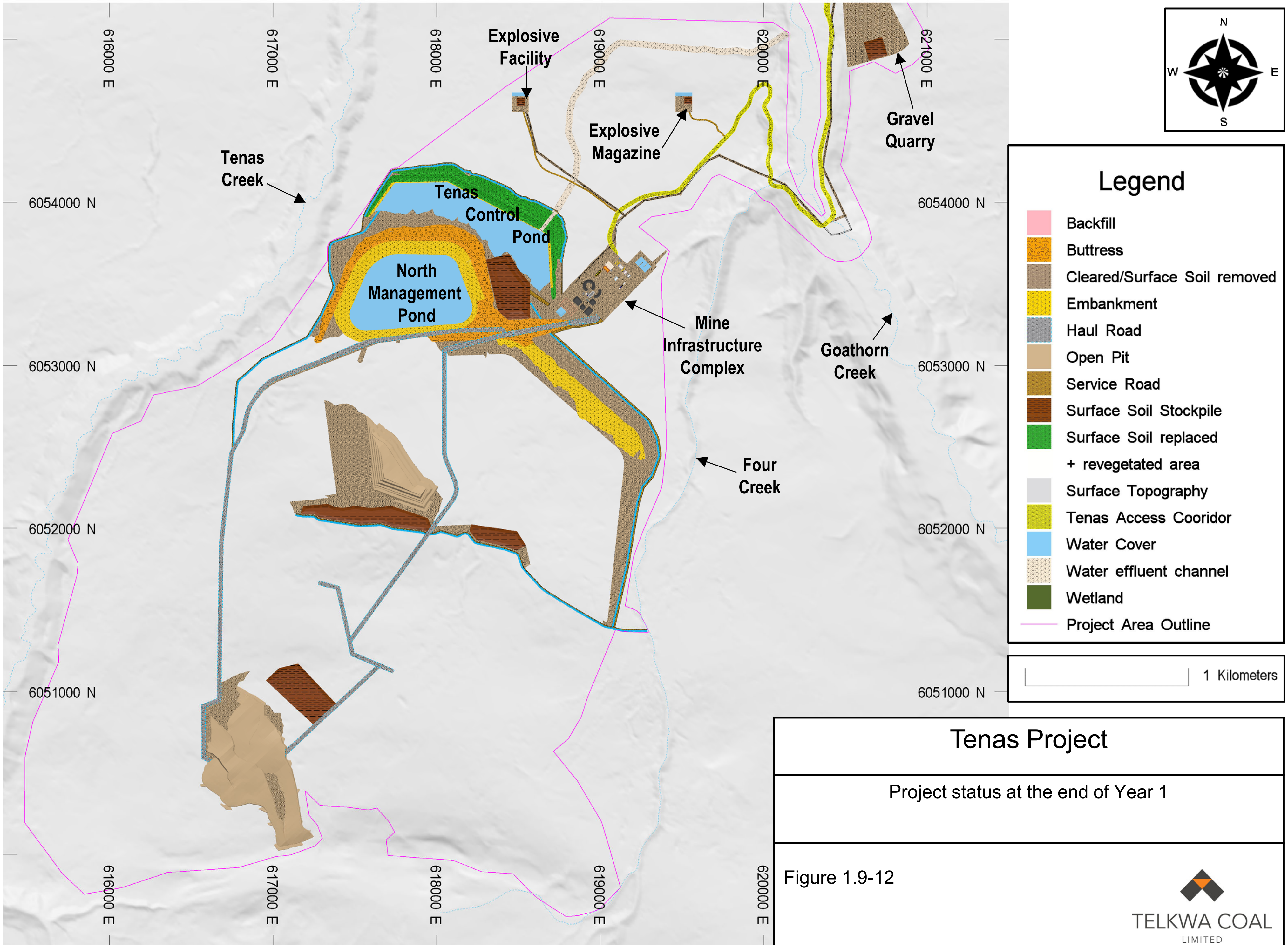


Tenas Project

Completion of Construction Phase activities at end of Year 0 for the entire Project

Figure 1.9-11

TELKWA COAL LIMITED

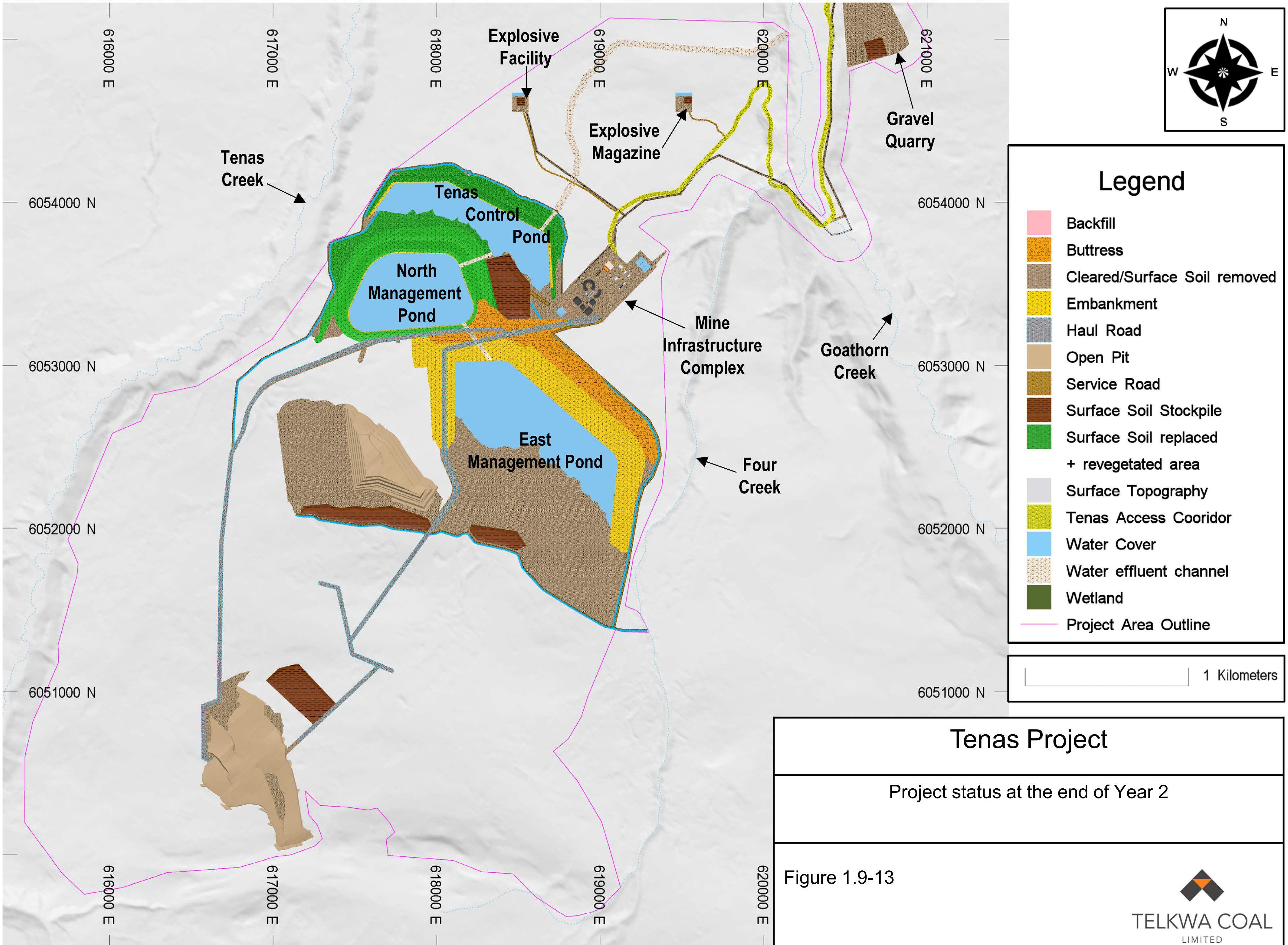


Tenas Project

Project status at the end of Year 1

Figure 1.9-12

TELKWA COAL LIMITED



Tenas Project

Project status at the end of Year 2

Figure 1.9-13

TELKWA COAL LIMITED